

# Energy Transition And Endogenous Development: Employment, Productive Chains, And Industrial Policy In The Renewable Sector

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## Abstract:

**Background:** The energy transition has gained increasing prominence in the international context by connecting environmental concerns, technological innovations, and changes in economic development strategies. In this perspective, the expansion of renewable energy goes beyond environmental issues and begins to shape the organization of productive chains, the dynamics of the labor market, and public policies aimed at strengthening industrial development. From this standpoint, the present study examines how the energy transition may influence endogenous development, particularly with regard to job creation, the strengthening of local productive chains, and the implementation of industrial policies directed toward the renewable energy sector.

**Materials and Methods:** Methodologically, the research adopted a qualitative approach, which enabled an interpretative analysis of the economic, institutional, and productive processes associated with the energy sector. The general objective of the study was to analyze how the energy transition can promote endogenous development through job creation, the consolidation of local productive chains, and the formulation of strategic industrial policies within the renewable energy sector.

**Results:** The findings indicate that changes in the energy matrix can stimulate local and self-sustaining development. This occurs particularly through the creation of new employment opportunities, the strengthening of locally operating productive chains, and the implementation of industrial policies aimed at improving and reinforcing technological capabilities within the country. In this sense, the energy transition emerges as a crucial element for regional economic development, as it encourages synergy among these different dimensions. The three axes investigated clearly demonstrate the strong interdependence between energy planning, industrial strategies, and the stimulation of regional productive dynamics.

**Conclusion:** The articulation of these elements is fundamental for amplifying the economic and social impacts generated by the growth and expansion of renewable energy sources. Therefore, the synergy among energy planning, industrial policy, and regional productive development is essential to fully harness the opportunities offered by this rapidly expanding sector.

**Key Word:** Endogenous development; Productive chains; Energy transition; Employment.

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## **I. Introduction**

Amid discussions on economic development, environmental sustainability, and transformations in productive structures, the energy transition has emerged as a central theme. This process refers to the transformation of paradigms related to energy generation and consumption, aiming not only at a more efficient and innovative economy but also at a future in which human behavior is aligned with the capacity of natural resources. In this context, it is essential to consider the relevance of adopting renewable and sustainable energy sources, as well as the impacts that this transition generates across different sectors of the economy. The urgent need to reduce greenhouse gas emissions, combined with the search for a more diversified energy matrix that is less dependent on fossil fuels, has led to the increasing adoption of renewable energy sources in several parts of the world. This transformation aims not only to reduce environmental damage but also to provide a more sustainable alternative for energy supply. Such a process does not merely represent a significant transformation in energy generation methods but also involves a profound restructuring of economic organization. Moreover, it affects labor market dynamics, influencing employment opportunities and the organization of productive chains associated with the energy sector. In this sense, the transition permeates multiple dimensions, revealing an interconnected relationship among technology, economic structures, and labor models that increasingly adapt to the emerging demands of the energy sector.

Within this context, the expansion and adoption of renewable energy sources provide a significant opportunity for examining their economic and territorial implications. This issue becomes particularly relevant when considering the role of renewable energy in fostering growth and development across different regions. It is therefore important to analyze how these energy sources can positively influence regional progress and their broader economic and territorial consequences. The implementation of renewable energy projects, the strengthening of industrial suppliers, and the formulation and execution of specific public policies for the sector can play an essential role in revitalizing productive activities. These initiatives may contribute to expanding employment opportunities and stimulating the development of technological capabilities within the national territory, thereby promoting advances in Brazil's technological autonomy and innovation capacity. Understanding the relationship between the energy transition and endogenous development thus becomes essential, as it allows for an analysis of how the expansion of renewable technologies may contribute to building trajectories of economic growth aligned with the particular characteristics and dynamics of different regions.

From a methodological perspective, the study adopted a qualitative approach, which allowed for an interpretative analysis of the economic, institutional, and productive processes associated with the energy sector. Data collection was conducted through two complementary research strategies that support the analytical framework of the study. The first consisted of a bibliographic review involving the analysis of academic works that address themes related to the energy transition, regional development, and industrial policies associated with the renewable energy sector. The second strategy involved documentary research based on the consultation and examination of institutional documents that help clarify strategic guidelines, policy instruments, and planning frameworks related to the energy transition.

