

DEVELOPING GREEN HUMAN RESOURCES IN VIETNAM

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ABSTRACT

In the context of climate change, the development of green human resources has become an urgent requirement for Vietnam. To implement the strategy of green growth and sustainable development, human resources serve as the foundation for economic progress and the key driver for transitioning toward an environmentally friendly economy that promotes sustainable development. Therefore, identifying difficulties and overcoming challenges in developing green human resources is an urgent task that Vietnam needs to prioritize. This not only ensures sustainable development but also creates the conditions for a greener future for the nation. The article analyzes the theoretical foundations and assesses the current situation of green human resource development in Vietnam. On that basis, it proposes solutions to improve policies, enhance training capacity, and promote multilateral cooperation in developing green human resources, thereby contributing to the realization of the National Green Growth Strategy.

Keyword: Green human resources, Green labor market, Green growth...

1. THEORETICAL BASIS OF GREEN HUMAN RESOURCES

In the context of global challenges posed by climate change, resource depletion, environmental pollution, and development inequality, the transition to a green economic model has become an inevitable trend toward sustainable growth. According to the United Nations Environment Programme (UNEP), a green economy is one that "results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities." Within this framework, green human resources play a central role, serving both as a driving force and a prerequisite for realizing green development goals at national and global levels.

According to the International Labour Organization (ILO, 2019), green human resources refer to a workforce possessing knowledge, skills, attitudes, and values aligned with the requirements of a green economy; capable of undertaking activities that minimize negative environmental impacts while promoting the sustainable use of natural resources and inclusive social development.

From a human resource management perspective, green human resources encompass not only workers in green economic sectors (such as renewable energy, waste treatment, and organic agriculture) but also the entire workforce with

environmentally friendly skills, attitudes, and behaviors, regardless of the sector in which they are employed.

Thus, green human resources include not only labor in sectors directly related to the environment (such as renewable energy, waste management, and ecological agriculture) but also extend to all occupations oriented toward innovation in technology, governance, and production in an environmentally friendly direction.

In terms of structure, green human resources are formed from three fundamental groups of factors:

- (1) Green knowledge – encompassing understanding of sustainable development principles, clean technology, circular economy, and resource management;
- (2) Green skills – the ability to apply environmentally friendly knowledge and technology to production, business, management, and innovation activities;
- (3) Green attitudes and values – demonstrated through environmental responsibility, a spirit of cooperation, and commitment to sustainable development.

Theoretically, green human resource development is closely linked to modern approaches such as sustainable growth theory, human capital theory,

and green transition theory. In this context, human capital is regarded as a foundational factor of national competitiveness, while green transition requires the restructuring of education systems, labor markets, and public policies to build a workforce capable of adapting to the new requirements of the economy.

Consequently, green human resources development is not only an inevitable requirement of implementing the National Green Growth Strategy but also a prerequisite for Vietnam to achieve the Sustainable Development Goals (SDGs) and deeply integrate into the global green economy trend.

2. RESEARCH METHODOLOGY

This study employs statistical, analytical, synthetic, and comparative methods to examine green human resources in Vietnam, based on a mixed-methods approach combining quantitative and qualitative analysis. Data on the current state and labor demand in sectors such as renewable energy, waste management, and sustainable agriculture are thoroughly analyzed, including the proportion of trained workers, the share of green jobs in total employment, and the sectoral distribution of human resources. Secondary data were collected from the General Statistics Office (2020–2025), the World Bank (2023, 2025), the ILO (2019, 2024), IRENA (2020), and the Ministry

of Industry and Trade (2024, 2025), together with policy documents such as the National Green Growth Strategy, Power Development Plan VIII, and the Organic Agriculture Development Project. Four analytical methods are applied: descriptive statistics and time-series analysis to identify green labor trends during the 2020–2025 period; inductive–deductive analysis to clarify the structural components of green human resources and the labor supply–demand gap; multi-source data synthesis to construct a comprehensive picture of opportunities and challenges; and comparative analysis to benchmark Vietnam's situation against international commitments (COP26, SDGs) as well as across key green sectors. On this basis, the study elucidates the opportunities and challenges Vietnam faces in developing green human resources, ranging from policy frameworks and training systems to the labor supply–demand gap, thereby providing recommendations to enhance the quality of green human resources in the future. The study is limited to secondary data analysis; however, the triangulation of multiple authoritative sources ensures the reliability and robustness of the findings, serving as a foundation for the proposed policy recommendations.

