
THE RELATIONSHIP BETWEEN GREEN ECONOMIES AND GREEN JOBS: EVIDENCE FROM GERMANY AND INDIA

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I. INTRODUCTION

Climate change is not only an environmental challenge but also an economic transformation. As countries reduce carbon emissions and transition to renewable energy, a key question emerges: does climate action destroy jobs in fossil fuel industries, or does it create new employment in green sectors? According to the [International Labour Organization \(2018\)](#), the global shift to a green economy could generate up to 24 million jobs by 2030. Likewise, the [International Renewable Energy Agency \(2023\)](#) reports that renewable energy employment has exceeded 13 million jobs worldwide, with solar and wind sectors growing the fastest. While these figures suggest expansion, they do not imply that all countries benefit equally.

A comparison between Germany and India highlights this unevenness. Germany, through its energy transition policy known as the *Energiewende*, has systematically reduced its reliance on coal and nuclear energy while expanding renewable energy and introducing carbon pricing. This transition has been supported by strong labour protections, retraining programs, and compensation schemes for displaced coal workers, reflecting a structured “just transition” approach. As a result, renewable energy now plays a significant role in Germany’s electricity system, and employment in the sector has grown steadily. Germany thus demonstrates how a high-income, industrialized economy can align climate action with labour market stability through coordinated institutional frameworks.

India, in contrast, represents a rapidly developing economy facing a different set of challenges. While it has emerged as one of the fastest-growing renewable energy markets, particularly in solar power through initiatives such as the National Solar Mission ([Government of India 2010](#)), it continues to rely heavily on coal to meet rising energy demand. Additionally, India’s labour

market is characterized by a large informal sector and relatively weaker social protection systems. Although green jobs are expanding, questions remain about their quality, stability, and inclusiveness. The Indian case therefore illustrates that green employment growth can occur alongside structural constraints linked to development priorities and institutional capacity.

This paper asks: are green jobs an outcome of green economic transformation, or do they depend on institutional strength, labour frameworks, and development pathways? It argues that green job creation is not a mechanical result of renewable energy expansion. Instead, both the quantity and quality of green jobs are shaped by policy choices, industrial strategies, and socio-economic conditions. While Germany and India both show that low-carbon transitions can generate employment, the nature and long-term developmental impact of these jobs differ significantly.

This study contributes to broader debates on just transition, sustainable development, and the political economy of climate action. By comparing a developed and an emerging economy, it emphasizes that green jobs are not simply the by-product of green economies but are outcomes shaped by deliberate policy design and institutional context.

II. LITERATURE REVIEW

2.1 The Green Economy Concept

The green economy concept developed due to increasing concern that traditional models of economic growth are not environmentally sustainable. According to the United Nations Environment Programme, a green economy is one which leads to better human well-being and social equity while significantly reducing the environmental risks and ecological scarcities (UNEP, 2011). This definition suggests environmental sustainability should not be seen as limiting development but rather as a reorganization of economic systems towards a low-carbon production and greater efficiency.

Nevertheless, scholars argue that a green economy is a concept that can be politically manipulated and lacks precision and clarity. According to some critics, green growth strategies may be used as a way of maintaining existing capitalist production systems while simply replacing fossil fuels with renewable energy sources. Thus, the shift towards a green economy does not necessarily ensure structural changes in the labour market. The main issue is whether the restructuring of the environment has the capacity of creating new jobs, or whether it is just a

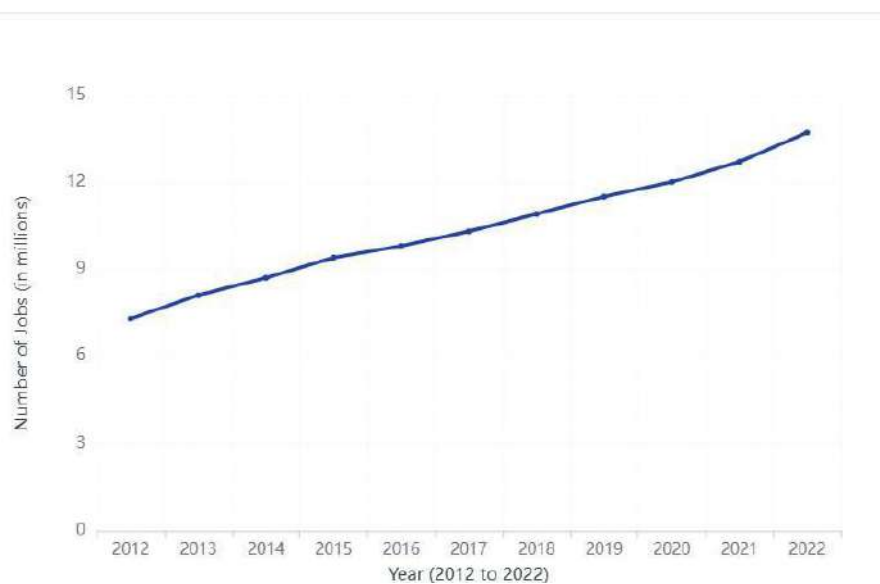
redistribution of capital across different industries.

