AUGUST 2025
No 371

Authors
Pham Minh Thu
Nguyen Thi Hoang Nguyen
Hoang Quynh Le

Coordination
Cecilia Poggi

Mapping Labor and Training Capacity to Strengthen Human Resources in the Renewable Energy Industry in Ninh Thuan Province, Vietnam

Research papers

ÉDITIONS AFD AGENCE FRANÇAISE DE DÉVELOPPEMENT

Agence française de développement

Papiers de recherche

Les *Papiers de Recherche de l'AFD* ont pour but de diffuser rapidement les résultats de travaux en cours. Ils s'adressent principalement aux chercheurs, aux étudiants et au monde académique. Ils couvrent l'ensemble des sujets de travail de l'AFD : analyse économique, théorie économique, analyse des politiques publiques, sciences de l'ingénieur, sociologie, géographie et anthropologie. Une publication dans les *Papiers de Recherche de l'AFD* n'en exclut aucune autre.

Les opinions exprimées dans ce papier sont celles de son (ses) auteur(s) et ne reflètent pas nécessairement celles de l'AFD. Ce document est publié sous l'entière responsabilité de son (ses) auteur(s) ou des institutions partenaires.

Research Papers

AFD Research Papers are intended to rapidly disseminate findings of ongoing work and mainly target researchers, students and the wider academic community. They cover the full range of AFD work, including: economic analysis, economic theory, policy analysis, engineering sciences, sociology, geography and anthropology. *AFD Research Papers* and other publications are not mutually exclusive.

The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the position of AFD. It is therefore published under the sole responsibility of its author(s) or its partner institutions.

Mapping Labor and Training Capacity to Strengthen Human Resources in the Renewable Energy Industry in Ninh Thuan Province

Authors

Pham Minh Thu

Independent researcher

Nguyen Thi Hoang Nguyen

Independent researcher

Hoang Quynh Le
Independent researcher

Coordinator

Cecilia Poggi (AFD)

Abstract

The objective of this study is to assess the employment situations in Ninh Thuan province, Vietnam, through the lens of green job criteria, and to identify human resource challenges related to the renewable energy (RE) sector, specifically onshore wind and solar power. A case study approach is applied, combining secondary data analysis with both qualitative and quantitative interviews with key stakeholders. Additionally, the study employs the JEDI model to project employment demand in the wind and solar energy sectors in line with the province's development plan through 2030.

Findings indicate that jobs in Ninh Thuan's wind and solar sectors largely meet green job standards, offering safe working conditions and competitive compensation. However, labor demand is no longer growing as rapidly as during the earlier RE investment boom and is increasingly concentrated in skilled positions—particularly for experienced technicians and highly trained workers with intermediate to advanced technical capabilities.

Despite this shift, the local vocational training system has yet to provide specialized programs tailored to the RE industry. Current training initiatives meet only about 50–70% of industry requirements, with notable gaps in practical experience, technical expertise, and soft skills—especially English proficiency. As a result, most enterprises must recruit skilled workers and engineers from other provinces or hire international experts. Moreover, collaboration between businesses and educational institutions remains limited.

Local communities report minimal economic benefits from RE projects, with few residents employed in the province's wind and solar companies.

This case study recommends strengthening partnerships between enterprises and vocational training institutions to improve the quality and relevance of the local workforce. Key measures include revising and updating training curricula, implementing targeted and intensive training programs, and enhancing knowledge transfer in emerging technologies. It also highlights the need for expanded vocational support and livelihood initiatives for local residents—particularly middle-aged and older workers—to ensure a more inclusive and balanced approach to RE development that benefits both industry and community.

Keywords
Renewable energy workforce; vocational training; labor market mismatch; Vietnam; energy transition.

Acknowledgements
This article was produced as part of the GEMMES Viet Nam 2 program (C3-WP2 project), with financial support from the French Development Agency.

JEL Classification
Q28; J24; O15; R58.

Original version
English

Accepted
August 2025

Résumé
L'objectif de cette étude est d'évaluer la situation d'emploi

dans la province de Ninh Thuận au Vietnam à travers le prisme des critères d'emplois verts et d'identifier les défis en matière de ressources humaines liés au secteur des énergies renouvelables, spécifiquement l'énergie éolienne et solaire onshore.

Une approche d'étude de cas est appliquée, combinant l'analyse des données secondaires avec des entretiens qualitatifs et quantitatifs avec les principales parties prenantes. De plus, l'étude utilise le modèle JEDI pour projeter la demande d'emploi dans les secteurs de l'énergie éolienne et solaire conformément au plan de développement de la province jusqu'en 2030.

Les résultats indiquent que les emplois dans les secteurs éolien et solaire de Ninh Thuận répondent en grande partie aux normes d'emploi vert, offrant des conditions de travail sûres et une rémunération compétitive. Cependant, la demande de main-d'œuvre n'augmente plus aussi rapidement que lors du boom antérieur des investissements dans les énergies renouvelables et est de plus en plus concentrée sur les postes qualifiés—en particulier pour les techniciens expérimentés et les travailleurs hautement qualifiés ayant des capacités techniques intermédiaires à avancées.

Malgré ce changement, le système local de formation professionnelle n'a pas encore fourni de programmes spécialisés adaptés à l'industrie des énergies renouvelables. Les initiatives de formation actuelles ne répondent qu'à environ 50 à 70 % des exigences de l'industrie, avec des lacunes notables en matière d'expérience pratique, d'expertise technique et de compétences non techniques—en particulier la maîtrise de l'anglais. Par conséquent, la plupart des entreprises doivent recruter des travailleurs qualifiés et des ingénieurs dans d'autres provinces ou embaucher des experts internationaux. De plus, la collaboration entre les entreprises et les établissements d'enseignement reste limitée.

Les collectivités locales ne rapportent que des avantages économiques minimes découlant des projets d'énergie renouvelable, et peu de résidents travaillent dans les entreprises éoliennes et solaires de la province.

Cette étude de cas recommande de renforcer les partenariats entre entreprises et établissements de formation professionnelle pour améliorer la qualité et la pertinence de la main-d'œuvre locale. Les principales mesures comprennent la révision et l'actualisation des programmes de formation, la mise en œuvre de programmes de formation ciblés et intensifs, ainsi que l'amélioration du transfert de connaissances dans le domaine des technologies émergentes. Il souligne également la nécessité d'élargir le soutien professionnel et les initiatives de moyens de subsistance pour les résidents locaux—en particulier les travailleurs d'âge moyen et plus âgés — afin d'assurer une approche plus inclusive et équilibrée du développement des énergies renouvelables qui profite à la fois à l'industrie et à la communauté.

Mots-clés
Main-d'œuvre dans le secteur des énergies renouvelables; formation professionnelle ; inadéquation du marché du travail ; Vietnam ; transition énergétique.

Remerciements
Cet article a été réalisé dans le cadre du programme GEMMES Viet Nam 2 (projet C3-WP2), avec le soutien financier de l'Agence française de développement.

Classification JEL
Q28; J24; O15; R58.

Version originale
Anglais

Acceptée
aout 2025

Introduction

Ninh Thuận is a coastal province in the South Central Coast region of Viet Nam, with a harsh climate, drought, abundant sunshine, and strong winds throughout the year. However, it is also the province with the highest solar radiation in Vietnam, which gives Ninh Thuận significant potential for the development of renewable energy (RE). In light of these favorable conditions, on August 31, 2018, the Government issued Resolution No. 115/NQ-CP to orient Ninh Thuận as the renewable energy center of the country (wind power, solar power). Following that, on August 17, 2022, the Ninh Thuận Provincial People's Committee issued Decision No. 467/QD-UBND on the Development and Enhancement of the Quality of Human Resources in key economic sectors of the province, such as high-end tourism and renewable energy, to meet the requirements for rapid and sustainable of Ninh Thuận socio-economic development. This is an important foundation to support the province's socio-economic development and improve the quality of life for its people.

According to the Department of Industry and Trade of Ninh Thuận province, there are currently 35 operational solar power projects with a combined capacity of 2,412 MW. Additionally, 11 wind power projects with a total capacity of 666 MW have been put into operation. Ninh Thuận has set a target to achieve a cumulative power capacity of approximately 6,500 MW by 2025, which would provide employment opportunities for more than 3,000 individuals. By 2030, the province aims to reach a cumulative capacity of about 11,800 MW, creating job opportunities for nearly 5,000 individuals.

To address the need for skilled human resources in the renewable energy (RE) labor market, several solutions are being implemented. The province plans to attract highly qualified experts and professionals to work in the field. Additionally, comprehensive resource development policies and training programs are being developed to support various stages of the energy industry.

However, there are challenges in RE human resource training. Firstly, through consultations with vocational teachers, RE is still a relatively new field of training, and many students are not aware of or inclined to pursue studies in the field. Furthermore, most universities lack proper facilities and practical connections with non-academic institutions, and the curriculum for RE training programs is not yet diverse and comprehensive, which makes it less attractive to learners.

As a result, the number of universities and colleges offering RE programs and the number of students enrolled in these majors are still limited. Moreover, there is a lack of coordination between educational institutions, factories, and RE projects, leading to a mismatch between supply

and demand of skilled labor. To address this issue, it is necessary to assess the capacity, needs, and roles of three parties involved: enterprises, educational facilities, and employees/students. This evaluation will help improve the connection and enhance the quality of human resources, meeting the developmental requirements of the renewable energy industry.

Considering the limited implementation time and resources, the research team proposes a case study focusing on employment needs and solutions to enhance the capacity of human resources in the renewable energy (RE) industry specifically for Ninh Thuận province.

The article is organized as follows: Section 1 presents the research methodology, while Section 2 presents the data collection process and an overview of the surveys' samples. The results are detailed in Section 3, with an overview of current renewable energy development policies and training programs relevant to Ninh Thuận (Section 3.1). Then it provides an assessment of the labor market and employment conditions in the sector (3.2), followed by a review of training systems and institutions supporting workforce development in RE (3.3). An analysis of the socioeconomic impacts of RE growth on local households completes the assessment of the main stakeholders analyzed by the study (3.4). Following the article develops an estimation of future employment trends and labor demand in the RE industry (3.5). Lastly, it is the policy implication Section 4 concludes the major findings or conclusions.

1. Research methodology

This study uses both qualitative and quantitative methods.

- Desk reviews: Comprehensive stock taking and reviewing available data sources, information and documents, such as: (1) legal documents on RE development, employment policy and energy development programs and strategies of Ninh Thuận province ; (2) national and regional/international studies related to this topic; (3) Information and articles published on the official websites of organizations and magazines in Vietnam related to the development of renewable energy, human resource training, and related contents.

