Green Jobs, Energy Efficiency and Sustainable Development: A Theoretical Overview of the Potential for Transformation and Synergistic Effects

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***Abstract*— This paper examines the transformative potential of green jobs in energy efficiency to achieve inclusive and sustainable development. Through a systematic review of the literature, the study reveals their significant contribution to economic growth, the creation of new sectors and the stimulation of innovation. From an environmental perspective, these jobs play a crucial role in reducing greenhouse gas emissions, limiting pollution, and efficiently utilizing natural resources. Social benefits include increasing employment, creating quality jobs, improving public health, facilitating the reskilling of workers, and contributing to energy justice. The study highlights the interdependence between green jobs and energy efficiency, but also identifies challenges such as skills shortages and the need for a just transition. Policy interventions, financial mechanisms and educational reforms are proposed as key to overcoming these barriers. Ultimately, the study advocates for the development of integrated strategies and in-depth theoretical research to fully leverage the potential of green jobs for a sustainable future.**

Keywords—green jobs, sustainability, energy efficiency, sustainable development, green transition

I. INTRODUCTION

The current era is marked by increasing uncertainty and global challenges that affect every aspect of human society [1-3]. Despite the significant increase in global wealth, the economic system often prioritises profits over mass employment, deepening inequalities and leaving large parts of the population struggling to meet basic needs [1].

Against the backdrop of these socio-economic challenges, the planet faces unprecedented pressures from a growing population, urbanisation, and accelerating climate change, leading to depletion of natural resources and constraints on the supply of essential goods such as water and food. Human impact on Earth is so significant that the modern era is increasingly referred to as the Anthropocene, highlighting the critical state of the planet and the need for fundamental societal change [1, 4].

In this complex context, energy efficiency (EE) is emerging as the most powerful and cost-effective tool for mitigating global challenges [5]. It not only reduces energy consumption but also brings significant economic, social, and environmental benefits by conserving resources, reducing pollution, and improving energy security and competitiveness. EE represents a "win-win" option, as it often has negative net financial costs and provides a high return on investment [6]. It is therefore crucial that all stakeholders, including governments, take bolder action to implement it [5].

There is no doubt that the growing global concern for the environment and the need to address climate change are driving the transition towards a sustainable economy. This transition towards a decentralised energy system based on renewable sources not only supports environmental sustainability but also opens up significant opportunities for the development of green jobs (GJ) [7]. The latter are considered fundamental to achieving this transition, playing an essential role in the implementation of environmental management strategies that promote sustainable economic development and cleaner production. This evolution also provides an opportunity to address established inequalities in the labour market, and supporting a socially just transition towards net-zero emissions is an integral part of achieving the Global Sustainable Development Goals [8].

By their very nature, GJ, covering a range of activities from renewable energy project management to infrastructure maintenance, foster social and technological innovation, transforming the production and management of energy services. In this way, local cooperation is stimulated, capacity building and the rethinking of urban and regional planning are fostered, and more inclusive and sustainable development is built. In Europe, for example, the convergence of the green economy and renewable energy is creating innovative and sustainable employment opportunities, reshaping the labour market and catalysing the development of rural areas and energy communities [7].

There is evidence that the labour market is undergoing a profound transformation, driven primarily by sustainability.

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According to the World Economic Forum (WEF), the green transition is expected to generate 170 million new jobs worldwide by 2030, resulting in a net positive balance of 78 million jobs [9]. The rapid expansion of the renewable energy sector, driven by government programs, technological improvements and increased environmental awareness, requires specialised skills in areas such as engineering, architecture and environmental protection [7]. For this reason, the demand for green skills already exceeds supply. Therefore, significant investments are needed in both the creation and development of GJ, as well as in the training and acquisition of new skills by those who are most adaptable to change [9].

This paper aims to explore how GJ in EE contribute to sustainable development through their economic, environmental and social benefits. The purpose of such an investigation is to reveal their interdependence and synergy, showing how one reinforces the other in the transition to a green and sustainable economy. By systematising this information, the study provides a comprehensive picture that informs decision-makers. The identification of challenges and the proposal of mainstreaming policies offer practical guidance on overcoming barriers and effectively realising the potential of GJ to achieve sustainable outcomes.