3. CURRENT STATE OF GREEN HUMAN RESOURCES IN VIETNAM

Table 1. Proportion of trained workers with degrees/certificates, 2020–2025

Year	Total workforce (million people)	Trained workers with degrees/certificates (%)	Workers in green sectors (estimated, %)
2020	54.4	24.5	3.0
2021	50.7	26.1	3.3
2022	51.9	27.8	3.5
2023	52.3	28.2	3.6
2024	53.0	28.3	3.9
2025	53.6	28.7	4.2

Source: Compiled by the author

Green human resources are becoming a key factor in Vietnam's economic transition toward sustainable, environmentally friendly development. According to the General Statistics Office (GSO), during the 2020–2025 period, the proportion of trained workers gradually increased from 24.5% in 2020 to 28.7% in 2025, reflecting efforts to improve overall labor quality — an

important foundation for green human resource development.

However, the current state of green human resources in Vietnam still faces many challenges and limitations, with only about 4.2% of total employment classified as green jobs, equivalent to approximately 2.2 million jobs (World Bank, 2025). This figure is relatively low compared to the demand and growth rate of green industries in

the context of the economy transitioning toward sustainable and environmentally friendly models.

In the field of education and training, higher education institutions are increasingly interested in providing green skills training programs. In recent years, many universities in Vietnam have proactively implemented training programs related to the environment and sustainability, such as Hanoi University of Science and Technology, Ton Duc Thang University, Can Tho University, and An Giang University, and have actively integrated courses on green skills and knowledge into their curricula. This plays an important role in preparing human resources with

appropriate skills and knowledge to meet the demands of green occupations in the future.

According to the Ministry of Industry and Trade (2025), Vietnam currently has approximately 39 occupations identified as green occupations, accounting for about 3.9% of total national employment. These occupations are primarily distributed in fields related to renewable energy, environmental management, organic agriculture, ecotourism, and green construction. This indicates that the trend of restructuring employment toward sustainability is gradually taking shape, although the scale remains modest relative to the overall labor market.

Table 2. Key green employment sectors in Vietnam

Sector	Share of total green jobs (%)	Human resource characteristics
Renewable energy (wind power, solar power)	27.5	High demand for technical engineers, operations and maintenance specialists for clean energy systems.
Waste and environmental management	18.2	Primarily mid-level technical workers, equipment operators, and environmental treatment specialists.
Organic and circular agriculture	16.4	Skilled agricultural workers with knowledge of clean production processes and biotechnology.
Ecotourism and green services	14.6	Demand for service workers, tour guides, communications personnel, and green destination managers.
Green construction and sustainable urban development	12.8	Requires design engineers, planners, project managers, and experts in green materials and technology.
Other sectors (green logistics, cleaner production, environmental technology, etc.)	10.5	Technical and managerial workers in logistics, clean industry, and recycling technology.

Source: Compiled by the author

One rapidly growing sector with significant potential for attracting green human resources is renewable energy, particularly solar and wind energy, which accounts for 27.5% of total green

jobs. This is the fastest-growing sector during the 2020–2025 period, with the strong development of solar, wind, and biomass power projects in Ninh Thuan, Binh Thuan, the Central Highlands, and the South Central Coast. Vietnam has achieved notable

accomplishments in solar energy development in recent years. The share of solar energy in the nation's total power capacity reached 24% in 2020, among the highest in the world. Installed solar power capacity in Vietnam increased to 19 GW by 2022, making Vietnam one of the leading countries in solar energy in Southeast Asia. According to Power Development Plan VIII, Vietnam aims to achieve a total solar power capacity of 12,836 MW by 2030 (excluding existing rooftop solar), with a vision toward 2050 when this figure will increase to between 168,594 MW and 189,294 MW. This strong development demonstrates the enormous potential of the renewable energy sector in creating green jobs, not only in investment and development phases but also in operations and maintenance activities after systems become operational.

Thus, green human resources in Vietnam has made positive strides, but Vietnam still faces many challenges. The proportion of green workers remains low, gender inequality persists, and the demand for skilled human resources in green sectors, particularly renewable energy, is increasingly high. In this context, training and developing green human resources is a key factor in ensuring the sustainable transition of Vietnam's economy.

4. OPPORTUNITIES AND CHALLENGES IN DEVELOPING GREEN HUMAN RESOURCES IN VIETNAM

4.1. Opportunities

Vietnam is presented with tremendous opportunities in developing green human resources, especially given Vietnam's commitment to achieving net-zero emissions by 2050 at the 26th United Nations Climate Change Conference (COP26). According to the World Bank, pursuing a sustainable and climate-resilient development pathway requires Vietnam to invest an additional approximately USD 368 billion by 2040. The Vietnamese Government has demonstrated strong commitment through documents such as: Decision No. 1658/QĐ-TTg approving the National Green Growth Strategy for 2021–2030, with a vision to 2050; and Decision No. 888/QĐ-TTg on implementing comprehensive solutions to respond to climate change and energy transition. These documents not only lay the foundation for the national green growth strategy but also open opportunities to promote green jobs, particularly

in renewable energy, environmental treatment, and sustainable agriculture.