Table 1. Number of Survey Samples

Object	**Form of questionnaire**	**Number of interviewees**	
		Planned	**Actual**
1. Representatives of state management agencies (Department of Labor, Invalids and Social Affairs, Department of Planning and Investment, Department of Industry and Trade)	In-depth interviews	10	3
2.1 Representative of RE companies	In-depth interviews	20	14
2.2 Worker/technician in RE companies (5 persons/company)	Semi structure interview	100	50
3.1 Vocational training teachers	Group discussion	10	10
3.2 Vocational training students	Semi structure interview	100	
On training			100
Graduated student at college level			53
4. Households living closed to RE area.	Semi structure interview	60	83
Total		300	313

- ***Qualitative Survey***: semi structure interview, group discussions, In-depth interviews.

To provide information and data for analysis, the research team conducted a qualitative survey in September 2024 in Ninh Thuận province with 7 questionnaire samples for 7 groups of subjects. Refer Appendix 3 for detailed information on the questionnaires/ survey tools.[1]

- ***Quantitative analysis***: The research team uses The Jobs and Economic Development Impact (JEDI) model (Goldberg, Sinclair & Milligan, 2004) to estimate the economic impacts of constructing and operating power generation of RE plant (wind and solar) at the province. Specifically, this is an econometric model based on the Input-Output (I-O) table, which estimates employment by calculating and projecting economic impacts. The JEDI model was developed by the National Renewable Energy Laboratory (NREL) with support from USAID. The model is intended to provide countries outside of the United States a tool to estimate gross economic impacts that could be supported by the construction and operation of renewable energy facilities. The input parameters for the model—such as electricity generation capacity (MW), the percentage of jobs carried out by local labor, etc.—were collected through consultations with business representatives and technical experts, JEDI estimates the number of jobs to a local area (Ninh Thuận) that can reasonably be supported by a wind or solar project. Thus, although for simplicity we refer to them as a "forecast", the reader should be warned that the main limitation of this analysis is that it generates only estimates of potential activity.

Thus, any JEDI results reported in the present article are intended to be estimates, and not precise predictions. JEDI model results are displayed in two different time periods: construction and installation (C&I) and operation and maintenance (O&M). C&I-period results are inherently short term. Construction jobs are defined as full-time equivalents (FTE), or 2,080-hour units of labor (one construction period job equates to one full-time job for 1 year). A part-time or temporary job may be considered one job by other models, but would constitute only a fraction of a job according to the JEDI models. For example, if an engineer worked only 3 months on a wind farm project (assuming no overtime), that would be considered one-quarter of a job by the JEDI models. Equipment manufacturing jobs, such as tower manufacturing, are included in construction-period jobs as it is ultimately new construction that drives equipment manufacturing. O&M-period results are long term, or intended for the life of the project, and are reported as annual full-time-equivalent jobs and annual economic activity, which continue to occur throughout the operating life of the facility.

[1] Sample questionnaire: see Appendix A.3.

2. Data

2.1. Survey of enterprises and employees in the renewable energy sector

The research team conducted a survey of enterprises and employees in the renewable energy sector, where the characteristics and number of surveyed enterprises that produce renewable energies in Ninh Thuận is as follows: 14 enterprises including 4 wind power enterprises (capacity from 50-150MW) and 10 solar power production enterprises with a capacity of (30-450MW). The total number of employees in 14 enterprises are 275 people, including 48 female employees (17%).

The number of officials and employees participating in the survey is 50 people (25 employees from wind power enterprises and 25 solar power enterprises) with the following structure:

- 6 people are female employees (accounting for 12%); 44 people are male (88%) ;

- 43 people are from Kinh ethnic group; 7 are from other ethnic groups account (14%).In Vietnam, the Kinh ethnic group is the largest among the 54 ethnic groups in Vietnam. They primarily reside in lowland areas, which offer favorable conditions for socio-economic development. The Kinh account for approximately 85.3% of the population (Population and Housing Census 2019 -GSO), making them the dominant labor force. Other ethnic groups are considered ethnic minorities.

- 27 people are local, 10 are from neighboring provinces, and 13 are from other provinces or cities.

- 62% of employees (31 people) have university or post-university-level qualifications, followed by 16 with college-level and 3 with intermediate-level qualifications. Common fields include Industrial Electrical Engineering, Electrical and Electronic Engineering, Industrial Electronics, Computer Engineering, and others such as Nuclear Power Engineering, Software Engineering, Construction, Finance, and Accounting.

2.2. Survey of teachers and students of vocational school

The research team conducted a survey at Ninh Thuận Vocational College in 2 forms: Group discussion with 10 vocational teachers and semi-structured questionnaire interviews with students. Due to time constraints, interviews with graduates are conducted online. The total number of student survey samples is 153 people, of which 100 students are studying at the school and 53 students have graduated from school.

Table 2. Characteristics of the students of vocational school sample

	Students who are studying		Graduates	
	Amount	Rate (%)	Amount	Rate (%)
1. Gender				
Male	100	100	51	96.2
Female	-	-	2	3.8
2. Training level				
Intermediate	23	23	12	22.6
College	77	77	41	77.4
3. Training disciplines				
Electricity	85	85	33	62.3
Electronics	15	15	20	37.7
Sum	100	100	53	100

2.3. Survey of Households

The surveyed households are all in Phuoc Minh commune, located in the south of Thuan Nam district, Ninh Thuận province, with an area of 77.67 km², the population in 2019 is 3,750 people, the population density is 48 people/km². This is an area with many active wind power projects. The total number of household representatives surveyed was 83 people.

Table 3. Characteristics of the household representative survey form

	Amount	Rate (%)
1. Gender		
Male	38	45.8
Female	45	54.2
2. Age Group		
18-24	3	3.6
25-34	17	20.5
35-44	26	31.3
45-54	15	18.1
55+	22	26.5
3. Technical qualifications		
No degree	61	73.5
Primary	7	8.4
Intermediate/College	11	13.3
University or higher	4	4.8

3. Results

3.1. Overview of current status and policies on renewable energy development and human resource training in Ninh Thuận

By the end of August 2024, in Ninh Thuận there are 57 projects have been invested and put into commercial operation (COD) with power sources (solar power, wind power, hydropower) with a total capacity of 3,749,942 MW, of which renewable power sources account for over 90%.

Table 4. Ninh Thuận energy sources by type of production

BTI	Type	Number of Projects	Capacity (MW)	Rate (%)
1	Hydroelectric	11	329.5	8.79
2	Onshore wind power	11	667.25	17.79
3	Concentrated Solar Power	35	2.466.792	65.78
4	Rooftop solar power		286.4	7.64
	Total	57	3749.942	100

Source: Department of Industry and Trade of Ninh Thuận province (9/2024).

- According to the Ninh Thuận Provincial People's Committee, the GRDP for the first quarter of 2024 is estimated to reach 5,812 trillion VND, an increase of 8.26% compared to the same period last year, and ranking 10th in the country. In this, the breakthrough in renewable energy continues to be effective, contributing 2.84% to the province's GRDP. Revenue from renewable energy (RE) has contributed over VND 5,284 billion to the provincial budget over the past five years (2018-2022). In 2023 alone, RE is expected to contribute VND 1,031 billion out of a total of VND 3,915 billion, accounting for 26% of the province's total budget revenue. For the first quarter of 2024, it is estimated that RE will contribute VND 279 billion out of VND 1,271 billion, representing 22% of the total provincial budget revenue.

- Renewable has created jobs for about 4,150 laborers, accounting for 1.8% of labor demand in 4 key economic sectors of the province.

- Contribution to national energy security: Renewable energy projects have completed the national grid, the province's total electricity output in 2023 has reached 7.8 billion kWh, accounting for 20.57% of the country's total renewable energy generation (37.922 billion Kwh).

- Ninh Thuận priority is to convert unproductive or arid land, unsuitable for traditional farming due to water scarcity or poor soil quality, into spaces for renewable energy infrastructure, like solar panels or wind turbines. By installing renewable energy systems, these projects make efficient use of land without directly competing with other land uses, such as agriculture. This approach has significantly improved land use efficiency, particularly in arid, deserted, or inefficient agricultural areas. As a result, the annual production value of these lands in Ninh Thuận has increased from about 10 million VND per hectare per year to approximately 3.84 billion VND per hectare per year when converted

to solar power generation.

- *Review policy on Renewable Energy Development in Ninh Thuận*

Ninh Thuận still has a lot of potential for renewable energy development in the future, but it is necessary to combine the available potential with local development support policies. As the renewable energy industry develops, it will promote investment opportunities while improving infrastructure and a more dynamic business environment. In the future, Ninh Thuận will develop new types of renewable energy such as offshore wind power.

- *Regarding investment incentive policies:* Ninh Thuận province has been applying investment policies in the province in the direction of ensuring the best benefits, the most convenient and simplest administrative procedures for investors with investment projects in the province. Accordingly, in accordance with the Law on Investment, the Law on Land, the Law on Enterprise Income Tax and the Law on Import-Export Tax, the highest preferential rate in the State's regulatory framework is applied for land lease, land grant, corporate income tax and import-export tax (see Box 1).

All districts of the province in areas with extremely difficult socio-economic conditions are entitled to the highest investment incentive policy framework according to the investment area in accordance with the provisions of the Law on Investment 2020 and Decree No. 31/2021/NDCP dated March 26, 2021, of the Government detailing and guiding the implementation of specific provisions of the Law on Investment.

The electricity purchase pricing mechanism in Vietnam has also seen fluctuations that significantly impact business performance and investment decisions. Notably, the Feed-in Tariff (FIT) mechanism for wind power was introduced in 2011, later extended to waste-to-energy in 2014, and to solar power in 2017 and 2020. As a result, renewable energy (wind and solar) witnessed rapid growth, increasing from an insignificant share in 2018 to accounting for 27% of the country's total installed power capacity by 2021. However, from 2021 onwards, capacity expansion slowed significantly as the FIT mechanisms expired.

In the context of adjusted (reduced) electricity purchase prices, the appeal of renewable energy projects to investors has somewhat declined compared to previous years.[2]Additionally, some legal provisions related to investment in this sector remain unclear. Specifically, at the time of the survey in September 2024, when the new solar power price framework had not yet been issued—and there was a proposal to set the rooftop solar purchase price at zero VND (although this was later revised)—company representatives expressed hesitation in making investment decisions in this area. Furthermore, the pricing in

[2] On January 7, 2023, the Ministry of Industry and Trade (MOIT) issued Decision No. 21/QĐ-BCT, which set the price framework for transitional solar and wind power projects; On april 10, 2025, the MOIT issued a decision approving the electricity price framework applicable to solar power plants

Vietnamese Dong (VND), while investors borrow in USD and import equipment, presents financial risks due to potential exchange rate fluctuations.