II. Theoretical Background

A. Energy Efficiency

The climate crisis is the most significant market failure ever. Addressing this and other pressing global environmental issues is potentially the most important challenge facing humanity in the 21st century [8]. The world's growing demand for energy and the urgent need to combat global warming have made EE an essential component of sustainability programs [3].

EE refers to the amount of output that can be produced with a given amount of energy input. Most often, EE is measured as the amount of energy produced per unit of energy input. The European Union (EU) EE Directive uses a comprehensive definition: "*energy efficiency means the ratio of output of performance, service, goods or energy, to input of energy*" [10].

The ability to reduce energy consumption while maintaining the same level of production is the essence of the EE process. This reduces energy losses without sacrificing productivity or operational efficiency. For this reason, EE has been recognised as a key tactic in the fight against climate change, a means of reducing energy dependence, and a means of promoting sustainable economic development. Growing concerns about the effects of global warming on the environment, the depletion of fossil fuel reserves, and the increasing volatility of the international energy market have made this requirement even more critical. At the same time, the transition to energy-efficient systems is crucial for achieving global carbon reduction goals [3].

Last but not least, EE is and will continue to be a competitive advantage for both countries and companies. Its improvements have significantly slowed the growth of energy consumption in Organisation for Economic Co-operation and Development (OECD) countries over the past 30 years. Furthermore, economic growth in OECD countries is expected to be supported by increased EE, rather than by increases in primary energy consumption. National and regional energy sectors are usually subject to regulation, which should incentivise companies to be more environmentally friendly. It is clear that evidence-based EE policy needs to be informed by reliable indicators that reflect the situation at both the national and international levels, and at the same time, correspond to the sum of efforts undertaken at the facility, company, and device/process levels [11].

EE is considered a significant contributor to global energy savings. This gives the European Commission reason to consider EE as a strategic priority for the Energy Union and to promote the 'energy efficiency first' principle. The Commission proposes to fundamentally rethink EE and treat it as an energy source in its own right. By using energy more efficiently, it is possible to reduce energy demand, leading to lower energy bills for consumers, lower emissions of greenhouse gases and other pollutants, a reduced need for energy infrastructure, and increased energy security through reduced imports. However, implementing EE policies is challenging, and the full potential of EE is far from being realised due to financial, behavioural, and regulatory reasons, such as high initial investment costs, access to finance, and a lack of information [10].

B. Green Jobs

Tackling climate change requires significant investments and large-scale transformations across sectors to achieve the goals of the green transition. This shift is expected to generate high demand for green employment and new skills. GJ are at the heart of the transition to net-zero emissions, playing a key role in both the design and implementation of environmental management strategies that promote sustainable economic development and cleaner production. They are perhaps one of the most essential elements of the green transition, as they provide both economic incentives (financial capital) and social consensus and mandate (social capital) for change [8, 12].

Different international organisations and researchers have offered their nuanced definitions of GJ. The International Labour Organisation (ILO) defines them as "decent jobs that contribute to the protection or restoration of the environment, whether in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and EE" [13-15]. This definition emphasises both the environmental contribution and the importance of decent working conditions.

The United Nations Environment Programme (UNEP) expands the scope to include "positions in agriculture, manufacturing, research and development (R&D), administration and service activities that contribute significantly to the protection or restoration of the quality of the environment". UNEP specifically mentions that this includes jobs that help conserve ecosystems and biodiversity, reduce energy, materials, and water consumption through high-efficiency strategies, decarbonise the economy, and minimise or avoid the generation of all forms of waste and pollution [16].

At the same time, according to Bradley *et al.* [12], the transition to GJ may encounter social resistance, as opportunities for such employment are currently unevenly distributed. For example, minorities are underrepresented in the environmental sector. To address these and other issues, governments and businesses need to develop adequate policies and strategies, but this requires a solid and reliable evidence base, which is currently lacking. Academia and

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practitioners need to engage substantially in GJ research to build this necessary foundation.