2.2 Green Jobs: Definition and Employment Measurement

A green job can be defined as employment that directly contributes to environmental sustainability by reducing environmental harm or improving natural resource efficiency, while also meeting standards of decent work. According to the [International Labour Organization \(2018\)](#), this includes jobs that help to protect ecosystems, reduce energy and resource consumption, decarbonize the economy, and minimize waste and pollution.

However, measuring green jobs remains a contentious issue. The International Renewable Energy Agency focuses more on employment in the renewable energy sector and reports that renewable energy employment increased to 13.7 million in 2022, compared to 7.3 million in 2012 ([IRENA and ILO, 2023](#)). However, these figures represent only direct jobs and do not include indirect or induced employment.

Figure 1 demonstrates a clear global increase in renewable energy employment over the period 2012–2022. However, this aggregate trend does not explain how or under what conditions such employment is generated. The figure supports the argument that while green jobs are expanding globally, their distribution, quality, and sustainability vary significantly across national contexts. Therefore, aggregate growth alone cannot be taken as evidence of structural labour market transformation.



[Figure 1: Renewable Energy Employment Growth on a Global Basis (2012-2022)]

Source: Compiled data from IRENA (2023)]

2.3 Green Growth and Job Displacement

One of the central arguments in the literature is whether the process of green economic transition result in net job creation. Positive perspectives suggest that environmental regulation can stimulate innovation and investment. According to the Organization of Economic Cooperation and Development, green growth policies can enhance competitiveness and generate jobs in the long run (OECD, 2011). On the same note, the International Labour Organization estimates that 24 million net new jobs could be created across the Globe by 2030 as a result of climate mitigation measures.

However, critical scholarship adopts a more cautious perspective. Research also indicates that job creation in the renewable energy sector may be offset by job losses in fossil fuel industries. The overall outcome depends on factors such as labour market flexibility, retraining programs, and the capacity of the state. In the absence of strong institutional support, displaced workers may experience prolonged unemployment or unstable incomes. Therefore, Green job creation is contingent upon three key conditions: policy stability and coordination, labour market protections and skill systems, and domestic industrial capacity.

The literature can broadly be divided into two perspectives. The pro-growth perspective argues that green transitions inherently generate employment through innovation, investment, and new industries. In contrast, the critical perspective emphasizes that employment outcomes are contingent and uneven, often shaped by institutional capacity, labour protections, and existing economic structures.

This study builds on the latter perspective by arguing that green job creation is not an automatic outcome of renewable energy expansion but is conditional upon structural and policy factors.

2.4 Effects of Green Transitions on Employment: Developmental Context/Institutional Capacity

Employment effects of green transitions vary greatly between developed and developing economies. In highly industrialized economies like Germany, labour market adjustments are facilitated through the coordination of industrial policy, vocational training, and social protection systems. The Energiewende in Germany is often referred to as a successful case of planned structural change supported by strong institutional capacity.

In contrast, emerging economies such as India face different structural challenges. While the expansion of renewable energy can generate large numbers of jobs, a significant proportion of these may be informal or temporary. The World Bank states that structural transitions in developing economies may create not only opportunities for growth but also transitional inequality (World Bank, 2020). This suggests that the level of development plays a crucial role in determining the relationship between green economic policies and their employment outcomes.

2.5 Just Transition and Employment Quality

Recent academic research is not based on job quantity; it is based on job quality. The idea of a just transition, which is advocated by the International Labour Organization, notes that it is important to provide fairness, retraining of the workers, and social protection in climate transitions. The number of renewable energy employment can also increase but issues on wages rates, job security, and location are also of concern.

Thus, the literature feels more and more compelled to acknowledge that the growth of green jobs should not just be assessed with regard to numerical growth, but equity and institutional support structures as well.

2.6 Research Gap

Despite the evidence of global data regarding renewable employment growth, comparative studies of the effect of institutional strength and level of development on the employment outcome have not been performed extensively. There is no literature that directly compares a highly industrialized economy such as Germany to a fast-growing economy like India in order to determine whether green jobs are the direct result of a deliberate restructuring of the economy towards a greener one or they are merely the by-products of expanding the sector.

This research gap explains the appropriateness of the comparative case study as a method of examining the influence of policy design, labour market institutions and development context on the employment impacts of low-carbon transitions.

III. CONCEPTUAL FRAMEWORK

3.1 Theoretical Orientation: Associating Green Economies with Labour Markets

In this study, the dependent variable is green employment, operationalized as employment generated within the renewable energy sector. This includes both direct employment (e.g.,

manufacturing, installation, operation, and maintenance of renewable energy systems) and indirect employment (e.g., supply chains and support services), where data availability permits.

Furthermore, the analysis differentiates between formal and informal employment, as well as permanent versus project-based jobs, in order to assess not only the scale but also the quality and stability of green employment. This distinction is particularly important in comparative analysis, as labour market structures differ significantly between developed and developing economies. An assumption was made that the creation of green jobs do not automatically follow the increase in the use of renewable sources of energy. Instead, the results of employment which are influenced by the institutional, economic and political systems of the green transitions are played out. Although the world statistics are those of the direct International Renewable Energy Agency, which show a substantial increase in the employment of renewable energy sources, aggregate numbers alone are inadequate to clarify how and why the employment patterns vary in national settings.