Box 1: Support Mechanisms for the Development of Wind Power Projects in Vietnam
Article 12: Incentives on Investment Capital, Taxes, and Fees

1. **Mobilization of Investment Capital:**
   a) Investors are permitted to mobilize capital through legally recognized forms from both domestic and international organizations and individuals to invest in wind power projects.
   b) Wind power projects are entitled to incentives under current regulations on state investment credit.
2. **Import Tax:**
   Wind power projects are exempt from import tax for goods imported to form fixed assets of the project, as well as for imported raw materials, supplies, and semi-finished products that cannot be produced domestically and are imported to serve the project's production needs, in accordance with the Law on Export and Import Duties and other current tax regulations.
3. **Corporate Income Tax:**
   Corporate income tax rates and exemptions or reductions for wind power projects are applied as for projects in sectors eligible for special investment incentives, as specified in the Law on Investment, the Law on Corporate Income Tax, and their guiding documents.

Article 13: Incentives on Land and Infrastructure

1. Wind power projects and related infrastructure, such as transmission lines and substations connecting to the national grid, are eligible for exemptions or reductions in land use fees and land rent, as per the regulations applicable to specially incentivized investment sectors.
2. Based on approved planning by competent authorities, provincial People's Committees are responsible for allocating land to investors for implementing wind power projects. Compensation, support, and site clearance must follow current land legislation.

Source: *Excerpted from the* Support Mechanisms for the Development of Wind Power Projects in Vietnam*, according to Consolidated Document No. 05/VBHN-BCT dated August 1, 2019, issued by the Ministry of Industry and Trade*

Therefore, to continue attracting both domestic and international investors, Vietnam's renewable energy policy and legal framework should be regularly reviewed, improved, and updated to keep pace with rapid changes in practice. Establishing a stable, transparent, and

appealing incentive mechanism will play a crucial role in promoting the sustainable development of the renewable energy sector in Vietnam.

- *Regarding development direction*: In the next period, Ninh Thuận Province still determines that energy and renewable energy are a breakthrough stage because the development potential of this industry is large and will certainly continue to make many contributions to the overall growth of the province in the coming time. Focus on exploiting the potentials and advantages of natural conditions of sunshine and wind to develop solar power, coastal wind power, offshore wind power, LNG power, new energy sources (hydrogen, tides, biomass, etc.) and especially hydropower storage (Currently, the province is simultaneously implementing 02 hydropower projects in Phuoc Hoa and Bac Ai with a total capacity of about 2,400 MW).

Box 2: Information on energy development projects according to the planning of Ninh Thuận province in the period of 2021 - 2030

At the Conference to announce the planning of Ninh Thuận province for the period of 2021 - 2030, with a vision to 2050 and investment promotion, there were 63 projects with a total expected investment of over VND 120,000 billion, including 2 renewable energy projects that received investment registration certificates, namely Phuoc Huu Wind Power Plant of Ha Do Group and Vietnam Power Wind Power Project No. 1 of Palatial Global Inc (with an estimated capital of about 1700 billion VND per project) and 4 energy projects were also awarded investment registration memorandums including the Green Hydrogen Research and Development Project of Trung Nam Construction Investment Joint Stock Company; T&T Group's Offshore Wind Power Project; Tri Hai Wind Power Plant Project of Bim Group; Dam Nai 3 and Dam Nai 4 wind power plant projects of TSV Joint Stock Company and The Blue Circle Co., Ltd. In addition, there are 2 projects in the field of Logistic, Structural steel and Industrial Salt including: the Project of Wind Power Equipment Factory and Steel Structure Products of Dai Dung Commercial Construction Mechanical Joint Stock Company (The Dai Dung–Ca Na Port Project at the Ca Na General Port Area and the Ninh Thuan High-Tech Mechanical Factory Project); Green technology and post-salt chemical complex project of Bim Group Joint Stock Company.

On November 10, 2023, the Prime Minister signed Decision 1319/QD-Ttg approving the Ninh Thuận Provincial Planning for the period 2021 – 2030, with a vision to 2050, which determines the development direction of the energy and renewable energy industry as one of the most important economic sectors of the province, stating the following objectives:

- Striving to 2030, energy and renewable energy will account for about 12% of the province's GRDP, covering 7.3% of job demand in the province. Focus on exploiting the potentials and advantages of natural conditions of sunshine and wind to develop solar power, coastal wind power, offshore wind power, LNG power, storage hydropower, new energy sources (hydrogen, tides, biomass, etc.).

- Developing green hydrogen energy sources from the use of self-consumption energy, on-site renewable energy towards a green industry in line with Vietnam's commitment at COP26.

The plan also sets out one of the 4 development breakthroughs: "Creating a breakthrough in the development of human resources, especially high-quality human resources, especially for important industries such as energy, renewable energy; high-quality tourism; specific agriculture, applying high technology in association with the processing industry and other industries to meet the requirements of fast and sustainable socio-economic development".

3.2. Labor situation in the renewable energy industry in Ninh Thuận

Between 2018 and 2020, solar and wind power projects in their construction phase rapidly attracted many unskilled workers. However, since 2021, as these projects have been put into operation, each company now only hires about 3 to 5 highly skilled workers for power management and operations. Therefore, solar and wind power companies and projects have entered stable operation, there is no longer a need to recruit many local unskilled workers. According to the report from the Ninh Thuận DOLISA, there are currently over 1,100 workers in 57 renewable energy plants and for survey's results, there are 306 employees are currently working in 15 companies in the wind and solar power sector, with an average of about 20 workers per company. These businesses have not yet determined their recruitment needs in the near future. .[3]

3.2.1. Labor recruitment

All surveyed enterprises said that they do not discriminate in recruiting job positions for local workers (Ninh Thuận province) with workers from other provinces and cities. Local workers have a little more "advantage" in terms of geographical distance, so they are considered to be able to stick with the business for a longer time. However, the representative of the business said that the recruitment decision is mainly based on the needs and results of the competency assessment of the candidates. The salary and compensation structures implemented by enterprises are relatively competitive compared

[3] Between 2021 and the first 9 months of 2024, the Ninh Thuan Employment Service Center has introduced new jobs for 62,863 labour. Source: Ninh Thuan DOLISA (9/2024).

to the average productivity in Ninh Thuận in 2024[4]. As a result, these businesses are able to attract and retain workers from other provinces and cities. Consequently, current managerial and engineering positions, requiring high-level technical qualifications, are mainly filled by individuals from outside the local area. Local workers who do not have a technical qualification are often recruited, doing simple jobs such as security, cleaning offices and cleaning solar panels and mowing grass at solar power farms.

The requirements for employees in terms of age are usually between 23 and 35 years old. In terms of qualifications, for technical positions, it is usually university and college level (technology engineers with expertise suitable for vacancies). Businesses also focus on finding experienced workers with soft skills to perform their jobs effectively, minimizing the time to get used to work at the enterprise.

Businesses often post their own recruitment information on the Company's website or send information to other recruitment sites. Some businesses said that they have contacted the Job Placement Center of the provincial Department of Labor, Invalids and Social Affairs, but the format posted on the website and social networking sites Zalo and Facebook is considered by businesses to be the most effective and accessible to workers.

Currently, businesses have been operating steadily, there are not many fluctuations in personnel, so the demand for recruitment is not large. Enterprises usually only recruit 1-2 more employees as a backup in case there are employees who are about to quit their jobs (with advance notice or unexpected leave). In the short term, from now (Q4 2024) to 2025-2026, most businesses also do not plan to build new wind and solar power farms, so the demand for labor recruitment in this field in Ninh Thuận will not be large. However, after 2026 according to the development plan, Ninh Thuận will see the implementation of several wind power projects (total capacity of 554MW) and solar power (224MW), there will be a need to recruit new workers (see JEDI estimates results in Section 3.5).

Some difficulties in recruiting workers, especially skilled workers

Some businesses said that at the same time they had difficulties in recruiting technical engineers for the operation and maintenance of wind turbines because the number of engineers with high professional qualifications in this field was not many. Therefore, large enterprises often have to recruit 1-2 more backup positions for these key technical positions.

Currently, high-quality human resources are still lacking and enterprises still have to hire international experts to handle complex technical problems, mainly in the field of wind power. In other words, Vietnamese engineers have not really mastered techniques and

[4] According to GSO, Ninh Thuân productivity was 141 million VND equivalent to USD 5800 and the preliminary statistics for 2024, Ninh Thuan's per capita GRDP reached 98.2 million VND per person per year, equivalent to approximately USD 4,000.

technology. This is partly due to training and partly because equipment suppliers do not want to reveal technological know-how. Therefore, many times there are failures that are not too big or complicated, but businesses still have to wait for technological support from international experts. It is difficult to find local experts and engineers who can undertake the inspection and repair of problems related to Core technology and the know-how of suppliers.

Another challenge is recruitment is due to employees who quit or change jobs but the business has not found a replacement also creates significant operational difficulties.

Furthermore, many workers transition to new positions after gaining experience, seeking environments with greater development opportunity. This highlights the need in energy enterprises to strengthen teamwork skills within their workforce.

3.2.2. Using of labor

The survey results show that the fixed personnel in small-scale wind and solar power plants from 45-50MW is also quite modest, generally ranging from 15-25 employees. The total number of employees in 14 surveyed enterprises are currently 275 people (including 48 women). The point to clarify is that these workers are directly recruited by the enterprise, and are employed under formal labor contracts, constituting the "core" workforce – responsible for the tasks of management, supervision and regular operation at the enterprise. Technology engineers and technicians are mainly responsible for supervising the operation of the power supply system as well as handling some small and simple failures.

In order to increase the efficiency of management, businesses now hire external companies to provide services to “support” activities in terms of security, security and office cleaning services. Solar power businesses also hire companies that specialize in cleaning panels, mowing lawns and doing repair and cleaning jobs for solar farms. These jobs only need to be carried out 1-2 times a month, but each deployment needs dozens of workers to do at the same time. Therefore, it will be much more effective to hire a company specializing in providing services instead of the enterprise doing it itself.

At the same time, companies outsource professional services, with aspects like maintenance, troubleshooting, and major repairs that are undertaken by companies specialized in technical service provision or by equipment suppliers. For example, Trung Nam Group chose Tien Nam Company[5] as a provider of operation management, construction, installation, maintenance and repair services for the entire wind and solar power system in the group's enterprises in all provinces and cities. This is the main reason, so the number of employees in both wind and solar power enterprises are not large.

[5] Refer to information about Tien Nam company at TIEN NAM TECHNICAL SERVICES.

Therefore, the number of official employees does not reflect all "personnel" who are actually doing jobs in enterprises. According to the estimate of the business representative, if not outsourced, the number of "personnel" to take on all jobs must be at least 5 or even 10 times higher than the number of existing workers (especially in solar power generation sites because there are many simple job positions that are outsourced such as cleaning solar cells, mowing the lawn, etc.).