Whittard *et al.* [8] also agree that GJ have the potential to address inequalities, as they are often associated with new and emerging industries and jobs. This allows for a fresh start, allowing practices to be explicitly designed to prioritise equality. This transition also offers an opportunity to address deep-rooted inequalities that exist in traditional industries, although evidence of such success is limited. However, without sufficient prioritisation, the transition could perpetuate and potentially deepen, rather than reduce, inequalities.

The OECD adopts a more functional approach, categorising jobs as green if at least 10% of their tasks contribute to environmental objectives, such as environmental protection and emission reductions [17-19]. The World Bank also emphasises green workplace goals, noting that they are not limited to one specific sector, but can be applied in renewable energy, green product manufacturing, sustainable agriculture, the circular economy, recycling, and many other areas [20-22].

C. Interdependence between the Two Concepts

The interdependence between EE and GJ is crucial to a sustainable transition, as the two concepts reinforce each other. EE catalyses the creation of new employment opportunities, while GJ are a key driver for the successful implementation of EE measures. Investments and initiatives in the field of EE lead to significant job creation. EE, defined as reducing energy consumption while maintaining or improving the service provided, is recognised as one of the most powerful and cost-effective tools for addressing global challenges [5]. It encompasses a wide range of activities, from building renovation and insulation improvements to the implementation of energy-efficient technologies in industry to the development of "smart" grids and energy management systems [6]. All of these activities require a specialised workforce. The ILO explicitly identifies EE as one of the new, emerging "green sectors" where decent jobs are created [13, 14]. The OECD notes that future GJ may be concentrated in medium- and low-skilled occupations such as renovation and construction, which are directly related to EE [17]. Thus, the drive for greater EE directly stimulates the creation of new occupations and expands the existing labour market.

Therefore, the availability of a skilled workforce with "green skills" is essential for the effective implementation of EE measures. GJ do not simply arise in response to EE needs, but also actively drive the process of their implementation. EE professionals are those who design, install, maintain and optimise energy-efficient systems and technologies. They provide the necessary expertise to identify energy-saving opportunities, develop solutions and monitor their implementation. According to the World Bank, GJ require more intensive use of high-level cognitive and interpersonal skills, necessitating higher levels of formal education, work experience, and on-the-job training [20].

This highly skilled workforce is indispensable for the technological innovations needed to advance EE. Without sufficient GJ, the implementation of complex and innovative EE solutions would be severely hampered, regardless of political will or financial incentives. Thus, GJ are not just a consequence, but an active factor and driver for achieving greater EE in the economy and society.

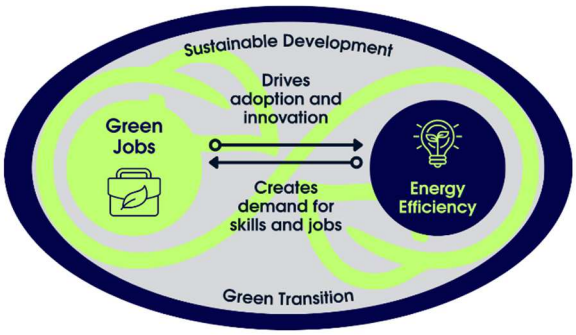


Fig. 1. Relationship between GJ and EE. *Source:* Own development

III. Methodology

The methodology for this study is based on a systematic literature review, combined with conceptual analysis and synthesis of data from diverse and authoritative sources (Figure 2). The aim is to provide a broad perspective on the transformative potential of GJ in the context of EE and sustainable development. The main steps in the methodology include:

Systematic literature review: 1) Source identification: A search and selection of relevant academic publications, reports from international organisations (such as ILO, UNEP, OECD, World Bank), government strategies and analyses were conducted; 2) Data collection: Key information was extracted on definitions of "green jobs", their characteristics, as well as their economic, environmental and social benefits, especially in relation to EE. Information was also collected on existing challenges and examples of successful policy interventions.

Conceptual analysis and framework: 1) Defining key concepts: Based on the collected literature, different definitions of "green jobs" and "energy efficiency" were derived and presented to ensure clarity and scope of understanding; 2) Developing a conceptual framework: A framework was built that shows the interdependence between GJ and EE, as well as their contribution to the three pillars of sustainable development – economic, environmental and social.