To conduct this research, a green economy is characterized as a structured transition of the policy to a low carbon-production systems, especially in the energy sector. This definition goes beyond the symbolic environmental commitment and concentrates rather on intentional economic restructuring, such as regulatory restructuring, industrial policy and state intervention.

Equally, green jobs have been defined according to [International Labour Organization](#) as jobs that will guarantee environmental sustainability. However, the operational focus of the Study has been narrowed down to renewable energy employment but also includes consideration of job stability, formality and institutional protection. Accordingly, the analysis identifies that the number of jobs is not enough to gauge the success of a green transition.

This framework, thus considers the relationship between the green economy policies and the employment condition as opposed to automatic. It assumes the mediation of the level of environmental transformation to sustainable and equitable job creation by institutional capacity, structure of the labour market and the level of development.

The theoretical logic that was used in this Study is a sequential process. Green economy policies trigger a process of structural change in the production systems, especially by investing in renewable energy infrastructure. These shifts in structures necessitate a labour redistribution, creating new jobs and at the same time may have an effect of pushing others out of job in carbon intensive sectors. The bottom line though is that, it will all depend on the institutional capacity

and the labour market conditions, whether job creation is equitable, stable and sustainable. Accordingly, the framework focuses on causality and not correlation, so that the growth of employment is not presumed to be a result of economic restructuring but assessed as a causal product.

3.2 Analytic Dimensions of Comparative Assessment

In order to conduct a systematic assessment on whether green jobs are even a product of green economies, this paper uses four analytical dimensions on the case of Germany and India which are as follows:

1. Renewable Energy Employment Scale

This aspect evaluates the scale and the trend of increase in renewable energy workers. Numerical expansion means sectoral growth, but does not imply structural transformation. Thus, the employment growth has to be viewed within the framework of macroeconomic restructuring.

2. Capacity of Institution and Policy Design

Green transitions are also associated with stable regulating policies, funding, and governmental cooperation. The extremely institutionalized policy framework is the contrast of the development oriented and fast-changing climate policy in India. This dimension measures deliberate policy architecture as a way of enhancing employment outcomes.

3. Labour Market Structure and Formality

The labour market characteristics mediate employment effects. The formal labour systems that have effective vocational training and social protection can help in making the sectoral shifts easier. On the contrary, high informality can have unstable or provisional employment results.

4. Just Transition Mechanisms

The idea of just transition advocated by the International Labour Organization emphasizes the moral duty of safeguarding employees in the process of structural adjustments. This aspect measures retraining interventions, payment systems, and geographic transition policies.

These dimensions, taken collectively, guarantee the analysis of employment in a quantitative, but structural and ethical, manner. Instead of assuming homogenous employment effects, this framework assesses the impact of structural, institutional, and developmental factors on the conditioning of the relationship between green economic change and employment generation. Using similar dimensions in both cases, the Study is comparative enough but lets the contextual

differences to emerge.

To ensure analytical consistency, the study applies identical indicators across both cases. Each country is evaluated using the same four dimensions—employment scale, institutional capacity, labour market structure, and just transition mechanisms—allowing for a structured comparison of how similar policy objectives produce different employment outcomes under varying institutional conditions.

Analytical Dimension	Germany	India
Renewable Employment Scale	To be evaluated	To be evaluated
Institutional Capacity	Strong policy coordination	Emerging institutional frameworks
Labour Market Structure	Predominantly formal	Mixed, significant informality
Just Transition Mechanism	Institutionalized support	Developing and uneven

Table 1: Analytical Framework for Comparative Case Studies

3.3 Transition to Methodology

This theoretical framework is the one that determines the analytical lens against which the following case studies will be analyzed. The framework allows determining systematically whether green jobs in Germany and India are the intentional effort of structural change or unbalanced by-products of sectoral growth. The next section describes the methodological approach that was employed in operationalizing this comparative analysis.

IV. RESEARCH METHODOLOGY

4.1 Research Design

The research design used in this Study is the qualitative comparative case study research to determine whether or not the green jobs are the by-product of the planned restructuring of the green economy. The case study methodology would serve well in interpreting complex and real-world policy transition in the system within their institutional and social-economic settings.

According to Yin (2018), case studies are especially effective in answering questions such as how and why, as well as when phenomenon and context do not necessarily demonstrate the boundaries between them.

The Study employs a structured, focused comparison method, in which both cases are analyzed using identical analytical questions derived from the conceptual framework. This ensures comparability, while allowing context-specific differences to emerge.

The Study uses a comparative analysis of two national settings and is highly focused on comparing, in order to determine how institutional capacity, the level of development, and structure of labour markets influence employment during green transitions. This Study does not take it that the growth in renewable energy will automatically create employment but examines the issue of whether or not employment will become a direct result of structural change because of policy.

4.2 Case Selection

Germany and India are the cases that have been chosen in this Study. The selection of these cases was done purposely because of their varying economic development, institutional capacity as well as labour market structure.