3.2.3. Labor and insurance contracts

The survey results show that almost all surveyed employees have labor contracts with enterprises with 42% of which are indefinite-term contracts; 52% are fixed-term contracts. Out of 50 employees surveyed, 47 are enrolled in compulsory insurance. Among the remaining three, all are engaged in seasonal employment, except for one who has a relatively more stable job. Of these three, one is not enrolled in any form of insurance, while the other two participate in voluntary insurance schemes.

3.2.4. Working time of employees

The average working time according to the survey data is 45.04 hours/week and there is not much difference between wind power enterprises (45.2 hours/week) and solar power is 44.88 hours/week. In general, the workers are about 44 hours a week, including weekdays and 1 Saturday morning.

3.2.5. Salary of employees

Calculated from the survey data, the average salary of employees in renewable energy enterprises are 14,066,000 VND (equivalent to 580 USD/month)[6] and this value has been tested (using T-Test) to ensure the statistical significance ($\alpha = 0.05$) to examine wage levels in the wind and solar power sectors. The salary of employees of wind power enterprises are 14,320,000 VND (590 USD/month), slightly higher than that of solar power enterprises of 13,812,000 VND (570 USD/month), however, when testing this difference value, it does not reach the statistical significance level.

Note that this salary does not include lunch support, allowances and other bonuses (13th and 14th months of salary – quarterly bonuses, bonuses according to output, etc.), so the average monthly actual income of employees will be higher at 20%-30% (at 750-900 USD/month).

[6] Currency converted at the exchange rate of the State Bank of Vietnam on 29/11/2024: 1 USD = 24,251VND.

- Remuneration regime

Most businesses support employees with lunch money (at the level of 35,000-40,000 VND/meal/day) and extra meals if working on duty or overtime. Depending on the job position/position, the company may pay additional travel and telephone allowances. For out-of-province employees living far from home, the companies have a regime for employees to arrange leave to visit home for a long time or provide additional support for travel expenses. In addition, some companies also arrange accommodation for officials and employees to stay.

In addition to participating in social insurance, health insurance, and full unemployment insurance, some companies also support health insurance costs (for example, Bao Viet Wind Power Company) so that employees can receive health care support.

Other benefits that encourage morale and strengthen employee connections are also implemented by many companies such as: giving a birthday gift of 300,000 VND/person (12 USD/person) and 01 day off on birthday with full salary. Programs for female workers: giving gifts on International Women's Day (March 8), Vietnamese Women's Day (October 20) (organizing cooking contests for female workers, games, cultural exchanges); giving gifts to the children of employees on International Children's Day 1/6, the Mid-Autumn Festival among others, or rewards for holidays and Tet; giving gifts to encourage their children, visiting and encouraging them when they are sick.

Every year, some businesses also organize tourism programs, team building and send officials and employees to participate in sports conferences, sports tournaments and other movement competitions launched by the Group or localities (such as tree planting holidays, humanitarian blood donation).

3.2.6. Working environment and conditions:

- Regarding the working environment and conditions at the enterprises: Currently, because the employees mainly work at the company's office, not on site, the majority of 80% of employees rate the working environment at a good and comfortable level, the rest are mainly considered at a normal and acceptable level (one opinion). Therefore, temperature and airiness issues are not affected by the weather outside. The company's offices near some wind power poles are also affected by noise, according to the assessment, this level is not significant because the offices have also been installed with soundproof doors.

As mentioned, there are many work tasks that have been applied with more modern machinery and equipment, so it has also helped to reduce the level of "hard work and heavy" of workers. For example, in the past, workers had to directly wipe the solar panels, now workers only need to control the robot to do it.

In addition, according to the assessment of enterprises, some job positions also contain "heavy and dangerous" elements, such as engineers and workers having to inspect and repair operating high-voltage electrical equipment; technical workers on duty, inspecting at locations at 22/220kV substations and other related electrical equipment in the solar power plant, including the electrical system connected to energy panels.

- The operator of the 110kV substation has to work under the condition of having to climb and carry repair equipment, so there are heavy and dangerous factors.

- Electrical system repair staff: There are risks related to high voltage and electricity leakage if technical safety measures are not fully implemented.

Wind turbines operate using high-voltage systems to transmit energy, so the inspection and maintenance of electrical components—such as converters, controllers, and wiring—carry potential risks of electric shock, fire, and explosion incidents if safety procedures are not properly followed. As the renewable energy sector increasingly integrates advanced technologies, occupational safety and health (OSH) measures must evolve accordingly to ensure worker protection and operational reliability. This highlights the need for continuous training, updated safety protocols, and robust regulatory frameworks that can keep pace with technological advancements in the RE industry.(as detailed by the ILO Occupational Safety and Health Management Systems).[7]

For the maintenance of lifting systems, especially in substations or wind turbine areas, workers must work in environments with high gravity and equipment that can cause serious injury if care is not taken. These systems when malfunctioning may require engineers to handle them in unfavorable weather conditions or in tight spaces.

3.3. Human resources training for the renewable energy industry in Ninh Thuận

3.3.1. Training at vocational institutions

Ninh Thuận currently has 9 vocational education institutions with 363 working staff and teachers (of which 01 vocational college; 02 intermediate schools; 06 vocational education centers and other institutions) participating in vocational training with a training scale of over 9,000 people/year.8

[7] Available at : https://www.ilo.org/topics/safety-and-health-work/occupational-safety-and-health-management-systems [Accessed July 2925].

[8] Source: Department of Labor, Invalids and Social affairs of Ninh Thuan province (9/2024).

The development of human resources for the energy industry is given attention. In the period of 2022-2023, the whole province has provided vocational training to meet the requirements of enterprises in the energy sector of about 438 people (319 people in industrial electricity, 66 people in mechatronics, 32 people in industrial electronics, 21 people in welding).

Advisory Subcommittees of the Provincial Council for Vocational Education in the Energy and Tourism sectors have been established, for the task of organizing activities to advise on contents related to the development of human resources in key economic sectors to help focus on directing, developing vocational education human resources, connecting the participation of all parties in vocational education activities, with the full participation of relevant organizations and individuals; conducting a review of vocational education institutions in the province.

Ninh Thuận Vocational College is licensed by the Ministry of Home Affairs (or formely Ministry of Labor, Invalids and Social Affairs, MOLISA) to operate 17 training disciplines, selected to invest in 05 key disciplines/professions according to Decision No.1769/QD-BLDTBXH dated 25/11/2019 on approving key disciplines and professions; the university is allowed to select key majors and professions in the period of 2016-2020 and orientation to 2025, with 5 key professions and 3 specific levels including: 01 profession at the International level; 02 occupations at the ASEAN regional level; 02 occupations at the national level.

Training program

Currently, the content of the training program related to the renewable energy industry includes professional knowledge (Basic knowledge of industrial electricity, industrial electronics and automation; Operating industrial electrical equipment systems; Overview of renewable energy systems), Vocational skills (Installation of solar power systems; Operating the solar power system; Operating wind power plants; Installation, connection and measurement, testing of basic renewable energy systems), other skills (Communication at work, reporting,...). In theory, the renewable energy training program still has few training schools, so there has been no sharing and contribution together to jointly build a suitable training program. In practice, students have visited and experienced renewable energy systems such as: wind energy, solar energy in Hai Phong, Binh Duong, Vung Tau, Thuan Bac wind power, renewable energy enterprises in Ninh Thuận. In general, according to the opinions of the teachers participating in the survey, the training program content meets about 50-70% of the requirements of the renewable energy companies.

The contents of the training program that need to be improved and supplemented include:

- In-depth theoretical knowledge integrated with advanced practical skills in the following fields: Wind Turbine Maintenance; Battery and Energy Storage Systems ; Electrical System such as: High-voltage system handling ;

- Update a number of hydraulics, connect to the renewable energy power grid, such as: Inverter and transformer configuration : Grid interconnection procedures.

- The content of maintenance and maintenance of wind and solar power systems has not been fostered for teachers, so it has not been taught to learners in the program.

- Increase the duration of wind power training for students in industrial power and industrial electronics.

- It is necessary to bring students to internships at enterprises, improve professional work habits, working environment and industrial workplace manners.

To implement the above recommendations, some solutions and mechanisms that can be applied are as follows:

- Local authorities should encourage training institutions to collaborate with industry partners to establish Association[9] RE occupation, which serve the role of evaluating and advising on training programs. These councils support schools in developing and regularly updating curricula to keep pace with the advancements and R&D in the renewable energy sector.

- Support for RE Training

Organize workshops and seminars to keep instructors updated on maintenance techniques and new technologies in wind, solar, and hydraulics systems.

Incorporate hands-on learning through updated simulation software, virtual labs, and practical fieldwork to enhance students' technical skills.

Increase practical experience by facilitating internships with renewable energy companies to develop students' technical abilities, work habits, and professionalism.

- Vocational training institutes offer "specialized" training paths: Develop specialized tracks that allow students link their relevant training program to specific renewable energy program, such as solar, wind or hydropower. This will enable students to gain expert-level knowledge and expertise in their chosen field, ensuring they are highly skilled and ready for the industry.

Vocational teachers also need to be trained to supplement their professional knowledge on renewable energy. The training and capacity-building program for vocational teachers can be structured into three main components:

(i) Advanced skills in maintenance and operation of renewable energy systems: Participants receive in-depth training in techniques related to the maintenance, control, and

[9] The association is a voluntary, non-profit organization composed of individuals and organizations sharing the same profession or interests. Its purpose is to unite and connect its members, operating regularly under the principles of Cooperation and Development.

monitoring of renewable energy (RE) systems. This includes procedures for inspection, routine maintenance, and troubleshooting in systems such as lighting, water pumping, ventilation, and HVAC (heating, ventilation, and air conditioning), with the goal of ensuring long-term operational efficiency and safety of RE equipment.

(ii) Management capacity and innovative solutions in renewable energy management: The program introduces new technologies and innovative solutions for applying renewable energy in industrial production contexts. This includes Energy Management Systems (EMS), along with methods and tools for analyzing and assessing energy consumption at production facilities, thereby optimizing energy efficiency.

(iii) Research and development (R&D) aimed at improving energy extraction efficiency: The curriculum is updated with emerging technology trends such as green hydrogen production, offshore wind power, and other advanced energy solutions tailored to the Vietnamese context. The program also covers supporting areas such as logistics for offshore wind development and related technical occupations, contributing to the development of a sustainable renewable energy ecosystem.

The results of the survey of graduating students (table below) showed that the professional and technical knowledge was assessed to be suitable for the job requirements with 78.5% rated at the levels of Very Suitable/Suitable/Partially Suitable. The majority (6/9) of the assessors who rated at the level of Inappropriate/Less suitable reported the reason that the work they were doing was not related to the trained skills. Overall evaluation of the school's training quality, 73.6% of graduates rated Very Good/Good/Relatively Good, only 1.9% rated Not Good (the remaining 24.5% did not give an opinion).