The general objective of this research was to analyze how the energy transition can promote endogenous development through job creation, the consolidation of local productive chains, and the formulation of strategic industrial policies within the renewable energy sector. To achieve this objective, three specific goals were established. The first was to evaluate the impact of renewable energy expansion on job creation and workforce qualification at the regional level. The second sought to examine the structuring and the degree of internalization of productive chains associated with renewable energy sources, identifying technological and industrial opportunities as well as existing bottlenecks. The third objective aimed to analyze the role of industrial policies and state planning instruments in promoting productive development within the renewable energy sector.

In order to ensure clarity in the presentation of arguments and research findings, the article is structured into four main sections. The first section corresponds to the introduction, in which the research context, the objectives of the study, and the methodological approach are presented. The second section is dedicated to the methodological procedures adopted in the research. The third section presents the theoretical framework, discussing the main concepts and analytical approaches related to the energy transition, productive chains, and industrial policies. Finally, the fourth section presents the concluding remarks, summarizing the principal findings of the study and indicating potential directions for future research.

## **II. Material And Methods**

The qualitative approach was adopted in this research. This type of strategy is common in the social and applied sciences when the objective is to understand complex phenomena through the examination of contexts, interpretations, and interrelations among different dimensions of a research problem. According to John W. Creswell and J. David Creswell (2018), qualitative research is a way of investigating processes, meanings, and conceptual structures that cannot be fully explained solely through quantitative methods, allowing for richer interpretations of social, economic, and institutional phenomena.

Qualitative investigation becomes crucial in scientific research because it enables the examination of historical, institutional, and structural processes that shape specific social realities. As noted by Gil (2019), this type of research makes it possible to understand phenomena from multiple sources of information, allowing the analysis of interactions among variables, institutional contexts, and economic dynamics. In the specific case of this study, this perspective proved appropriate for investigating the relationship between energy transition, endogenous development, job creation, and the formation of productive chains within the renewable energy sector.

With regard to the methodological procedures adopted, two main research strategies were employed, both of which proved essential for the development of the study: bibliographic research and documentary research. Bibliographic research consists of the analysis and review of previously published works and materials related to the topic under investigation, while documentary research involves the collection and analysis of relevant documents that can significantly contribute to the understanding of the subject addressed. The bibliographic review conducted in this study aimed to provide a careful and systematic examination of scientific works dealing with the themes under investigation. This detailed analysis enabled a deeper exploration of the existing discussions and knowledge on the subject, contributing to a broader and more substantiated understanding of the topic.

During the development of the research, a survey was carried out that included the consultation of more than fifteen academic works. These sources consisted of scientific articles, books, and specialized studies addressing themes such as the energy transition, regional development, industrial policies, and productive chains associated with the renewable energy sector. The diversity of sources contributed to a comprehensive and in-depth understanding of the issues under analysis.

According to Gil (2019), bibliographic research represents one of the most important stages of scientific work, as it allows the researcher to understand the current state of knowledge on a particular subject, recognize different analytical approaches, and position the investigation within the broader context of existing academic production. Throughout this process, the review of the selected works made it possible to construct the theoretical framework of the study and to provide conceptual support for analyzing the economic and institutional processes associated with the expansion of renewable energy.

In addition to the bibliographic analysis, documentary research was also conducted, focusing on documents that served as primary sources of information. This procedure primarily supported the analysis of the third topic of the theoretical framework, which is specifically dedicated to the discussion of issues such as industrial policy, energy planning, and strategies aimed at ensuring technological sovereignty. This approach allowed for a deeper exploration of the interrelations among these elements, which are essential for sustainable and autonomous national development.

The documentary investigation involved the consultation and analysis of various types of institutional documents, including technical reports and regulatory frameworks produced by both national and international organizations linked to the energy sector and to the promotion of technological development. According to Piana (2009), documentary research makes use of sources that have not yet undergone systematic analysis or that may be reinterpreted according to new research objectives. Through this method, it becomes possible to examine institutional guidelines, planning strategies, and public policy instruments that regulate specific areas of governmental action. Within the scope of this study, the documentary analysis revealed how different countries and institutions organize their policies to promote the development of energy technologies and the strengthening of national productive capacities.