Data synthesis and thematic analysis: 1) Integrating information: Data and findings from different sources were synthesized to derive the main emphases on each of the topics considered (e.g. economic contribution, environmental benefits, social dimensions); 2) Thematic analysis: A thematic analysis of the collected information was carried out to identify recurring concepts, trends, common benefits and challenges, as well as differences in the perspectives of the different sources.

Analysis of challenges and policy implications: 1) Identification of barriers: Based on the literature, the main barriers to the widespread implementation of EE and the development of GJ are systematized (e.g. skills needs, uneven distribution of opportunities, social resistance); 2) Policy recommendations: Recommendations are formulated for policy interventions, financial mechanisms and educational reforms that can contribute to overcoming these barriers and to synchronizing EE and GJ objectives.

Through this methodology, the paper aims to provide a comprehensive overview of the topic, supported by up-to-date and relevant information, while indicating key areas for future action and research.

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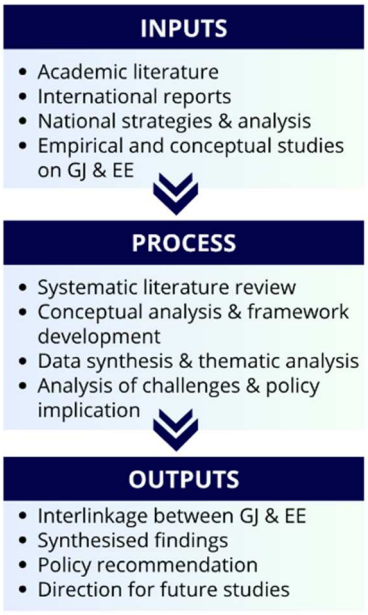


Fig. 2. Conceptual framework of the study. *Source:* Own development

IV. Results and Discussion

Economic contribution of GJ for EE

GJ, particularly those related to EE, play a crucial role in economic development, offering multiple benefits that extend beyond environmental aspects. They are recognised as one of the most essential elements of the green transition, as they create significant economic incentives for change [8].

Creation of new sectors and niches in the labour market: The transition to greener economies and the emphasis on EE are giving rise to entirely new industries and specialised market niches. This includes activities such as energy audits, the design and construction of passive and low-energy buildings, the installation and maintenance of advanced insulation systems and efficient heating, ventilation and air conditioning (HVAC) systems, and the development of "smart" grids for managing energy consumption.

The ILO explicitly defines GJ as including those in emerging sectors, such as EE [13, 14]. The World Economic Forum predicts that by 2030, the green transition will generate 170 million new jobs globally, resulting in a net gain of 78 million jobs, indicating the enormous potential for creating new employment opportunities [6-10].

Stimulating innovation and technological development: GJ are inextricably linked to promoting innovation and technological development in the EE sector. The need for more efficient and sustainable solutions stimulates research and development of new materials, systems and software that contribute to reducing energy consumption [1-6]. This, in turn, leads to the constant improvement of technologies and methodologies, which is key to the long-term sustainability and competitiveness of the economy.

Reducing energy costs for households and businesses: One of the most direct economic contributions of GJ in EE is the reduction of energy costs. By implementing EE measures, households and businesses can significantly reduce their energy bills. This is achieved through better insulation, installing more efficient appliances and systems, and optimising energy consumption. EE programs have been shown to bring significant benefits to energy users through cost savings, and from a project economics perspective, they are often viewed as "no regret" policies because their net financial costs can be negative [5- 9]. Reduced operating costs make businesses more sustainable and free up resources for other investments or household spending.

Increased competitiveness: Reduced energy costs and more efficient resource utilisation directly contribute to enhanced industrial and commercial competitiveness [6-10]. Enterprises that invest in EE and create or hire green workers become more competitive in the market, as they reduce their production costs, improve their environmental footprint and meet increasing consumer demands for sustainability. This gives them an advantage in both domestic and international markets, especially in the context of increasingly stringent environmental regulations and growing demand for "green" products and services.