Table 5. Graduate students' assessment of the suitability of trained skills to job requirements

Degree	Number of comments	Rate (%)
Not suitable	2	4.8
Less suitable	7	16.7
Partial Fit	14	33.3
Consistent	15	35.7
Very suitable	4	9.5
Sum	42	100

Source: Survey of the research team (9/2024).

The assessment of student skills level: teacher perspective and graduate students' feedback

According to the opinion of teachers at vocational schools, after studying at the school, students meet the skills and working styles, meet over 50% to 70% of the company's work needs and have the ability to update new knowledge right at the enterprise. For example, students who graduated and were recruited by companies such as Trung Nam Solar Power Plant and Thuan Nam 19 Solar Power Plant were able to meet the basic requirements of the enterprises. Upon starting their jobs, all employees participated in several training sessions and orientations covering general regulations as well as familiarization with the working environment and corporate culture. When working in renewable energy (RE) companies, graduates from general electrical training programs often face a significant **skill gap** compared to the actual requirements of the job. Specifically, they lack the ability to operate specialized equipment and software such as high-capacity inverters, charge controllers, solar radiation meters, wind sensors, as well as Energy Management Systems (EMS) and SCADA (Supervisory Control and Data Acquisition) interfaces. In addition, they have limited experience and skills in performing technical tasks in demanding work environments — for example, working at heights in wind power systems or operating in high-radiation environments in solar power plants.

On the side of enterprises, the majority of enterprises said that the employees they are working to meet the requirements of enterprises (at a good level – completely satisfied). Workers' assessments are also similar to theoretical knowledge which receives slightly more positive ratings than practical skills and higher than soft skills assessments. Depending on the job position, companies may assign skilled workers or engineers to provide on-the-job guidance and mentoring. This learning process in the workplace helps students further develop their knowledge, skills, and adaptability to the working environment and the specific characteristics of each enterprise In addition, skilled workers are not yet proficient and professional English is not good. According to the assessment of enterprises, technical workers often have limited ability to use English. Students often struggle with technical English, particularly in reading and understanding technical documents or communicating with foreign experts. Another limitation is the lack of initiative in learning and the ability to quickly adapt to new technologies — both of which are crucial in the fast-evolving renewable energy industry.

On the side of working graduates, they self-assess their ability to meet the requirements of the job quite well in terms of professional knowledge, practice, and soft skills with over 80% of students self-assessing that they meet at an average level or above, and over 50% self-assessment that they meet well/very well.

Table 6. Graduates' assessment of their ability to meet job requirements (%)

Degree	Expertise	Practice vocational skills	Soft Skills
1. Not related to the field of study/Not meeting	9.3	11.6	9.3
2. Partial Response	9.3	7.0	4.7
3. Moderate responsiveness	30.2	23.3	23.3
4. Good response	39.5	46.5	44.2
5. Very responsive	11.6	11.63	18.6
Total	100	100	100

Source: Survey of the research team (9/2024).

Job prospects for apprenticeships

According to teachers at Ninh Thuận Vocational College (NTVC), not only Ninh Thuận Province but also many other localities are experiencing strong growth in the renewable energy sector. As a result, students who study related fields such as industrial electricity or industrial electronics can easily find employment in other provinces and cities. Their salaries may even be higher, accompanied by attractive benefits. . Currently, the GIZ project has supported the establishment of a Renewable Energy Training Center and the implementation of a dual training model, which allows students to gain hands-on experience at enterprises while still in school. This model not only provides practical learning opportunities but also opens doors to employment immediately after graduation. According to school representatives, the dual training model has resulted in an employment rate of over 85% among graduates. Notably, some students have already begun working at wind and solar power plants, taking on key roles in operation and maintenance. In summary, job opportunities for students in technical vocational training are quite favorable.

In addition to training activities, NTVC also has programs and activities to support students to find jobs after graduation such as:

- Organizing annual job fairs;

- Connect with businesses for interns to create opportunities to be recruited at enterprises;

- Directly invite enterprises to the recruitment school on the day of graduation issuance;

- Introduce jobs to students who have graduated at the university or introduce them by phone to students to understand recruitment information;

- Connect with job promotion intermediaries for students such as employment service centers, labor export companies.

The survey of post-graduation students showed that 85% of students had/had been employed, of which nearly 30% had a job before graduation, 46.7% had a job within 3 months and 23.3% had a job after 3 months of graduating. 27.3% of those who are working are active in the field of renewable energy (wind power, solar power).

3.3.2. Training at the enterprise

90% of the surveyed employees said that they had been trained at the enterprise with a period of 2 weeks to 2 months with professional content and knowledge directly related to the operation of the enterprise's power production and transmission system. Knowledge and regulations on occupational safety, fire prevention and fighting are also focused on training to ensure that all employees have a full understanding to comply and comply with the processes and regulations that the enterprise develops.

- *Solutions to solve the skills shortages of employees:*

+ Enterprises train themselves or hire external training units to retrain and improve their professional qualifications and knowledge to meet work demands;

+ Coordinate with equipment suppliers to organize in-depth training on the design and installation of power supply and transmission systems;

+ Create conditions and provide financial support for laborers to study certificates to improve their qualifications such as: certificate of shift leader, certificate of operation and repair of 110kV transmission lines;

+ Periodically organize training, visit and study of neighboring projects, share professional knowhow;

+ Increase salaries when employees complete their work well, add more benefits for relatives, families of key officials and experts.

Most enterprises said that they have not had any cooperation activities with universities and training institutions on training programs in the renewable energy industry, partly because the recruitment demand of enterprises are not large and the training institutions currently do not have specialized professions suitable for renewable energy enterprises.

Currently, 3 out of 10 enterprises interviewed said that they have connected with Ninh Thuận Vocational College to discuss training programs and content for some vocational skills that enterprises think are needed in the future, but there is currently no specific training program implemented.

3.4. Impact of renewable energy industry development on local household life

The development of the renewable energy industry in Ninh Thuận is one of the driving forces for the province's economic development. At the household level, the expected benefits include improved jobs and people's incomes. Assessments from households show that households have partially noticed a significant improvement in the local economy, new jobs, workers' incomes as well as the environmental landscape. The most obvious bright spot is that the power supply is more stable and complete.

Table 7. Response rate on positive impact on locality (%)

	Impact Level		
	No change	Improve a part	Improve distinct
1. Better development of the local economy	51.8	39.8	8.4
2. Creating many new jobs for local workers	47	47	6
3. Workers with higher incomes	50.6	43.4	6
4. Improved environmental landscape	54.2	39.8	6
5. Stable and complete power supply	44.6	31.3	24.1

Source: Survey of the research team (9/2024).

Survey data shows that in the area with many wind power projects (commune level), not many local workers are participating. Only 7 out of 83 households interviewed had a family member working in this field, and these jobs were rated as stable, with higher incomes than other family members' jobs.

Table 8. People's opinions on the impact on household agriculture production

Opinion	Number of Respondents	Rate (%)
1. No influence	32	38.55
2. Influential but not significant	27	32.53
3. Big influence	24	28.92
	83	100

Source: Survey of the research team (9/2024).

In addition to the positive impacts, the negative impact on local people remain significant, especially related to livelihoods (lack of land for agricultural production, noise-making turbines, higher temperature,etc.).

Although wind and solar power projects bring significant benefits in terms of economic development and job creation, some households living near project areas are facing certain livelihood-related challenges. Specifically, local people's agricultural land has been reduced to make way for energy infrastructure; some crops and livestock have been affected by changes in the natural environment. In addition, the shift in land use purposes has forced many households to change their traditional livelihoods, which have long been tied to farming and animal husbandry. About 28.9% of the respondents said that the renewable energy industry has a big impact on the production and business of local people. These changes call for timely and appropriate support to help affected communities adapt and stabilize their lives.

Table 9. Rate of responses on negative household impacts (%)

Action	**Level (%)**		
	Unaffected	Less influence	Influence distinct
1. Households whose land is recovered or lacks land for agricultural production	22.9	42.2	34.9
2. Noise-making wind turbines, ...	14.6	56.1	29.3
3. Affecting the habitat of species	16.9	49.4	33.7
4. Make the area temperature rise higher (solar panels get heat and emit high heat to the surroundings)	15.7	43.4	40.9

Source: Survey of the research team (9/2024).

To overcome these conditions, the solution of households is to change occupations (work for hire), plant trees to shade the sun, use water to reduce heat, and migrate to other areas to live. The survey results show that only 16.9% of households (14 out of 83 households) want to learn a job, but these jobs are hardly related to the renewable energy industry. In addition to the fact that the majority of people who do not want to do vocational training already have suitable jobs, the major barriers to participating in vocational training are listed as not knowing which vocational training brings economic efficiency (8.5%) and limited qualifications to be eligible for vocational education (21.3%). After vocational training, the majority of learners want to be supported in finding a job (71%) and loan support (21%).

3.5. Forecast of employment in the renewable energy industry in Ninh Thuận

The renewable energy market is no longer as "attractive" as it was in the period 2017-2019, so it will not create an "explosive" development in both the number of projects and installed capacity. Instead, it is a stable development over the next 5 years. It is expected that in the period of 2026-2030 when officially approved renewable energy projects are implemented, the demand for labor in the fields of construction, transportation and operation of the power system will continue to increase. Some enterprises said that they are also preparing resources to participate in the construction of wind and solar power plants, including small hydropower plants), when there are appropriate development mechanisms and policies. In addition, according to enterprises, the strong development of energy infrastructure is expected to serve as a catalyst for the growth of other sectors in Ninh Thuận—both energy-intensive industries and sectors with high economic potential. These include high-quality tourism (with a focus on enhancing traditional offerings and developing new, climate-based tourism models), high-tech agriculture, as well as construction and other bussiness development.

Pursuant to Decision No. 262/QD-TTg, dated April 1, 2024 on Approving the plan to implement the national electricity development plan for the period 2021 - 2030, with a vision to 2050, the wind power development plan in Ninh Thuận to 2030 is 554 MW and that of solar power to 2030 is 44MW, after 2030 is 224 MW.

This study uses the JEDI model with the input of the additional generation capacity as above with the following hypothetical parameters:

Regarding the investment rate of wind power, it is calculated as 2,000,000 USD for 1 MW of electricity produced (the average cost for turbines alone is 1,300,000 USD/1 MW), the cost of operating and maintaining wind turbines is 1 - 2 US cents per kWh produced, or 42,000 - 48,000 USD per year. The average life of a wind power plant is from 25-30 years. In this study,

the current use is 25 years. The localization rate of turbine production, costs related to transportation and operation, maintenance and repair are presented in Appendix A.1.

Regarding the investment rate of solar power calculated as 1,000,000 USD for 1 MW, the cost of operation and maintenance accounts for 1-2% (in this study, it is 1.5%). According to experts, depending on the size of solar power plants/farms, operating costs can range from 10,000-30,000 USD for 1 MW. In this study, the average operating cost is $22,000 and repairs are $20,000 for 1MW of capacity per year. The localization rate of solar cell production, the costs associated with transportation and operation, maintenance, repair are presented in Appendix A.2.