Germany is a highly industrialized economy with an established history of energy transition policy (Energiewende). It has high quality regulatory bodies, vocational educational systems and social protection systems that can ease the process of labour market adjustment.

India, on the contrary, is a fast-growing economy where the renewable energy development has a tremendous growth and the development priorities are broader. It has a large informal sector in its labour market and institutional capacity is unevenly distributed. This contrast makes the analytical comparison of structural and developmental conditions possible.

The choice of contradictory cases enhances the explanatory power of the Study since it enables the determination of the mediation of the employment outcomes by various institutional settings.

4.3 Data Sources and Data Collection

This research paper solely uses secondary data. The data regarding employment and the renewable energy was gathered by the reports issued by the International Renewable Energy Agency and the International Labour Organization. The additional policy data was obtained from documents of the national government and academic literature.

The systematic review and extraction of the employment figures, sectoral distribution statistics, and policy frameworks were used to collect data for the period 2012-2022. Publicly available and internationally standardized datasets were only used so that they could be compared across cases.

4.4 Analytical Strategy

The comparative analysis will be organized with regard to the four dimensions of analysis presented in the conceptual framework:

1. Renewable Energy Employment Scale
2. Policies and Institutional Capacity
3. Labour Market Form and Structure
4. Just Transition Mechanisms

The systematized approach to each case makes sure that the evaluation is consistent and follows the approach of these dimensions. The systematic method allows recognizing similarities and differences and preserving analytical consistency.

The Study does not focus on measuring employment growth in isolation, instead it determines whether green jobs are integrated into larger structural economic transformation. In this way, it is possible to differentiate between the sectoral growth and systemic restructuring of the green.

4.5 Time Frame

The paper is devoted to the period 2012-2022. This period would encompass a decade of worldwide renewable energy growth, such as the post-Paris-commitment of accelerated climate policy. It provides an opportunity to analyze the medium-term trends in employment and retain the consistency of data in different sources.

4.6 Limitations

This research has a number of drawbacks. First, the use of secondary data can be associated with the problem of classification of employment differentiated in the countries. Second, the employment statistics of renewable energy might not adequately reflect informal or indirect employment. Third, the results of the policy implementation might be different across regions within each country, which restricts the possibility of generalization at subnational levels.

Nevertheless, the shortcomings are compensated by the use of internationally standardized sources of data and structured comparison, which increases the strength of the findings.

Component	Description
Research Approach	Qualitative structured comparative case study
Research Question	Are green jobs the product of deliberate green economic restructuring?
Cases Selected	Germany and India
Rationale for Case Selection	Contrasting levels of development and institutional capacity
Data Type	Secondary quantitative employment data and qualitative policy analysis
Data Sources	International Renewable Energy Agency (IRENA), International Labour Organization (ILO), national policy documents, and peer-reviewed academic literature
Time Frame	2012–2022
Analytical Method	Structured focused comparison across four dimensions
Analytical Dimensions	Employment scale, institutional capacity, labour structure, just transition

Table 2: Overview of Research Design and Methodology

V. CASE STUDY 1: GERMANY

5.1 Energiewende: A Structured Green Transition

A political decision was taken in Germany in the beginning of the year 2010 to reform its energy system. After the Fukushima nuclear disaster, the German Government became even more active in its energy transition strategy, promising to shut nuclear power down and increase the capacity of renewable energy sources. This was not some spontaneous adjustment of the market but a willed and state-sponsored re-organization of the national economy.

The German-based energy transition, Energiewende, was a mixture of climate goals and industrial policy, consideration of employment and technological innovation. The growth of renewable energy was addressed by the use of feed-in tariffs, grid access with guarantee and long-term predictability of regulation. These steps formed an organized environment where the

industries of renewables would grow within the Country.

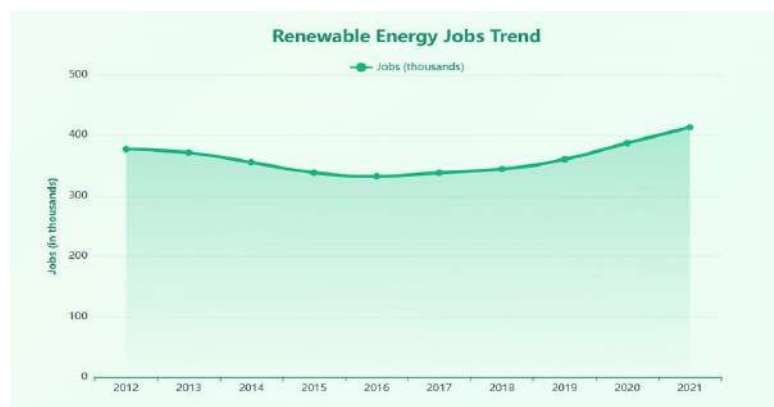
A key question in this case is; did more jobs in the renewable sectors improve merely due to increase in clean energy technologies, or did the state actually incorporate job creation in the economic reformulation?

5.2 Renewable Energy Employment Growth

In Germany, the level of renewable energy employment grew tremendously in the 2000s and 2010s. Based on the statistics of International Renewable Energy Agency and the International Labour Organization, the jobs grew specifically in the fields of manufacturing of Solar PV and wind energy.