Bibliographic research and documentary research were used jointly, which significantly strengthened the development of the investigation. The literature review provided the theoretical foundation necessary to understand the energy transition and its economic implications, while the analysis of institutional documents enabled the evaluation of specific public policy guidelines and energy planning strategies. In summary, the combination of these two methodological approaches made it possible to gather diverse evidence, resulting in a robust analysis of the role of the energy transition in promoting endogenous development, generating employment, and strengthening productive chains within the renewable energy sector.

### **III. Theoretical Framework**

The theoretical structure of this study was developed based on three complementary analytical axes, organized to articulate the main dimensions surrounding the energy transition and endogenous development. The first axis, entitled *3.1 Energy Transition and Employment Dynamics in the Territory*, examines the relationship between the expansion of renewable energy supply and job creation, with particular emphasis on the territorial impacts associated with the implementation of energy projects.

The second axis, *3.2 Productive Chains, Local Content, and Endogenous Development*, discusses the organization of productive chains within the renewable energy sector, focusing on the nationalization of industrial stages, the development of suppliers, and the stimulation of local economies.

Finally, the third axis, *3.3 Industrial Policy, Energy Planning, and Technological Sovereignty Strategies*, analyzes the role of public policies and state planning instruments in coordinating investments, fostering national

technological capabilities, and consolidating strategies aimed at strengthening productive structures during the process of energy transition.

### **Energy Transition and Employment Dynamics in the Territory**

The expansion of renewable energy has emerged as an important driver of job creation in various regions, producing direct, indirect, and induced impacts on regional economies. Ram (2020) estimates that, worldwide, the number of direct jobs associated with the electricity sector will increase from approximately 21 million in 2015 to nearly 35 million by 2050. Solar photovoltaic energy, batteries, and wind power are among the main technologies responsible for job creation during the energy transition between 2015 and 2050. As demonstrated in the studies of Garcia-Casals, Ferroukhi and Parajuli (2019), the construction of wind farms, solar parks, and other renewable energy facilities generates temporary employment during the construction phase and subsequently requires specialized professionals for operation, maintenance, and technical support. This process also stimulates professional qualification and strengthens local human capital. The large-scale development of hydrogen, for example, has the potential to strengthen a new industrial sector dedicated to the production of high-technology equipment. Regional supply chains for the manufacturing of equipment such as electrolyzers and fuel cells could create opportunities and jobs beyond major economies (IEA, 2019). Furthermore, the geographical location of these investments may benefit areas that have historically been marginalized, thereby increasing the socioeconomic impact of energy policies.

A detailed analysis of each phase of the productive cycle shows that each stage produces distinct and specific impacts on the labor market and, consequently, on the creation and quality of employment. The manufacturing of equipment and machinery often concentrates employment opportunities in traditional industrial regions, historically recognized for their long-standing experience in this type of economic activity. In contrast, the installation and operation of renewable energy plants tend to distribute labor functions across a much broader geographical area. This wider distribution not only generates employment but also plays a crucial role in the growth and development of local communities located in these areas. According to Gielen et al. (2019), the expansion of activities ranging from the transportation of goods to the provision of more specialized services generates multiplier effects in the economy, resulting in a more balanced regional dynamic. This diversity can create a balance that benefits different sectors and areas, positively influencing regional development. The discussion presented here clearly demonstrates that the energy transition can be a powerful ally in promoting productive inclusion and fostering local economic development. The transformation of the energy sector not only alters the ways in which energy is produced and consumed but also creates opportunities for communities to benefit, promoting economic growth that is both sustainable and accessible.

It is also important to consider the quality of the jobs created. Genc and Kosemepel (2023) emphasize that, in addition to the number of positions generated, it is essential that workers have access to technical training and professional development programs in order to benefit sustainably from the sector's growth. Positions requiring higher levels of specialization, such as energy engineering, project management, and technical maintenance, are expected to expand, increasing workforce qualification and strengthening regional competitiveness in the energy sector. Studies conducted by the International Energy Agency indicate that the transition to clean energy in Latin America may benefit from the region's competitive advantages in the production of renewable fuels, enabling the creation of opportunities and jobs within a net-zero emissions scenario (IEA, 2019).