The forecast results of the number of jobs corresponding to the 2 phases of (i) Construction and installation and (ii) Operation and Maintenance are as follows:

3.5.1. Forecast of employment in the wind power industry to 2030

According to the plan to develop an additional 554MW of onshore wind power (the study has consulted and calculated the average investment rate for 1 MW of wind power is 2 million USD, of which, the turbine price alone is 1.3 million and other parameters have been "localized" to suit the context of Vietnam).

During the Construction and Installation phase, it is forecasted that the number of direct jobs created is 6160 jobs as shown in Table 10 (this means that if these wind farms are built in 5 years – from 2026-2030, about 1232 jobs will be created each year for the construction and installation of wind turbines). In addition, the number of indirect jobs created in this sector is nearly 2 times higher (including jobs in industries such as equipment manufacturing, transportation, etc.) and induced jobs - jobs created by the spending of workers with direct and indirect jobs. However, these jobs are not as easy to identify as direct and indirect jobs (for example, workers of enterprises who buy goods and services will create income and jobs for sellers, etc.).

When the construction and installation process is completed, the factories will enter the Operation and Maintenance phase (Table 11), with a total capacity of 554MW forecast to create about 603 direct jobs and 350 indirect jobs in operation and maintenance. The total number of direct and indirect jobs created is 950 jobs per year, and this number of jobs will last until the end of the life cycle of the wind power plant (estimated at about 28 years). This is the difference in the "Unit of Calculation" of the 2 types of jobs in 2 periods. If converted to Employment units, the number of direct jobs in Operation and Maintenance will be 350 x 28 years = 9,800 jobs (1.5 times higher than 6160 jobs directly in Construction and Installation).

Table 10. Forecast of Jobs Created during the Construction and Installation phase of Wind Power to 2030

Type of Jobs	Number of Jobs (Single year)	Earnings*(USD/per year)	Average Earnings* (USD/1 person per month)
Direct	6,160	54831903	742
Indirect	11,281	76425775	565
Induced	34,959	178495169	425
Total	52,401	309752846	493

**Note*: Earnings are all payments made to workers, including wages and salaries. These are the employer's payroll. These do not include payments for "informal sector" labor, such as family members working on a family farm without a salary.

Table 11. Forecast of jobs created during the Operation and Maintenance phase of Wind Power to 2030

Type of Jobs	Number of Jobs (annually /ongoing)	Single year equivalent (x 15 years)	Earnings* (USD/per year)	Average Earnings* (USD/1 person per month)
Direct	603	16884	5419303	749
Indirect	350	9800	2347952	559
Induced	1,536	43008	7842795	425
Total	2,489	69692	13610050	456

**Note*: Earnings are all payments made to workers, including wages and salaries. These are the employer's payroll. These do not include payments for "informal sector" labor, such as family members working on a family farm without a salary.

3.5.2.Forecast of employment in the solar power industry to 2030

The solar power sector has an expected additional capacity of 268MW, the number of jobs created in 2 phases is forecasted by the JEDI model for the results below.

It is forecasted that by 2030, solar power farms will have a demand for 2090 direct jobs, 2277 indirect jobs, 8724 induced jobs in the construction and installation phase.

Table 12. Forecast of jobs created during the Construction and Installation phase of Solar Power to 2030

Type of Jobs	Number of Jobs (Single year)	Earnings* (USD/per year)	Average Earnings* (USD/1 person per month)
Direct	2,090	17509341	698
Indirect	2,277	15245976	558
Induced	8,724	44543420	425
Total	13,091	77298737	492

**Note*: Earnings are all payments made to workers, including wages and salaries. These are the employer's payroll. These do not include payments for "informal sector" labor, such as family members working on a family farm without a salary.

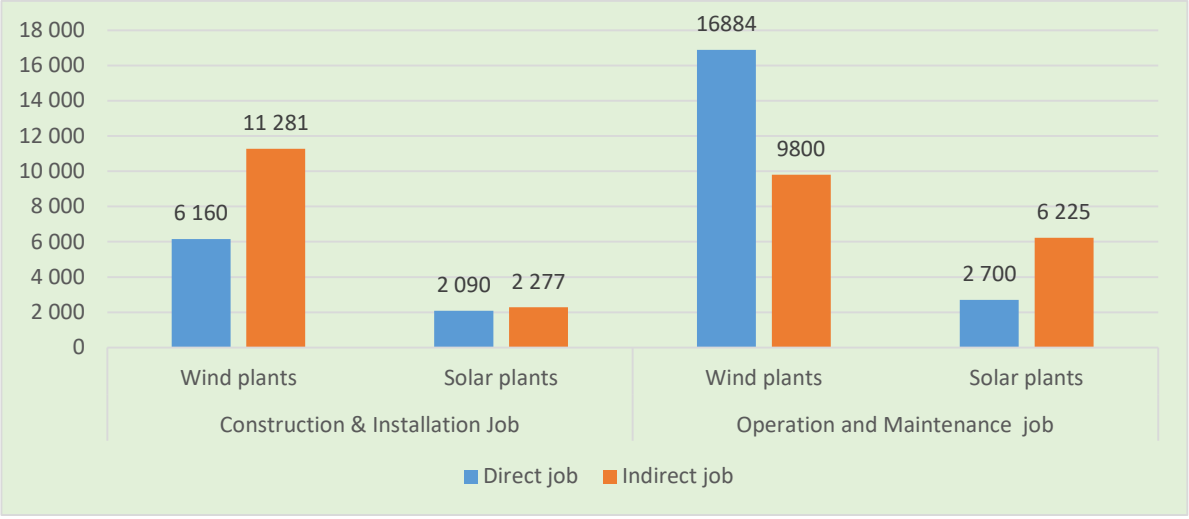
The Operation and Maintenance phase (Table 13) created 168 direct jobs, 438 indirect jobs (2.6 times more direct jobs) and 1218 derivative jobs. If the life cycle of a solar power plant is calculated at a minimum of 15 years, the number of direct jobs created is 180 x15 = 2700 jobs (higher than the number of direct jobs in the construction and installation phase).

Table 13. Forecast of jobs created during the Operation and Maintenance phase of Solar Power to 2030

Type of Jobs	Number of Jobs (annually /ongoing)	Single year equivalent (x 15 years)	Total earnings* (USD/per year)	Average earnings* (per 1 person per month)
Direct	180	2700	1738061	805
Indirect	415	6225	2789015	560
Induced	1206	18090	6156296	425
Total	1801	27015	10683372	494

**Note*: Earnings are all payments made to workers, including wages and salaries. These are the employer's payroll. These do not include payments for "informal sector" labor, such as family members working on a family farm without a salary.

Figure 1: Estimated Number of Direct and Indirect Jobs in Wind and Solar Power Plants in Ninh Thuan by 2030 (Unit: Single-Year Equivalent Jobs)



Source: Authors' own compilation

3.6. Policy implications

Economic development is associated with the development of jobs and incomes for local people

Continue to increase investment in key economic sectors of Ninh Thuận, specifically industries with strong development potential such as renewable energy, high-tech industry and seaports/logistics. This will not only create more sustainable job opportunities but also promote local economic development, create new jobs with stable income for local people, especially young workers. Strengthen the local workforce's engagement with renewable energy projects by creating targeted programs , for example, it could be relevant to discuss the feasibility for offering financial assistance or low-interest loans for local job seekers, or to provide resources for transitioning into new types of work, or supporting agricultural innovation to mitigate income loss.

Ensure welfare, safety and improve working conditions for workers

- In order to protect the interests of employees and improve the quality of work, enterprises propose to develop social security policies and adequate insurance for employees. Benefits such as health insurance, social insurance, and unemployment insurance will help employees feel secure working for a long time and stick with enterprises.
- Local state management agencies regularly supervise the implementation of labor insurance policies to ensure full insurance benefits for employees, including occupational accident insurance and health insurance to protect them in case of incidents; coordinate with enterprises to provide training courses on occupational safety, skills in preventing accidents and handling emergency situations for workers, especially in job positions with dangerous factors.
- Develop a mechanism to encourage enterprises to invest in facilities and apply modern technologies to minimize human involvement in dangerous jobs, such as the use of robots or drones in inspecting and maintaining renewable energy buildings and equipment.

Training and improving the quality of human resources for renewable energy development

In order to meet the demand for high-quality human resources, enterprises recommend upgrading local vocational training schools. At the same time, enterprises will cooperate with educational institutions and training units to provide intensive training programs, especially in sharing knowledge about new technologies. This will help solve the local labor shortage, and at the same time create a highly skilled workforce that is ready to meet the job requirements at enterprises.

- Develop policies to support training institutions to equip with modern facilities, with the foundation of practical and experimental equipment for basic and intensive training in Electrical and Electronic Engineering Technology, Control and Automation Engineering Technology, Thermal Engineering is ready to meet the requirements for training in the Renewable Energy industry.
- Train and improve the qualifications of lecturers participating in training for the Renewable Energy program are scientists with high professional capacity and foreign language proficiency; have a mechanism to support and reward teachers and experts with many research results and scientific works related to the renewable energy industry.
- Build a network of experts in the field of renewable energy and cooperate with vocational training schools, establish research institutes to develop high-quality training programs, provide practical opportunities for students and workers, ensure the training of engineers with design ability, operate and master advanced technologies related to solar power, wind power, hydropower, stored energy sources and other energy sources.
- Local authorities connect enterprises to create cooperation programs with vocational training schools and research institutes to develop intensive training programs on renewable energy; Providing incentives for technology providers when participating in training such as: providing tax incentives, financial support or incentive policies for technology providers to participate in training programs, technology transfer and skill improvement for domestic engineers.

Based on the needs of enterprises and the aspirations of employees, the present study recommends that enterprises establish mechanisms to support the training of employees with deep expertise. This includes offering specialized training courses and practical programs at production facilities and project sites, and cooperating with training institutions to design short-term programs (3–6 months) focused on practical skills. Through these efforts, employees can be equipped not only with theoretical knowledge but also with opportunities to gain hands-on experience, thereby enhancing labor productivity and work quality.

In addition, strengthen communication and management skills for employees through periodic training courses. At the same time, employees are encouraged to have a spirit of learning and be willing to take on positions outside of their trained specialization in order to develop their skills more comprehensively and contribute more to the growth of the business This not only helps employees improve skills but also create a dynamic and creative working environment.

Cooperation with enterprises in sharing knowledge and technology. Develop mechanisms and policies for sharing knowledge through technology partners, encourage providers to share part of their technology and train domestic experts, through technology transfer cooperation agreements, and protect the interests of suppliers through confidentiality

clauses. Encourage enterprises to invest in research and development (R&D) to create appropriate renewable energy solutions and technologies, helping to reduce dependence on foreign suppliers; Creating conditions for domestic engineers and experts to participate in training programs, seminars, and research in countries with a strong foundation in renewable energy so that they can actively update knowledge and new trends without having to rely entirely on technology providers.