For instance, renewable energy employment in Germany declined from approximately 380,000 jobs in 2012 to around 330,000 in 2016, largely due to the contraction of the domestic solar manufacturing industry. However, employment recovered after 2020, driven by expansion in wind energy and grid infrastructure.

Nonetheless, the trend of employment was not constant because of the competition in the world and even the changes in policies. The solar manufacturing jobs suffered a decline as it augmented the competition in the Asian markets, whereas the wind and grid-related jobs did not suffer much. This shows that green jobs are not necessarily permanent but they require competitiveness in the industries and long term policy backing.



[Figure 2: Trend of Renewable Energy Jobs (2012-2021)]

According to Figure 2, the renewable energy employment in Germany has reduced between 2012 and 2016 because of shrinkage in solar manufacturing industry. However, the employment situation stabilized in 2017 and then grew considerably since 2020, which is a sign of the re-established policy support and growth of wind and grid infrastructure.

5.3 Institutional Capacity and Labour Market Structure

The institutions of the coordinated labour market in Germany are very important in stabilizing the green employment. Good vocational education systems, collective bargaining systems and industrial clusters facilitated skill development in renewable industries.

The development of trade unions into a part of transition planning reflects aspects of a just transition model. It is this institutional depth that makes Germany stand out of most emerging economies. In this case, green jobs are incorporated in a wider industrial policy, and not isolated market results.

5.4 Just Transition and Social Protection

Germany also came up with compensatory measures for workers who had fallen victim to local phase-out. A programme called Regional Reconstructing Funds was established to assist displaced workers. This proves that the green jobs are not the just by-product of renewable expansion but a constituent of a socially coordinated structural shift.

The German example, thus, confirms the thesis of the close relation of green jobs with a coordinated green economic planning and even the institutional capacity.

VI. CASE STUDY 2: INDIA

6.1 Policy Driven Expansion

India, a developing country, is an emerging renewable energy economy. As opposed to the Germany's long industrialized arrangement, India green transition lies in the larger development agenda like energy access, industrialization and job creation.

India has greatly expanded its development target goals and wind capacity in the last one decade through the National Solar Mission and successive renewable capacity targets. The development of renewable energy has been presented not as climate action but also as economic development strategy.

However, the policy implementation differs among states and the coordination among industries is not quite even. This forms a new structural context of formation of green employment as compared to that of Germany.

6.2 Trends in Employments in Renewable Energy Industries

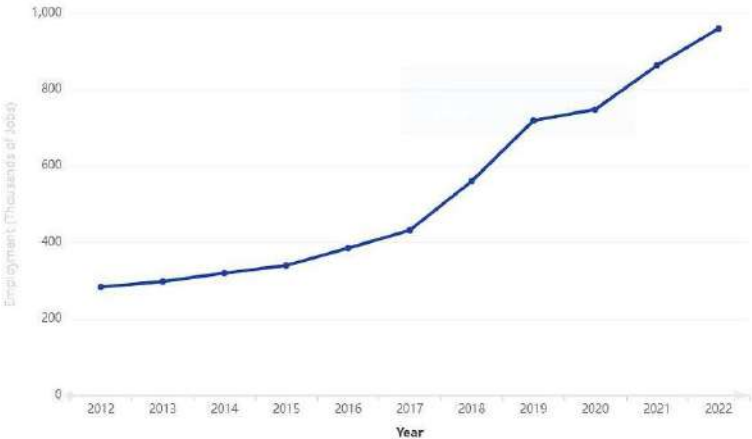
The estimates of employment in the renewable energy industry provided by the International

Renewable Energy Agency and labour measurements undertaken by the International Labour Organization state that in India the renewable energy industry registered a stable employment growth during 2012–2022, especially in the area of solar installation and project development.

In India, renewable energy employment increased from approximately 284,000 jobs in 2017 to nearly 960,000 in 2022, with the majority concentrated in solar installation and project development activities.

This is in contrast to Germany, where employment has been highly skewed towards labour intensive sectors like installation and construction rather than high-tech manufacturing. To perceive the relations of the renewable energy expansion and the growth of employment, one should look into the longitudinal employment tendencies.

Figure 3 shows, the number of jobs in the realm of renewable energy in India is gradually increasing since 2012, and nearly two hundred and eighty four thousand jobs have increased by the year 2017 and almost to nine hundred and sixty thousand till 2022. The highest acceleration occurred after 2017, when the swift growth of Solar Capacity and Government Renewable Objectives were registered. Unlike in Germany, however, where employment was determined by the industrial restructuring, growth pattern in India implies utilization of labour in large scale. Such a positive trend, though, does not necessarily imply that the structure is stable since much of the work is concentrated to the project work rather than manufacturing and high-technology industries.



[Figure 3: Renewable energy employment trends in India (2012–2022)]

Source: International Renewable Energy Agency (IRENA)]

6.3 Institutional Capacity and Labour Market Structure

The structure of the labour market in India is quite different as compared to that of Germany, which is having a coordinated structure. The large percentage of renewable energy jobs is either seasonal, project-based, or non-formal jobs. There is a growing trend in the formation of the skill but in an uneven manner, in line with the geographical region. The national renewable targets are ambitious but institutional capacity differs between the Central and State Governments. This has an impact on stability and quality green jobs.