Impact on GDP and economic growth: All of the above factors – job creation, stimulating innovation, reducing costs and increasing competitiveness – cumulatively have a positive impact on gross domestic product (GDP) and overall economic growth. Investments in EE generate economic activity, which is reflected in the creation of employment, increased incomes, and stimulated consumption and production. GJ not only contribute to economic growth but also have the potential to promote social inclusion and reduce poverty, leading to more stable and prosperous societies [8, 13, 14].

Ecological benefits and environmental impact

GJ play a central role in environmental protection and restoration, making a significant contribution to addressing the global environmental challenges facing the planet in the Anthropocene era [1]. Their impact encompasses a wide range of ecological benefits that are essential for achieving sustainable development.

Direct reduction of greenhouse gas emissions (CO2, CH4, etc.): One of the main environmental benefits of GJ, especially in the EE sector, is the direct reduction of greenhouse gas emissions. Workers in this sector are involved in implementing technologies and practices that reduce energy consumption and shift reliance on fossil fuels. EE programs specifically contribute to reducing the carbon footprint of the energy sector [6, 13-15].

Reduction of air, water and soil pollution: GJ also have a direct impact on reducing various forms of pollution. By implementing cleaner production processes, waste management and pollution prevention, these jobs contribute to a healthier environment. The UNEP definition of GJ includes activities that "minimise or avoid the generation of all forms of waste and pollution" [16]. EE programs specifically reduce environmental pollution [6].

More efficient use of natural resources: GJ promote more efficient and sustainable use of natural resources. This includes optimising the consumption of raw materials, water and energy across all sectors. The ILO also states that GJ "reduce the consumption of energy and raw materials" [13, 14]. Improved efficiency, in turn, contributes to the conservation of natural resources and reduces resource dependency [6].

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TABLE I. SUMMARY OF THE ECONOMIC, ENVIRONMENTAL, SOCIAL AND POLICY DIMENSIONS OF GREEN JOBS IN THE CONTEXT OF ENERGY EFFICIENCY

Dimension	Key Contributions / *Benefits*	Illustrative Examples / *Mechanisms*
Economic	▪ Creation of new sectors and labour market niches; ▪ Stimulating innovation and technological development; ▪ Reducing energy costs for households and businesses; ▪ Enhancing industrial competitiveness; ▪ Positive impact on GDP and overall economic growth.	▪ Energy audits, passive/low-energy buildings, HVAC systems, smart grids; ▪ Development of new EE technologies and materials; ▪ Cost savings through insulation and efficient systems; ▪ Increased market competitiveness via lower production costs.
Environmental	▪ Reduction of greenhouse gas emissions; ▪ Decreased air, water and soil pollution; ▪ More efficient use of natural resources; ▪ Contribution to climate change mitigation and adaptation; ▪ Monitoring and enforcing environmental standards.	▪ EE technologies reducing fossil fuel dependency; ▪ Cleaner production, waste management; ▪ Optimised resource consumption; ▪ Strengthened resilience and climate adaptation measures.
Social	▪ Increasing employment and reducing unemployment; ▪ Creating better and safer jobs; ▪ Improving public health and well-being; ▪ Supporting retraining from "brown" sectors; ▪ Contributing to energy justice and reducing energy poverty.	▪ Job creation through EE and renewables; ▪ Decent work principles (ILO); ▪ Cleaner environment and lower energy bills; ▪ Reskilling and vocational training programs; ▪ Inclusive policies addressing vulnerable groups.
Challenges & Policies	▪ Job displacement and industrial decline; ▪ Uneven distribution of green job opportunities; ▪ Skills mismatch and lack of training; ▪ Financing gaps and need for investment; ▪ Weak policy coordination.	▪ Integrated policy frameworks aligning EE and GJ targets; ▪ Financial mechanisms: tax incentives, green bonds, innovation funds; ▪ Educational reforms and skills development programs; ▪ Holistic approach including social inclusion, transition planning, cross-sectoral cooperation.

Source: Own development

Contribution to climate change mitigation and adaptation: Overall, GJ play an integral part in both climate change mitigation (reducing emissions) and adaptation (adapting to changing conditions). EE is one of the "best tools for mitigating" the challenges of climate change [6]. Therefore, GJ related to EE help build more resilient systems and infrastructure that can withstand the impacts of climate change. In confirmation, the ILO emphasises that GJ "enable businesses and communities to adapt to climate change" [13, 14].