4. Conclusions

Ninh Thuận is a province with strong potential and clear advantages for the development of renewable energy.

The planning of Ninh Thuận province for the period of 2021–2030, with a vision to 2050, determines the development direction of the energy and renewable energy industry as one of the province's most important economic sectors. It identifies one of the 4 development breakthroughs as "Creating a breakthrough in human resource development, especially high-quality human resources, especially for important industries such as energy, renewable energy; high-quality tourism; specific agriculture, applying high technology in association with the processing industry and other industries to meet the requirements of fast and sustainable socio-economic development".

Ninh Thuận province has invested in and put into commercial operation (COD) 57 projects with power sources (solar power, wind power, hydropower) with a total capacity of 3,749,942 MW, of which renewable power sources account for over 90%. Renewable energy projects have contributed over 20% of the province's annual budget revenue and accounted for over 20% of the country's total renewable energy power generation.

Ninh Thuận province has been applying investment policies in the province in the direction of ensuring the highest incentives, the best benefits, and the most convenient and simplest administrative procedures for investors with investment projects in the province. However, there are still policy barriers that need to be overcome. One of the prominent problems is that the renewable energy development planning policy is not synchronized, especially between the construction of power sources and loads, leading to imbalance and inefficiency. In addition, legal regulations related to renewable energy investment are still binding and unclear, causing investors to be concerned about legal risks. The current incentive mechanism for the development of renewable energy sources is not attractive enough, does not create favorable conditions to ensure long-term investment efficiency. Moreover, the system of policies and laws on renewable energy is incomplete and slow to adapt to rapid changes in practice, making it difficult to implement projects.

Labor demand in the renewable energy industry in Ninh Thuận has decreased for unskilled workers, recruitment is geared towards workers with high technical skills.

In the period of 2018-2020, solar and wind power projects in the construction investment stage attracted many unskilled workers. From 2021 to now, solar and wind power projects have been put into operation, each company only recruits about 3-5 highly skilled workers to do power management and operation. Once solar and wind power companies and projects have been put into stable operation, there is no need to recruit many local unskilled workers. When solar and wind power projects have entered stable operation, businesses no longer have a high demand for recruitment. However, after 2026, according to the development plan, Ninh Thuận will have several wind power projects (with a total capacity of 554MW) and solar power projects (224MW), which will lead to new labor recruitment needs.

The age range for recruited workers is from 23 to 35 years old. In terms of qualifications, technical positions typically require a university or college degree. Most technically qualified workers recruited are international experts or engineers from other provinces or cities. Businesses also focus on hiring experienced workers with soft skills to perform their jobs effectively, helping shorten the adaptation time at the enterprise.

In order to increase the efficiency of management, businesses now hire external companies to provide services to "support" activities in terms of security, security and office cleaning services. At the same time, companies also hire professional services, take care of maintenance, maintenance or troubleshooting, repair major failures are undertaken by companies specializing in providing technical services or equipment suppliers. Therefore, the number of official employees at enterprises is not large.

Issues of labor contracts, working hours and social insurance for employees are officially guaranteed in accordance with the law. The majority of employees rated the working environment at a good level, many work tasks have been applied with modern machinery.

Training human resources for the renewable energy industry in Ninh Thuận needs to strengthen close links with enterprises.

Ninh Thuận currently has 9 vocational education institutions with 363 working staff and teachers (of which 01 vocational college; 02 intermediate schools; 06 vocational education centers and other institutions) participating in vocational training with a training scale of over 9,000 people/year for all occupations.

Currently, there are not many VT colleges participating in training programs for renewable energy occupations, and the involvement of enterprises in developing training programs (particularly theoretical content) remains limited. In addition to in-school training, students have opportunities to visit and observe the operation of renewable energy systems and

equipment. However, internships at renewable energy enterprises are not as common as in manufacturing companies due to the specific nature of the work. . The current program meets about 50-70% of the requirements of the renewable energy industry. The training program needs to be improved and supplemented in terms of in-depth knowledge, new technology, and internship time at the enterprise.

According to the opinions of teachers at vocational schools, businesses and students, after studying at the school, students meet the skills and working styles, meet over 50% to 70% of the company's work needs and have the ability to update new knowledge right at the enterprise. Theoretical knowledge received slightly more positive ratings than practical skills and higher than Soft Skills assessments. In addition, skilled workers are not yet proficient and professional English is not good.

Ninh Thuận is thriving in renewable energy, high labor demand, stable income, students learning related professions such as industrial electricity, industrial electronics can easily find a job in this field, even not only convenient when looking for a job in Ninh Thuận but can also learn and apply for jobs in other provinces.

Most enterprises have short-term training for employees with professional content and knowledge directly related to the operation of the enterprise's power generation and transmission system. However, most businesses have not had any cooperation activities with universities and training institutions on training programs in the renewable energy industry.

Impact of renewable energy industry development on local household life

Assessments from households show that households have not noticed a significant improvement in the local economy, new jobs, workers' incomes as well as the environmental landscape. In addition to the positive impacts, about 28.9% of the interviewees said that the renewable energy industry has a great impact on the production and business of local people, specifically: loss of production land (agriculture), impact on livestock, exposure to noise and heat emitted from wind power generation projects. Encourage the initiatives to address the environmental concerns of noise and heat from wind power for affected households.

The current situation of labor supply and demand in the renewable energy sector calls for some policy implications as follows: It is necessary to develop the economy in parallel with the development of jobs and incomes for local people, ensure welfare, safety and improve working conditions for workers, strengthen training, improve the quality of human resources for renewable energy development, cooperate with businesses in sharing knowledge and technology.

Bibliography

GOLDBERG, M., SINCLAIR, K., & MILLIGAN, M. (2004). *Job and Economic Development Impact (JEDI) model: A user-friendly tool to calculate economic impacts from wind projects*. MRG & Associates.

INTERNATIONAL LABOUR ORGANIZATION (ILO). (2016). *What is a green job?* https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm

KOZAR, Ł. J., & SULICH, A. (2023). Green jobs in the energy sector. *Energies, 16*(15), Article 5732. https://doi.org/10.3390/en16155732

MACZULSKIJ, T. (2024). How are green jobs created? A decomposition analysis. *Energy Economics*. Advance online publication. https://doi.org/10.1016/j.eneco.2024.106681

SAUERBORN, K., PHAM, N. T., & NGUYEN, N. T. H. (2019). *Future skills and job creation through renewable energy in Vietnam: Assessing the co-benefits of decarbonising the power sector* (COBENEFITS Study). IASS Potsdam

List of acronyms and abbreviations

DOLISA	Department of Labor, Invalids and Social Affairs
MOLISA	Ministry of Labors, Invalids and Social Affairs
MOIT	Ministry of Industry and Trade
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit/German Agency for International Cooperation
GSO	General Statistics Office
JEDI	The Jobs and Economic Development Impact model
OHS	Occupational Health and Safety
RE	Renewable energy
USAID	United States Agency for International Development.

Appendix

Appendix A.1 Parameters of the JEDI model for the forecast of employment in the wind power industry

Wind Plant Construction

Equipment	Cost (US $2030)	% Manufactured and Purchased in CustomRegion1
Turbine (Generator, Gearbox, Nacelle)	$ 547,352,000	0%
Blades	$ 43,788,160	0%
Tower	$ 87,576,320	30%
Equipment Shipping/Transportation	*$ 54,735,200*	70%
Equipment Subtotal	$ 733,451,680	

Construction	**Cost (US $2030)**	**% Purchased in CustomRegion1**
Electrical Balance of Plant	**$ 44,007,101**	**60%**
Construction (Excluding Site Improvements)	**$ 146,690,336**	**75%**
Subtotal	**$ 190,697,437**	

Other	**Cost (US $2030)**	**% Spent in CustomRegion1**
Engineering and Other Professional Services	**$ 50,000,000**	**70%**
Site Improvement (i.e., Road Construction)	**$ -**	**50%**
Subtotal	**$ 50,000,000**	

Construction Total	**$**	**974,149,117**

Operations and Maintenance (O&M)	**Cost (US $2030)**	**% Spent in CustomRegion1**
Plant Operations (staff, equipment such as trucks)	$ 19,944,000	80%
Replacement Parts	$ 4,986,000	20%
Civil Works (Access Road Maintenance, Etc.)	$ -	85%
O&M Total	**$ 24,930,000**	

Appendix A.2 Parameters of the JEDI model for the forecast of employment in the solar power industry

Solar Photovoltaic Installation	Expenditures	Local Content (CustomRegion1)
Equipment	**Cost (US $2030)**	**% Manufactured in CustomRegion1**
Module	$ 80,400,000	20%
Inverter	$ 28,140,000	20%
Subtotal	**$ 108,540,000**	

Installation	Cost (US $2030)	% of Workers Residing in CustomRegion1
Construction and installation costs	$ 4,020,000	95%
Subtotal	**$ 4,020,000**	

Other	Cost (US $2030)	% of Expenditures Made in CustomRegion1
Design and civil engineering	$ 8,040,000	70%
Other (public relations, legal, environmental studies)	$ 4,020,000	90%
Infrastructure - electricity and other	$ 12,000	50%
Transportation - Country Specific	$ 6,000	50%
Subtotal	**$ 4,038,000**	
Construction Total	**$ 106,049,250**	

Operations and Maintenance

	Annual Cost (US $2030)	% of Expenditures

			Made in CustomRegion1
Maintenance and repair services	$	11,256,000	60%
Repair parts	$	5,628,000	20%
O&M Total	**$**	**16,884,000**	

Appendix A.3 List of survey forms

TOOL 1. DISCUSSION CONTENT WITH DEPARTMENTS IN THE FIELD OF RENEWABLE ENERGY DEVELOPMENT

A. Some overview information about the current situation of renewable energy development in Ninh Thuận province

1. Please tell us about the current situation of renewable energy development of Ninh Thuận province in the past period (2020-2024). What are the main results and what difficulties and challenges still exist?
2. Please tell us about the benefits that renewable energy projects bring to the province? (number of new jobs created)
3. What are the preferential policies or investment support for renewable energy projects that are and are expected to be implemented in the province? (Indicating contents related to job creation and vocational training for laborers).

B. The current situation of human resources and skills development training

4. Please tell us an overview of the labor situation in the renewable energy industry in the province in the past period? (What is the scale of the working workforce? Which provinces and cities do workers come from?...)

5. General assessment of the employment situation of laborers in renewable electricity enterprises (salary, job stability, remuneration regime, etc.)

6. Indicate the assessment of the skill level of the employee compared to the requirements of the enterprise (in your opinion, what important skills are still lacking?