The positive interaction between industrial policies and the expansion of renewable energy sources is extremely important for strengthening the productive chains characteristic of each region. This synergy not only promotes sustainable development but also contributes to job creation and increased local competitiveness. In this context, the combination of such policies can stimulate innovation while significantly boosting regional economic development. According to Goldthau et al. (2019), the implementation of strategic policies that support local suppliers, facilitate technology transfer, and provide financing for project implementation can significantly enhance the positive effects on employment generation and regional economic development. These initiatives have the potential to transform local realities by creating a more favorable environment for regional economic growth and prosperity. Such alignment is fundamental because it helps ensure that the energy transition is not limited solely to the generation of clean energy but also functions as an effective mechanism for promoting development in local communities. In this way, significant productive autonomy can be achieved while simultaneously contributing to the construction of robust economic resilience capable of addressing present and future challenges.

Table 1 below summarizes the relationship between the phases of the renewable energy production cycle and their impacts on employment, considering dimensions such as job quantity, job quality, workforce qualification, and the territorial distribution of employment opportunities.

**Table 1** – Relationship between phases of the renewable energy production cycle and impacts on regional employment.

Phase of the Production Cycle	Type of Employment	Impact on Training	Territorial Distribution	References
Equipment manufacturing	Direct	Advanced technical training	Consolidated industrial areas	Gielen et al., 2019; Jianchao et al., 2021
Construction/Installation	Direct and indirect	Basic and intermediate training	Regions where projects are implemented	Garcia-Casals et al., 2019; Genc; Kosemepel, 2023
Operation and maintenance	Direct	Continuous technical qualification	Expanded regional distribution	Garcia-Casals et al., 2019; Gielen et al., 2019
Support services and logistics	Indirect and induced	Specific training	Peripheral and semi-arid regions	Blondeel et al., 2021; Goldthau et al., 2019

Source: Gielen et al., 2019; Garcia-Casals et al., 2019; Goldthau et al., 2019; Blondeel et al., 2021; Jianchao et al., 2021; Genc; Kosemepel, 2023.

The table demonstrates that the energy transition simultaneously acts as a driver of employment and a mechanism for regional qualification, showing that different phases of the productive cycle affect territories in distinct ways. Therefore, the integrated analysis of direct, indirect, and induced effects allows for a better understanding of how renewable energy can function as an instrument of endogenous development and productive inclusion.

When examining South America, it is possible to observe that different studies have estimated job creation associated with specific projects in the energy sector. As previously mentioned, there are still relatively few studies that examine the impacts of the energy transition on job creation in Latin America, a gap that this study seeks to help address. Considering the energy sector in a broader perspective, a recent study conducted by the Inter-American Development Bank indicated that, on average, every US\$ 1 million invested in energy projects generates approximately 50 direct jobs. This figure represents the highest rate among infrastructure projects, since initiatives in the water and transportation sectors generate, on average, approximately 18 and 11 direct jobs, respectively, for the same investment volume.

In this context, Saget, Vogt-Schilb and Luu (2020) project that, in Latin America and the Caribbean, there could be a reduction of approximately 60,000 jobs in fossil fuel-based thermal power plants. In contrast, it is estimated that around 100,000 new jobs may be created in the renewable electricity sector, in addition to 540,000 positions in the construction sector associated with energy efficiency projects and approximately 120,000 additional jobs in the manufacturing industry supporting low-carbon technologies (Ravillard et al., 2021).

Finally, it is possible to observe that semi-arid or less industrialized regions may benefit significantly from this process. According to Blondeel et al. (2021), the presence of renewable energy projects in these areas not only creates jobs but also stimulates the establishment of complementary services and the circulation of local income, thereby strengthening peripheral economies. Jianchao et al. (2021) further emphasize that well-structured policies can maximize these effects, ensuring that the growth of the sector contributes to economic and social sustainability at the regional level.