The role of green jobs in monitoring and enforcing environmental standards: GJ also include roles related to monitoring, assessing, and ensuring compliance with environmental standards and regulations. This ensures that environmental policies are not only developed but also effectively implemented in the real world. These positions are essential for maintaining ecological integrity and accountability in the transition to a more sustainable economy.

Social dimensions and benefits

GJ offer significant social benefits that go beyond the purely economic and environmental aspects, contributing to more just and sustainable societies. In an era of uncertainty and social fragmentation, these jobs can serve as a means of addressing fundamental social challenges such as poverty and exclusion.

Increasing employment and reducing unemployment: The most direct social contribution of GJ is their potential to increase employment and reduce unemployment significantly. The global transition to a sustainable economy, including through investments in EE and renewables, creates enormous opportunities for new positions. The expected over 170 million newly generated GJ will not only provide livelihoods for many, but will also stimulate local cooperation and capacity building, leading to more inclusive development [7, 9].

Creating better and safer jobs: GJ are often associated with higher quality and safer working conditions. The ILO defines "green jobs" as "decent jobs" [13-15], which encompass aspects such as fair working conditions, adequate income, social protection, and a safe working environment. Although there are still challenges related to the equitable distribution of opportunities, the green transition has the potential to improve the overall quality of employment in the economy.

Improving the health and well-being of the population (through a cleaner environment and cheaper energy): By promoting EE and reducing pollution, GJ contribute directly to improving public health and well-being. Reducing emissions of greenhouse gases and other pollutants into the air, water, and soil leads to a cleaner environment, which directly improves the health of the population by reducing pollution-related diseases [6, 16]. In addition, EE measures lead to reduced energy costs for households, freeing up financial resources, which also improves overall well-being [2, 5-7, 9, 16].

Role in retraining workers from brown sectors: The transition to a green economy will inevitably lead to changes in the structure of the labour market, including the potential displacement of jobs from brown (highly polluting) sectors. In this context, GJ play a critical role in the retraining and training of workers. Although initially green job opportunities were mainly targeted at high-skilled workers, the OECD indicates that future GJ may be directed at medium- and low-skilled occupations (e.g., renovation and construction) [17, 18], which highlights the need for investment in training and the acquisition of new skills [9]. This allows workers from declining industries to adapt and find new livelihoods in emerging green sectors, ensuring a smooth and just transition.

Contribution to energy justice and reducing energy poverty: GJ and EE can significantly contribute to energy justice and reducing energy poverty. By making energy more accessible and reducing its costs through efficient use, they ease the financial burden on vulnerable households. Although there are challenges related to the equitable distribution of benefits, the potential for social inclusion and poverty reduction through the creation of GJ is substantial [8]. A focus on local cooperation and more inclusive development also

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contributes to a fair distribution of the benefits of the energy transition [7].

Challenges and policies for integration

While the transition to greener economies presents opportunities for economic growth, job creation, and the potential for social inclusion and poverty reduction, it also poses significant barriers and challenges. These include job displacement, the decline of specific industries, unclear net impacts on overall employment, and potentially adverse effects on low-income households stemming from higher prices or loss of livelihoods [12]. Integrating EE targets with the development of GJ is a complex process that requires overcoming significant challenges through targeted policy interventions, adequate financing mechanisms and large-scale educational reforms.

Policy interventions needed to align EE targets with the development of green jobs: A successful green transition and the accompanying development of GJ depend directly on coordinated policy interventions. Governments need to develop and implement comprehensive strategies that align EE targets with plans to create and sustain GJ. This includes making clear regulatory frameworks that incentivise investment in EE, as well as policies that encourage the creation of new market niches and the demand for green skills. It is essential to establish a robust and reliable evidence base to inform these policies and strategies, as this currently lacks. Policy measures should also address the uneven distribution of green job opportunities to avoid social resistance and ensure an inclusive transition.