However, in contrast with Germany, in India, green jobs are not a part of long-term industrial strategy; instead, they are often products of rapid capacity growth, as opposed to deep industrial restructuring. This implies that even renewable energy growth will not necessarily stabilize the green employment designs.

6.4 Just Transition and Social Protection

The strategies of Just Transition in India are developing. The regions reliant on coal may be unemployed but massive retraining of fireworks is in their infancy. The social protection mechanisms in the Country are not institutionalized, as in Germany. Consequently, the issue of green employment growth is not yet comprehensive in terms of dealing with the wider labour transition issues.

This indicates that while green jobs might be increased in numbers, but in the absence of an effective institutional capacity and labour protections, their long-term sustainability is vastly different than the structured green economy.

VII. COMPARATIVE ANALYSIS

7.1 Renewable Growth and Employment Performance

India and Germany had a positive growth of installed renewable energy capacity during the period 2012–2022. Nevertheless, the correlation between growth and jobs is not as stable, and is more of a form. The growth in the renewable energy capacity in the Country has been regular and policy-coordinated in Germany. After the initial decrease in employment trends, it stabilized and began growing after the year 2020. It states that industrial competitiveness and policy changes mediate employment creation, as opposed to growth of capacities solely.

In India, there was growth in renewable energy capacity at the same time, as there was steadily increasing employment, especially after 2017. However, the growth in employment is highly

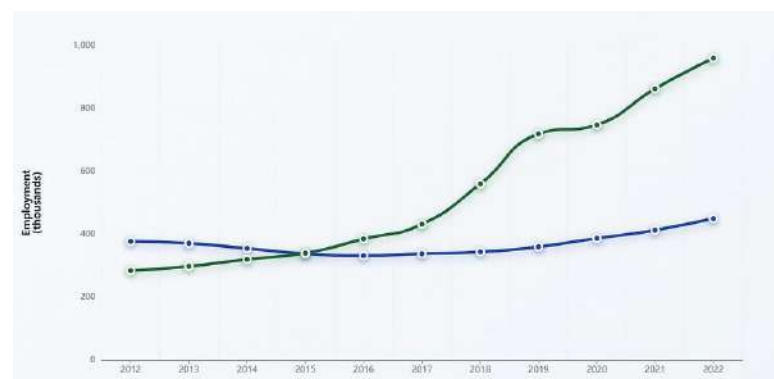
skewed towards installation and project development efforts as opposed to high value production. This comparison shows that the growth of renewable energy is sufficient but not enough for continuous growth of green jobs.

7.2 Institutional Capacity

One of the explanation variables in the conceptual framework is institutional capacity. The renewable employment is structurally supported by the coordinated industrial policy, good vocational training systems and collective bargaining institutions in Germany. Green Jobs are integrated into long term industrial restructuring. In contrast, the institutional environment in India is far more fragmented.

The national targets are very ambitious, but the capacity to implement them differs depending on the region. The rise in employment is in a hybrid formal labour format. This is an indication that green jobs are more sustainable and they are more entrenched in the situations in which institutional capacity facilitates coordinated transition.

Figure 4 illustrates the fact that the growth in renewable energy employment in both Germany and India has been manifested in different ways and at varying levels in the past decade. The pattern of employment in Germany is quite moderate in growth with phases of smoothing, whereas the pattern of employment in India is rather faster and stable particularly after 2017. These variations are the reflection of underlying institutional capacity, labour market organization, and priorities of development that justifies the argument that green jobs are framed by structural factors rather than appearing spontaneously as the result of renewable development.



[Figure 4: Trends in Renewable Energy Employment: Germany vs India (2012–2022)]