Furthermore, universities in Vietnam have been actively training green skills to meet the growing demand for green human resources, contributing significantly to preparing quality green human resources for the sustainable development process. This helps students acquire not only knowledge but also essential practical skills, ready to participate in the green labor market, thereby creating a workforce capable of meeting the requirements of sustainable economic development trends. Through the development of new disciplines, particularly in technology and innovation linked to environmental protection, universities have been contributing to creating sustainable and long-term career development opportunities for green human resources in Vietnam. In fact, out of 441 occupations in Vietnam, 39 are considered green occupations and 88 others have the potential to become green occupations, accounting for 41% of total employment (World Bank, 2023). This highlights the expansion potential for green human resources in Vietnam.

With the rapid development of the renewable energy sector, possessing a highly skilled workforce in this field will bring significant opportunities for the economy, especially during the green transition period. To fully exploit this potential, Vietnam needs a highly qualified workforce in renewable energy. To serve the energy transition through 2030, Vietnam will need many more workers in this sector (IRENA, 2020). It is estimated that approximately 315,000 new jobs will be created annually in solar power, wind power, and biomass energy production to meet operational needs. However, at present, green human resources for the operation and maintenance of these energy systems remains very limited, failing to meet the large market demand.

Not only in renewable energy, but the environmental treatment industry, particularly waste management and recycling, also has significant human resource needs. Each year, Vietnam generates approximately 25 million tons of municipal solid waste, but only 30% is treated through methods such as incineration or organic fertilizer production, while the remaining 70% is still directly landfilled. In particular, plastic waste and plastic bags account for approximately 8%–

12% of total waste, and this volume is increasing year by year (VEA, 2023). This not only puts pressure on waste treatment facilities but also creates an urgent need for green human resources, especially in plastic recycling and hazardous waste management. Human resources capable of managing and treating waste effectively and sustainably are becoming increasingly essential.

Additionally, sustainable agriculture and organic agriculture are emerging as a new direction for rural development in Vietnam. According to the Vietnam Organic Agriculture Association, the total organic agricultural production area in 2021 reached only 119,105 hectares, accounting for 0.5% of the nation's agricultural land. According to the Organic Agriculture Development Project for 2020–2030, approved under Decision No. 885/QĐ-TTg of the Prime Minister in 2020, the goal is to increase the organic agricultural production area to approximately 1.5–2% by 2025 and 2.5–3% by 2030. To achieve these goals, the sustainable agriculture sector will need a large workforce with specialized skills in organic farming and the application of green technology. Expanding organic agricultural production not only meets food safety and environmental protection requirements but also creates numerous employment opportunities for rural areas.

Thus, from renewable energy to waste management and sustainable agriculture, Vietnam is facing significant opportunities in developing green human resources with skills and in-depth knowledge, while also requiring investment in education and training to meet the growing demand in key sectors of the green economy. Green human resources development is not only an important factor helping Vietnam achieve international commitments on climate change but also contributes to promoting sustainable growth and environmental protection.

4.2. Challenges

Green human resources development is a crucial factor for Vietnam to successfully implement its green growth and sustainable development strategy. However, this process is currently facing many significant challenges, ranging from the quantity and quality of green human resources, the training system, to policy and legal mechanisms.

- **Quantity:** The gap between labor supply and demand in the green sector remains substantial. According to enterprises, up to 46.8% of organizations face difficulties in recruiting personnel with expertise in emission reduction and green transition. They often rely on support from consulting firms, but this human resource pool is still insufficient to meet the specific requirements of the field. The risk of labor shortage in the renewable energy industry is even more severe, as the quantity and quality of human resources for this industry remain limited due to the participation of only a few educational institutions in training.
- **Quality:** The quality of green human resources has not yet met the high requirements for technology and engineering. Many production lines and technologies in Vietnam are still outdated, leading to high fuel and energy consumption, reducing efficiency in sustainable production. The proportion of untrained workers in Vietnam remains high, and the occupational structure is not yet reasonable, creating difficulties in generating quality human resources for the green economy (Dao Xuan Loc, 2024). This is a major obstacle when the green economy demands advanced scientific and technological proficiency.
- **Training:** The education and training system has not adequately met the demand for green skill development in the labor market. Current training programs are not flexible enough to keep pace with the rapid changes in skill requirements in green transition-related industries. Additionally, the shortage of faculty and experts with deep expertise in green skills is a significant barrier, while infrastructure conditions and financial resources for training remain limited.
- **Policy mechanisms:** The lack of a measurement system and official definition of "green jobs" also poses significant obstacles to developing training and skill development policies in this field. Currently, Vietnam does not have an official measurement framework for green jobs, which makes it difficult to plan and monitor green human resources development. Moreover, wage policies for green jobs in Vietnam remain lower than those for traditional occupations, which contrasts