### Productive Chains, Local Content, and Endogenous Development

When discussing productive chains in the renewable energy sector, the debate is directly related to the capacity to internalize each phase of the production process. This includes the production of inputs, the manufacturing of industrial components, equipment assembly, the provision of specialized technical services, and engineering activities. In this sense, strengthening local productive structures can enhance the economic impacts of the energy transition, particularly when there is articulation among public policies, industrial strategies, and regional development (Alves; Mattei; Silva, 2022).

According to the literature on local development, the consolidation of productive chains depends on a joint effort involving firms, research institutions, and public actors. Oliveira (2020) argues that territorial development is not simply the result of the arrival of new businesses, but rather the outcome of the creation of economic networks that promote cooperation, knowledge sharing, and the generation of added value. In the context of renewable energy, this dynamic is reflected in the establishment of production hubs associated with equipment manufacturing, the provision of technical services, and industrial support activities.

Another relevant aspect concerns the degree of dependence on imports within the renewable technology sector. In many countries, a significant share of the equipment used in solar and wind power plants is still produced abroad, which limits the internalization of productive stages and reduces multiplier effects on the local economy. In this regard, Araújo (2025) argues that industrial policies aimed at the energy sector should stimulate the domestic production of strategic components, thereby promoting technology transfer and expanding national industrial capabilities.

The formation of industrial clusters also represents an important factor in this process. According to Torcheto et al. (2024), when companies, research centers, and specialized suppliers are located in close proximity, they tend to share information and experiences, which leads to faster innovation and more effective collective learning. This dynamic strengthens more complex productive chains and gradually allows producing regions to become more technologically advanced and industrially specialized within the context of the energy transition.

The analysis of these elements makes it possible to understand how different levels of productive internalization may influence regional economic development. In this sense, Table 3 presents a synthesis of the main stages of productive chains in the renewable energy sector, highlighting the levels of industrial internalization, technological challenges, and the effects on endogenous development.

Table 3 – Structure of Renewable Energy Productive Chains and Levels of Local Industrial Internalization

Stage of the Renewable Energy Value Chain	Main Activities	Level of Local Industrial Internalization	Technological and Industrial Challenges	Contribution to Endogenous Development
Raw materials and basic inputs	Extraction and processing of metals, minerals and basic industrial materials	Low to medium	Dependence on global commodity markets and limited processing capacity	Limited local value generation when processing occurs abroad
Components and intermediate goods manufacturing	Production of blades, towers, photovoltaic cells, electronic systems and structural components	Medium	Technological dependence and restricted domestic manufacturing capacity	Expansion of industrial capabilities and supplier networks
Equipment assembly and manufacturing	Assembly of wind turbines, solar modules and electrical systems	Medium to high when supported by industrial policies	Need for technological transfer and specialized industrial infrastructure	Job creation and strengthening of domestic industrial sectors
Installation and infrastructure development	Construction of plants, grid connection and engineering services	High	Need for skilled labor and specialized engineering services	Regional employment generation and local service expansion
Operation, maintenance and technical services	Monitoring, maintenance and performance optimization	High	Continuous professional training and technological updating	Long term economic circulation and consolidation of regional expertise

Source: Alves; Mattei; Silva (2022); Araújo (2025); Oliveira (2020); Romano et al. (2022); Torcheto et al. (2024); Veloso; Silva (2022).

From this perspective, it is possible to observe that the energy transition can serve as an important catalyst for the dynamization of regional productive structures, provided that it is accompanied by policies that encourage innovation, the development of suppliers, and technological capacity building. According to Veloso and Silva (2022), the renewable energy sector can stimulate the creation of new enterprises and foster local economic growth by linking environmental sustainability with economic development. Similarly, Romano et al. (2022) argue that integrated productive chains tend to increase income generation, stimulate innovation, and strengthen development strategies that are aligned with the specific characteristics of each territory. Fields (2025) examines endogenous development in the context of the energy transition in low- and middle-income countries, developing quantitative models supported by data derived from a systematic literature review.