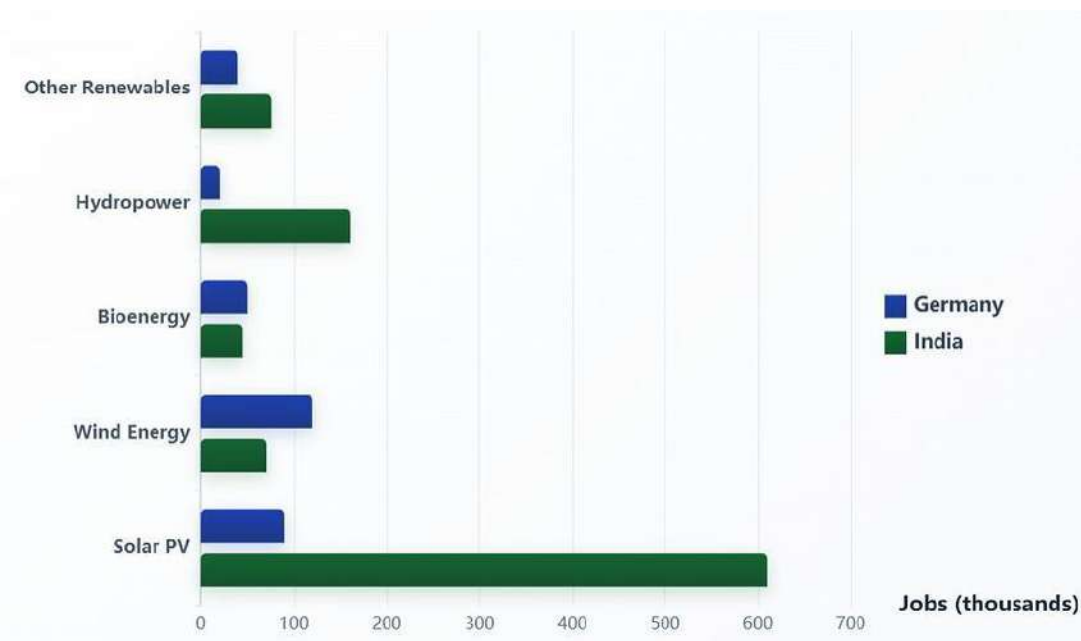
7.3 Labour Market Structure

The quality and sustainability of employment is highly determined by labour market structure. The renewable energy workforce in Germany is at advantage with the formal employment

contracts, skill certification mechanisms, and social protections. This enhances job security in the long-term.

The renewable jobs in India are more contract based and temporary jobs, particularly installation and building. Although this helps in accelerated employment, however, the employment security is doubtful in the long-run. Therefore, the green employment outcomes are not only different in their magnitude, but their structural features as well.

Figure 5 demonstrates that India's renewable employment is heavily concentrated in Solar PV and Hydropower, reflecting its rapid expansion strategy and labour-intensive installation activities. Germany, by contrast, shows a more balanced distribution, with significant employment in wind energy and bioenergy, indicating stronger industrial integration and technological specialization. This sectoral divergence highlights how institutional frameworks and industrial capacity shape the nature of green jobs within the economy.



[Figure 5: Sectoral Composition of Renewable Energy Employment in Germany and India (2022)]

Source: IRENA Renewable Energy and Jobs Annual Review]

7.4 Just Transition Mechanisms

The comparative evidence shows that there are different ways of handling transition risks. Germany has introduced systematic coal-phase out plans that are backed up by retraining programs and regional compensation funds. The policy planning is institutionalized using just transition principles.

The mechanisms of transition in India are in the process of development. Renewable energy expansion generates job opportunities, although they are not well-institutionalized as holistic retraining and social protection systems are. This implies that the increase in green jobs will never guarantee socially equitable transition results.

In addition to total job figures, employment structure can give some understanding of the structure of the labour market. The situation in India provides that most of the renewable energy jobs are centered on the installation and project-based operations (Figure 6). This indicates a labour-intensive growth model that is caused by rapid deployment of capacities, as opposed to profound industrial integration.

Conversely, the low proportions of manufacturing and long-term operations indicate low levels of institutional embedding. This strengthens the position that although green jobs are on the rise in terms of number, their structural sustainability lies in the hands of the institutional and industrial capacity.



[Figure 6: Comparative institutional and economic mechanisms influencing green job creation

Source: Author's synthesis based on IRENA, ILO, and national policy reports]

7.5 Synthesis: Are Green Jobs the Fruit of Green Economies?

The existence of a critical difference between numerical and structural employment change is seen when the conceptual framework is applied to both the cases. India is a good example of why renewable energy growth can lead to large growth in jobs. However, this growth is commonly associated with deployment operations but not profound industrial construction.

Germany gives greater testimony that green jobs are being structurally enshrined in coordinated

economic transformation with the help of institutional capacity and labour protection.

Thus, the comparative results indicate that green jobs are most sustainable and stable when they arise out of renewable energy capacity expansion, as opposed to renewable energy capacity expansion alone.

In a systematic attempt to assess the conversion of green economies into employment results, Table 3, compares Germany and India in terms of major institutional, economic, and labour market processes that determine the creation of green jobs.

Feature	Germany	India
Policy Framework (Stability vs Acceleration)	Long-term Energiewende policies with stable regulatory support.	Rapid expansion driven by national missions and capacity targets.
Industrial Integration (Depth vs Dependence)	Domestic manufacturing and tech innovation embedded in economy.	Heavy dependence on imported technologies and installation.
Labour Market (Quality vs Quantity)	High-skilled, formal employment; strong vocational training.	Labour-intensive, project-based and semi-formal jobs.
Expansion Model (Tech vs Capacity)	Technology-driven transition focused on efficiency.	Capacity-driven expansion focused on scale.
Just Transition (Protected vs Vulnerable)	Strong worker retraining & social protection mechanisms.	Limited transition protection systems for workforce.

Table 3: Analytical Mechanism Comparison: Energy Transition Systems

VIII. DISCUSSION

8.1 Summary of Research Question and Key Findings

This Study asked the question: Are green jobs the output of green economies? Using comparative case studies of Germany and India. The results suggest that despite the fact that renewable energy development not only leads to job creation in the two nations, the interdependence between the green economy growth and job creation is not automatic.

Germany shows how institutional coordination can make green employment stable in the long term, and India indicates employment increase owing to the fast growth of renewable sources but limited by labour market and institutional issues. Thus, green economies are only able to offer employment opportunities with the help of proper governance and workforce systems.