with trends in high-income countries. This disparity makes green jobs less attractive to workers, reducing the appeal and competitiveness of this sector.

- **Legal framework:** Although the Vietnamese Government has issued many national strategies to promote green growth and sustainable development, the legal system has not yet been truly completed and synchronized. The lack of synchronization in the legal system slows down the process of green human resources development in Vietnam.

Thus, Vietnam has made important strides in transitioning to a green economy, but many challenges remain to be addressed in building quality green human resources. Improving training quality, completing the legal framework, and enhancing the attractiveness of the green labor market are key factors in ensuring the success of the sustainable development strategy.

5. RECOMMENDATIONS

To build quality green human resources in Vietnam, a comprehensive and synchronized strategy is needed, focusing on key issues: education and training, cooperation and research, communication and gender equality, and policy and legal frameworks. These efforts will not only promote sustainable development but also contribute to environmental protection and improving the quality of life for citizens. Only when we act in unison can Vietnam's green human resources develop strongly, creating solid progress on the journey toward a more sustainable future. Therefore, in the coming period, to develop green human resources, Vietnam needs to focus on addressing several key issues:

First, strengthening investment in education and training is extremely necessary. Vietnam needs to focus on sectors such as renewable energy, waste management, and sustainable agriculture to equip the workforce with necessary skills and knowledge. This investment not only improves the quality of education but also enhances the capacity of the green workforce, better meeting the growing demands in sustainable development sectors while addressing the skill shortages that enterprises currently face. Additionally, enhancing cooperation between enterprises and educational institutions is essential. Establishing collaborative

training programs that link schools and enterprises will help educational institutions quickly update the latest skill requirements while creating opportunities for students to practice and accumulate experience. This not only enhances students' competitiveness but also helps enterprises find suitable personnel for green job positions.

Second, promoting research and application of new technologies in the green sector. Departments of Science and Technology and research institutes in major cities need to prioritize budgets to attract research investment from scientists through high-applicability research projects. Strengthening research will help develop effective solutions to current environmental challenges. Human resources with expertise and skills in green technology will become an essential part of achieving sustainable development goals.

Third, promoting community communication and education programs on the importance of green human resources. Raising community awareness will encourage more people to participate in environmental protection and green development activities, creating a solid foundation for green human resources development in the future. At the same time, encouraging women's participation in green occupations should be given special attention. Support programs such as scholarships and facilitating access to green education for women will not only contribute to gender equality but also promote sustainable development, as women often bring new perspectives and solutions to environmental protection.

Fourth, establishing a measurement and evaluation system for green human resources - related activities and programs is necessary. This system will help monitor the progress and effectiveness of green human resources development policies, thereby adjusting necessary measures in a timely manner. This not only ensures that sustainable development goals are achieved but also consolidates stakeholder confidence in these programs. Additionally, developing a clear legal framework for green jobs is also an important factor. Legal regulations related to green employment need to be developed and issued, including specific definitions and criteria. A solid legal framework will help enterprises and educational institutions easily identify recruitment and training criteria,

facilitate measurement and evaluation of effectiveness, thereby promoting sustainable development in this field and creating synchronization between green labor supply and demand.

6. CONCLUSION

Green human resources development is an urgent requirement and, at the same time, a strategic opportunity for Vietnam to move toward sustainable growth, enhance national competitiveness, and protect the ecological environment. To achieve this goal, it is necessary to implement synchronized solutions in education and training, scientific research, communication to raise awareness, institutional improvement, and enhanced policy enforcement.

These efforts not only contribute to addressing the shortage of green skills in the labor market but also help form a workforce with knowledge, innovation capacity, and environmental responsibility – the foundation for the transition to a green economy.

Only with close coordination among the State, enterprises, training institutions, and the social community can Vietnam proactively seize the opportunities of the green transition era, moving toward a future of harmonious development between economic growth, social equity, and environmental protection, thereby improving the quality of life for all citizens.

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