**Industrial Policy, Energy Planning, and Technological Sovereignty Strategies**

The energy transition has been accompanied by a renewed debate on the role of industrial policies and state planning in the organization of strategic sectors of the economy. In several countries, governments have sought to articulate public policy instruments capable of guiding investments, reducing technological risks, and stimulating the development of national productive capacities. In this context, the coordination between energy policy and industrial policy emerges as a relevant element for structuring productive chains associated with renewable technologies and for expanding the economic effects linked to the growth of these energy sources (FMI, 2024).

The resurgence of more proactive industrial strategies represents a response to transformations in the global scenario. In recent decades, policies aimed at fostering technological development, protecting strategic sectors, and strengthening national industry have become increasingly common, according to the International Monetary Fund. This movement is associated with the search for greater economic security, technological autonomy, and resilience in global supply chains, particularly in sectors considered strategic for the energy transition (FMI, 2024).

In the renewable energy sector, instruments such as targeted financing, tax incentives, and innovation programs have been used to promote the domestic production of clean technologies. The World Bank emphasizes that the state can act as a coordinating agent, encouraging long-term investments and establishing an institutional environment conducive to industrial development. This includes both the formulation of regulatory policies and the mobilization of financial resources, whether public or private, in sectors considered strategic for economic growth (Banco Mundial, 2023).

Among the tools most frequently used by governments are local content requirements and government procurement policies. These measures aim to promote the integration of national companies into the renewable energy production chain by encouraging the internalization of industrial processes and the creation of local suppliers. According to the International Energy Agency, several countries have adopted strategies of this kind to strengthen their domestic industries and enhance the competitiveness of low-carbon technologies (IEA, 2024).

Another highly relevant aspect concerns the role of energy planning, which is essential for directing investments with a long-term perspective. State-led planning enables the alignment of energy matrix expansion targets with the industrial and technological strategies to be adopted. This alignment reduces uncertainties and simultaneously encourages the participation and engagement of the private sector in these initiatives. Such articulation is fundamental for creating a more favorable environment for energy development in Brazil. At the national level, studies addressing infrastructure strategies indicate that the synergy among energy planning, logistics, and industrial development can be crucial for establishing a more robust and coherent trajectory of economic growth, closely linked to the ongoing energy transition (Silva; Meister, 2025). The interconnection among these areas may represent a key factor in fostering sustainable and innovative national development.

The issue of technological sovereignty is also central to this debate. The growing demand for clean technologies has intensified global competition for strategic resources, equipment, and technical expertise. In this context, the International Energy Agency highlights that critical minerals such as lithium, cobalt, and rare earth elements have become essential for the productive chains associated with energy technologies, playing a decisive role in the industrial and energy security of nations (IEA, 2023).

With regard to renewable technologies, the sustainable management of strategic minerals also raises important geopolitical and industrial questions. Gomes et al. (2025) argue that the production and processing of rare earth elements are crucial for the advancement of equipment used in energy generation and storage systems. Consequently, policies aimed at strengthening technological capabilities related to these resources may represent a pathway to increasing industrial autonomy and reducing external dependence.

Evidence from other countries shows that state action, both in coordinating investments and in fostering innovation, has been decisive for the development of industrial sectors associated with the energy transition. In many cases, public governance instruments and state-owned enterprises have been employed to implement strategic projects, mobilize financial resources, and promote research and development activities. According to the OCDE, the actions of these institutions can contribute to strengthening planning and coordination capacities in areas considered strategic (OCDE, 2024).

Furthermore, cooperation among countries of the Global South has been proposed as a strategy for expanding technological collaboration and reducing inequalities within international productive chains. As noted by Rodriguez (2025), multilateral initiatives involving emerging economies can facilitate the development of common strategies for technological innovation, financing of energy infrastructure, and the strengthening of shared industrial capabilities.

In Brazil, the recent formulation of policies directed toward the technological sector reflects an effort to consolidate the national industrial base. Law No. 14.968, of September 11, 2024, establishes mechanisms to support technological production and innovation in Brazil, providing incentives for the semiconductor sector and other areas considered strategic. Although its primary focus lies in the information technology industry, the initiative illustrates the importance of industrial policies in strengthening technological capabilities that may also benefit sectors associated with the energy transition (Brasil, 2024).