8.2 Interpretation of Institutional and Labour Market Variations

The comparative results indicate institutional capability as the key element influencing the green job performance. The good governance structures, vocational education systems, and labour laws in Germany enable employees to smoothly move to the renewable energy industries. The institutional planning will make sure that the technological transformation is matched with the adaptation of the workforce to mitigate the employment risk of energy transition.

Conversely, the Indian labour market system poses some structural constraints even with the high rate of renewable energy development. Creating jobs is usually a project-oriented and geographically skewed, as a manifestation of the skills gap and formal labour market inclusion. This disparity implies that even renewable energy growth will not be sufficient to ensure that employment is sustainable unless there are institutional processes that facilitate the absorption of the workforce and job security in the long run.

8.3 Consistency with the Existing Literature

The results agree with the work of other organizations, including International Renewable Energy Agency (IRENA), International Labour Organization (ILO), and OECD. Available literature supports the fact that the reason behind successful green employment performance is not due to environmental investment but because of policy stability, training systems and labour governance. The case of Germany supports arguments on the need of model of coordinated transition, whereas the case of India substantiates literature to suggest the challenges of the developing economies in the rapid and uneven green transition.

In this way, this Research contributes to the current academic wellness based on the view that green employment creation is moderated by institutional efficacy but not technological appropriation.

The connection to the conceptual framework consists in the fact that the author has described in this paper the mechanism by which decisions are made.

8.4 Relation to the Conceptual Framework

The relationship with the conceptual framework lies in the fact that the author has explained the mechanism with which decisions are made. According to the conceptual framework advanced in this Study, the postulated hypothesis was that green economies have an indirect effect on employment, both via institutional and labour market process. This framework is proven by both the case studies.

Germany is one of the most mediated transitions in which institutional capacity transforms the growth of renewable energy into consistent employment results. India is an example of a partly mediated system, whereby the growth of the economy creates employment opportunities only to be constrained by institutional factors that restrict the quality and sustainability of jobs. This proves that institutional strength is the key factor between the environmental policy and labour market transformation.

8.5 Policy Implications

The comparative study has valuable lessons to policymakers. To developed economies, Germany proves that in order to be successful in green transitions, the policy has to be long-term, and the industrial planning and the reskilling of the workforce must be coordinated. In the case of developing economies, India accentuates the need to build upon training systems, labour protection and institutional coordination as well as renewable expansions.

The policymakers should thus view green transitions as a socio-economic reform and not as an environmental strategy. By absence of labour integration policies, green growth would run the risk of generating short-term or unequal employment results.

8.6 Research Limitations

The Research is based on secondary data sources such as international institutional reports and national employment statistics as the main source. This type of data might not be able to capture the informal nature of employment or the geographical differences especially in the renewable energy industry in India. Moreover, cross-country comparison eases the complicated socio-economic settings, which can affect the employment results in various ways across areas. Such limitations indicate the possibility of cautious interpretation of findings.

8.7 Future Research Directions

Future studies can focus on how transition to green jobs differs at sub-national levels and the quality of jobs in the renewable sectors over time. The research on informal labour integration and social protection mechanisms would help future studies build a better understanding of fair

green transitions. Stability of employment in the long run could also be studied in longitudinal research which would shed more light on whether green jobs would be sustainable as energy systems change.

IX. CONCLUSION

This paper has discussed whether green jobs are a creation of green economies with a systematic comparative analysis of Germany and India. Using a framework that concentrates on renewable energy growth, institutional capacity, labour market structure and just transition mechanisms, the results obtained indicate that green employment outcomes are determined not only by renewable energy growth, but also by economic and institutional conditions.

The findings highlight that a just transition framework is essential for ensuring that green job creation is not only quantitatively significant but also socially equitable. Policies must therefore integrate renewable energy expansion with targeted worker retraining programs, income support mechanisms for displaced workers, and institutional strengthening of labour protections.

Without such measures, green transitions risk producing uneven and insecure employment outcomes, particularly in developing economies.

Germany and India have both developed renewable energy capacity by a significant amount during the last decade. However, the character and consistency of the employment vary greatly. Germany shows that green jobs are best sustained where they are entrenched in the industrial policy, well-organized labour institutions and even a systematic transitional planning. The growth in employment here is intentional economic restructuring as opposed to accidental market growth.

India, on the contrary, shows that fast deployment of renewable resources can create a massive employment effect, especially in those spheres of the installation, where labour is the primary resource. However, the relocation of employment into project-based and less formalized sectors suggests that numerical growth does not necessarily make the creation of green economies structural. The depth of industry and labour protection is still a key factor of the long-term stability.

The similar evidence thus indicates that green jobs are not simply the by-product of renewable energy growth. Instead, they are most robust and fair when they have good institutional structures in place, policies are well coordinated and labour markets are systematized.

Finally, the association between green jobs and green economies is contingent. The opportunity of renewable energy growth is made, but the sustainability is decided by structural change. Further, Studies need to be carried out in the future on how improving economies could build up institutional capacity to guarantee that green employment not only limits climate to some degree but also to growth that is inclusive and stable.

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