The role of financial mechanisms (public and private investment): Financing is at the heart of the green transition and the development of EE. Large-scale public and private investment is needed to support the creation of GJ and the deployment of energy-efficient solutions. Governments should introduce "bold policy measures and instruments and increase investment to accelerate the deployment of energy-efficient solutions across all sectors". This could include tax breaks, subsidies, green bonds and innovation funds to incentivise both the private sector and households to invest in EE. An example of this is European policies that promote innovative and sustainable job prospects, reshaping the labour market and catalysing the development of rural areas [5, 7].

Educational reforms and skills development programmes: There is a significant imbalance between the demand and supply of green skills, which necessitates urgent educational reforms and large-scale skills development programmes. GJ require specialised knowledge and skills. Therefore, education systems, from vocational schools to higher education, need to be adapted to offer training and retraining programmes that meet the needs of the green economy. As mentioned, the OECD and the World Bank emphasise the importance of developing high-level cognitive and interpersonal skills, in addition to formal education, work experience, and on-the-job training. This is also essential for workers in the "brown" sectors, who require retraining opportunities to transition into new GJ [7, 18, 20, 23].

Barriers to deployment and how they can be overcome through a holistic approach: The deployment of EE and the development of GJ face numerous obstacles. These include potential job displacement, decline of some industries, and unclear net employment impacts. There is also the problem of uneven distribution of green employment opportunities, which could lead to social resistance if minority groups are not adequately represented. To overcome these challenges, a comprehensive approach is needed that includes:

- *Social inclusion*: Policies that ensure fairness and equal opportunities, preventing the marginalisation of certain groups of workers;
- *Transition planning*: Active measures to manage changes in the labour market, including support for reskilling and redeployment of workers.
- *Cross-sectoral cooperation*: Close cooperation between government, business, academia and civil society to develop and implement integrated strategies;
- *Building an evidence base*: Continuing research better to understand the dynamics of GJ and their impacts in order to inform effective policies;

By implementing this integrated approach, it is possible to ensure a smoother, fairer and more effective transition to a sustainable economy that maximises both the environmental and socio-economic benefits of EE and GJ.

V. Conclusion

GJ, particularly in the EE sector, have immense transformative potential for achieving comprehensive sustainable development. As discussed, they are not just a response to environmental challenges, but also a powerful driver for overall progress, encompassing economic, social and ecological benefits. Economically, GJ stimulate the creation of new sectors and niches in the labour market, catalyse innovation and technological development, reduce energy costs for households and businesses, increase competitiveness and have a positive impact on GDP and overall economic growth. Environmentally, they contribute directly to reducing greenhouse gas emissions, limiting air, water and soil pollution, promoting more efficient use of natural resources and underpinning climate change mitigation and adaptation. Socially, GJ increase employment, reduce unemployment, create better and safer jobs, improve the health and well-being of the population and play a key role in retraining workers from traditional industries, contributing to energy justice and reducing energy poverty. By their very nature, GJ provide both economic incentives and social consensus for change, becoming one of the most essential elements of the green transition.

To fully realise this potential, a shift from fragmented to integrated strategies is imperative. There is a need for targeted synchronisations of EE goals with the development of GJ through adequate policy interventions that create a favourable regulatory environment and stimulate investment. Financial mechanisms – both public and private – must be mobilised to support the large-scale financing of green infrastructure and workforce training. Furthermore, educational reforms and skills development programmes are key to closing the existing gap between the demand and supply of green skills, ensuring a smooth and fair transition for all groups in the population. Overcoming barriers such as potential job displacement and uneven distribution of opportunities requires a holistic approach that focuses on social inclusion, transition planning, and cross-sectoral cooperation. Finally, despite growing interest in GJ, there remains a need for more in-depth

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theoretical research on the complex relationships between the economic, social, and environmental pillars of sustainable development. Achieving an *environmentally sustainable and fair economy* requires a *solid and reliable evidence base*, which is currently lacking. Academics and practitioners should continue to engage in research on GJ to shed light on labour market dynamics, assess the impact of policies and propose innovative solutions. Only through integrated strategies and a deeper understanding of these interlinkages can we ensure that GJ become a true catalyst for an inclusive and sustainable future for all.

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