#### **IV. Final Considerations**

The energy transition has emerged as one of the central processes driving the significant economic and technological transformations currently underway. This transformation, which involves the shift from conventional energy sources to more sustainable alternatives, plays a crucial role in the changes observed in contemporary societies. It is a phenomenon that reshapes not only the ways in which energy is produced and used but also how economies are structured and evolve, becoming closely associated with innovation and new technological paradigms. The gradual replacement of conventional fossil-based energy sources with alternatives that produce lower environmental impacts involves not only changes in the generation of energy but also broader structural transformations. In this sense, the transition requires a profound reconfiguration of existing productive systems, a reassessment of industrial strategies, and the creation of new dynamics for regional development. Within this framework, the present study conducted a detailed examination of the relationship between the energy

transition and endogenous development, particularly regarding its effects on employment, the organization and formation of local production chains, and the role of industrial policies in strengthening and consolidating the renewable energy sector. The research sought to understand how the transformation of the energy matrix may generate economic and social benefits for local communities while fostering sustainable growth.

The results obtained through bibliographic and documentary research indicate that the proposed objectives were successfully achieved. The analysis made it possible to articulate the multiple dimensions that compose the expansion of renewable energy, demonstrating how the energy transition can act as a driver of regional economic dynamism when integrated with planning strategies, institutional coordination, and the strengthening of local productive capacities.

Regarding the first analytical axis, related to Section 3.1, *Energy Transition and Employment Dynamics in the Territory*, the collected data indicate that the expansion of renewable energy is associated with the creation of employment opportunities across several stages of the production cycle. The implementation of energy generation projects, construction activities, plant operation, and maintenance services generate direct, indirect, and induced employment opportunities. The evidence also suggests that these impacts tend to spread significantly in regions that receive investments in energy infrastructure, contributing to increased income circulation and the strengthening of local economies.

The second analytical axis, associated with Section 3.2, *Production Chains, Local Content, and Endogenous Development*, demonstrated that the capacity to internalize productive stages directly influences the economic impacts of the energy transition. When the manufacturing of equipment, components, and specialized services occurs domestically, the multiplier effects on the economy tend to be considerably greater. The analysis also indicated that policies encouraging local content, technological innovation, and supplier development can contribute to the consolidation of more integrated and diversified production chains.

The third analytical axis, related to Section 3.3, *Industrial Policy, Energy Planning, and Technological Sovereignty Strategies*, highlighted the continuing importance of the state in coordinating investments and establishing instruments that promote technological development. Targeted financing, tax incentives, innovation programs, and long-term energy planning strategies reduce the risks associated with new investments and contribute to strengthening the industrial base of renewable energy technologies. The articulation between energy policy and industrial policy was also identified as a key factor in enhancing technological autonomy and reinforcing the country's productive capabilities.

The evidence presented supports the view that the energy transition should not be understood merely as a change in the energy matrix. Rather, it encompasses a broader set of transformations that extend well beyond the substitution of energy sources. It also represents an opportunity to restructure productive systems, expand qualified employment opportunities across different sectors, and promote development pathways aligned with the characteristics and specificities of each region. Such restructuring may contribute to more sustainable forms of growth that are better adapted to local realities. The combination of industrial policy and state planning creates a context in which the expansion of renewable energy can play a crucial role in strengthening regional economies. In this perspective, the energy transition may also function as a catalyst for endogenous development, understood as development that originates within the community or region itself. This dynamic can stimulate sustainable and inclusive economic growth while valuing local resources and respecting regional particularities.

Despite the contributions presented, additional research may further deepen the understanding of the multiple dimensions associated with the energy transition. Future studies may explore, for example, the long-term territorial effects of large-scale renewable energy projects, the evolution of local technological capacities across industrial sectors, and the implications of geopolitical transformations for global energy technology supply chains. Comparative studies between countries and regions that adopt different industrial policy strategies in the energy sector would also be particularly relevant.

Finally, future research may further investigate the relationship between technological innovation, human capital development, and the configuration of industrial ecosystems oriented toward renewable energy. Such investigations may help clarify how the energy transition can be aligned with broader strategies of economic and industrial development across diverse national and regional contexts.

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