7. Currently, is the province implementing a training and skill development program for workers in the renewable energy industry? (Please tell us specifically the activities implemented and the results achieved...).

C. Renewable energy development trends and job prospects

8. Please tell us about the trend/target of renewable energy development of the province in the period of 2025-2030 and the period after 2030?

- What new technologies are expected to be invested in renewable energy businesses and impact labor demand?

- How will the demand for skilled workers increase?

9. Please tell us about the specific solutions that will be implemented to develop human resources and meet the development requirements of the province's renewable energy industry? (For example, policies on investment, support mechanisms, encouraging training institutions and renewable energy enterprises to participate in training for employees...).

Thank you very much!

TOOL 2. INTERVIEW WITH ENTERPRISES IN THE WIND AND SOLAR ENERGY SECTOR IN NINH THUẬN PROVINCE

The information provided by you is completely confidential and only serves for research purposes in order to propose solutions to support vocational training and ensure sustainable employment and meet the needs of renewable energy development in Ninh Thuận province

A. GENERAL INFORMATION

1. Name of the enterprise/establishment:

.....

2. Name of the interviewee and position:

.....

3. Type of enterprise/establishment: .....

4. Five enterprises officially put into operation: .....

5. Power Generation Capacity by Design (MW)

1. Wind power: ..... 2. Solar Power: .....

3. Other energy, specify: .....

Indicates what percentage of the current power generation capacity is compared to the design?.....%

B. CONTENT OF THE INTERVIEW

6. Please indicate the total number of employees working at the enterprise: .....person

In which, the number of female employees: ..... person

The number of employees who have signed labor contracts? ..... person

*How many employees participate in social insurance**?*** ..... person

7. From what sources do enterprises mainly use labor? (rate can be estimated)

..... local workers (Ninh Thuận province)?

Out-of-province workers.....?

Is there any difference in the job position of employees in the province? If so, please tell us specifically which job positions local workers usually do and which job positions do out-of-province workers do?

.....
.....

8. Please indicate the number of employees working at the enterprise by gender and qualification of the enterprise:

	Number of officers and employees		
	South	**Female**	**Number of**

	employees
1. No technical qualifications	
2. Technical workers who do not have vocational certificates/certificates	
3. Short-term Certificate/Certificate of Apprenticeship (less than 3 months)	
4. Primary vocational training/certificate/short-term vocational training certificate (from 3 to less than 12 months)	
5. Vocational Intermediate / Professional Intermediate	
6. Vocational Colleges/Professional Colleges	
7. Colleges and universities or higher	
Number	

9. Do enterprises face any difficulties in recruiting workers, especially skilled workers? If so, please tell us what occupations and skills are they?

.....
.....

Please tell us the reason for the difficulty in recruiting workers? How have businesses overcome difficulties in recruiting workers?

.....
.....

10. Please tell us about the average working time of the employees? .....h/week

Which job position is the employee working the most time (specifically time and reason)?

.....
.....

11. Please tell me the average salary of employees in the enterprise? What other welfare and remuneration policies do enterprises have for employees (lunch money, lunch money, accommodation support, travel, etc.)?

.....
.....

12. What are the activities of the enterprise trade union? How many members does the enterprise trade union currently have? What is the percentage of female members?

- What are the activities of the movement organized for employees?

.....

13. General assessment of working conditions and environment of employees? (temperature, ventilation, altitude, noise, working intensity)?

.....

14. Are there any heavy and dangerous factors that still exist in the working environment of employees? If so, please tell us in which job positions those factors exist?

.....

Please tell us the solutions you have implemented to mitigate these factors:

.....

15. Assess the level of satisfaction of labor skills compared to job requirements?

.....

If there is an assessment at the level of Not Responding or Not Responding well, please let us know:

- What skills are workers currently lacking and in what job positions?

.....
.....

- How has the enterprise solved those skills shortages of employees?

.....
.....

- What skills of workers are being retrained by enterprises?

.....
.....

16. Assessment of the level of training response of local vocational education schools/institutions compared to the needs of renewable electricity enterprises in Ninh Thuận *(in terms of training scale? What is the compatibility between the training program and the requirements of the business? in terms of training quality)?*

.....
.....

17. Does the enterprise coordinate and associate with schools and vocational education institutions in the area to train its employees?

If so, please tell us specifically about the cooperation model and training program? (developing training programs, lecturers, teachers, facilities and practical equipment?

.....

18 Evaluate the effectiveness of this training cooperation model? And tell us about the advantages and difficulties in the process of training cooperation?

.....

.....

19. If the enterprise has not cooperated with the training institution, please tell us the reason?

.....

C. PROPOSALS & RECOMMENDATIONS

20. What do you think about the opportunities, challenges and trends of renewable energy development to the operation of enterprises in the current new context:

-Chance

.....
.....

-Challenge

.....
.....

21. How do enterprises plan to change and adjust production and business activities to adapt to the new context? (Investment in operation expansion? For new technology?...)

.....

.....

.....

22. What is your assessment of the chances of finding jobs for local workers in the renewable energy sector? (which industries will attract and provide more job opportunities for local workers and why)?

.....

.....

.....

In addition, what other industries do local workers have the opportunity to work in? What are the expected job prospects of industries that attract more workers to 2025 and 2030?

.....

.....

.....

23. Please tell us about the demand for labor recruitment by 2025 and 2030, the number of employees expected to be recruited and the requirements for qualifications of employees

By 2025

.....

By 2030

.....

Requirements for laborers (age, qualifications, skills)

.....

.....

24. What are the significant barriers to learning new skills and career change for workers to meet the requirements of the business in the future?

.....

.....

25. What are the proposals of enterprises in promoting sustainable job creation and improving the quality of jobs for employees?

.....

.....

Thank you for participating in the interview.

TOOL 3. SURVEY OF WORKERS ON EMPLOYMENT AND SKILLS IN THE WIND AND SOLAR ENERGY INDUSTRY

The information provided by you is completely confidential, only for research purposes in order to propose solutions to support vocational training and ensure sustainable employment, meeting the needs of renewable energy development in Ninh Thuận province

A. GENERAL INFORMATION

1. Full name of the interviewee: .....
2. Gender*:* ☐ *Male* ☐ *Female*
3. Year of birth (solar calendar): .....

4. Ethnicity: ☐ 1.*Sutra* ☐ 2. *Other ethnic groups*
5. Living area: ☐ 1. Urban 2. ☐ Rural
6. Highest technical qualification *(if from 2 training disciplines)*
☐1. No technical qualifications
☐2. Technical workers without vocational certificates/certificates
☐3. Short-term Certificate/Certificate of Apprenticeship (less than 3 months)
☐4. Vocational Primary/Certificate/Short-term Apprenticeship Certificate (from 3 to less than 12 months)
☐5. Vocational Intermediate/Professional Intermediate
☐6. Vocational Colleges/Professional Colleges
☐7. Colleges and universities and higher
7. Name of the specialty/profession trained at the highest level (corresponding to the level in question 6):
.....

B. EMPLOYMENT SITUATION

8. Do you currently work in your industry/field?
1. Wind power 2. Solar power 3. Renewable electricity different 4. Other, specific.....
9. Name/position of the job you are holding

.....

Summarize the main tasks in your work

.....
10. How many months have you been doing your current job: .....
11. What other jobs did you have before working here?
☐ 1. Never worked elsewhere ☐ 2.Never had another job**-> Verse 12**
12. What work have you done? ..... (job title, or main task performed)
13. Please tell us the reason for changing jobs? (Choose 1 most important reason)
☐1. Losing jobs (old businesses stopping/downsizing...)
☐2. Changes for salary/income reasons
☐3. Changes to improve working conditions (safer, less heavy, dangerous factors...)
☐4. Change to be able to develop in terms of career and qualifications

☐5. Other reasons *(Specify the record)*.....

14. <u>Does your current job</u> use knowledge and skills related to the jobs you have done in the past?

☐ 1. Unrelated ☐ 2.Related 1 part ☐ 3.Very relevant

15. What kind of contract do you have for your current job?

☐1. Indefinite-term labor contract

☐2. Definite-term labor contract

☐3. Labor contracts are seasonal or according to a certain job with a term of less than 12 months.

☐4. Labor contract has not been concluded

☐5. Not subject to labor contracts

16. Do you participate in social insurance*? (can choose both 2 and 3)*

1) Nope; 2) Yes, ***Compulsory Social Insurance; 3. Yes, voluntary social insurance***

17. Average working hours/week: ..... (hours)

18. What is your average monthly salary/income from this job?

+ Salary (including overtime pay) .....(1000 VND)

+ **Other benefits** (shift meals, travel support, housing expenses) ..... (1000 VND)

+ Holidays, Tet bonuses (travel, other unexpected supports (calculated for the whole year*) ..... (1000 VND)

19. What is your general assessment of the environment and working conditions at the enterprise?

☐ Good, comfortable ☐ Normal ☐ Acceptable ☐ Tired ☐ Very tired (uncomfortable)

If there is a factor that causes fatigue/discomfort, please tell us what it is?

.....

.....

C. LEVEL OF SATISFACTION IN TERMS OF SKILLS AND TRAINING NEEDS OF LABORERS

20. Since joining this enterprise, can you participate in any training courses of the enterprise? ☐ Yes ☐ No

***If yes, please indicate the name of the profession/vocational skill and the form that the enterprise has organized to train you* :** *(Fill in specific information and write the corresponding code in the table)*

Occupation/Skills	**Form of training** **1. Study at a training institution** **2. Learn in the workplace** **3. Online learning**	**Training duration (weeks)**
1.		
2.		

21. Assess the suitability of the current job for the trained profession/technical expertise:

☐ 1. Inappropriateness -> Verse 22 ☐ 2.Less fit -> Verse 22
☐ 3. Fit 1 part ☐ 4. Fit ☐ 5. Very suitable

22. If the judgment is inappropriate or inappropriate, please tell us the reason?
☐1. Jobs that are not or less related to the profession and trained profession
☐2. Because they are new to work, it takes time to learn and adapt
☐3. Because the technology of the enterprise is still very new, not trained at school
☐4. Other (Write Specific).....

23. Do you currently need new vocational training or training to improve your qualifications?

1. There is a need for new vocational training improve qualifications **2. There is a need for fostering to**

3. Undetermined, depending on job requirements **4. No need -> Verse 26**

24. If there is a need for training, please tell us specifically about the knowledge and skills you want to learn?

1. The name of the job/skill you want to learn (you can add the time you want to study next to the job title)	**Marking an X on the form of learning**		
	Focused Learning	**Work and study**	**Online learning**
1.			
2.			

25. If you participate in the training, what kind of support do you expect to receive from the business?

1. Enterprises shall support training expenses (when participating in courses at training institutions)

2. Enterprises create conditions for time – learning during working time
3. Enterprises raise salaries or arrange new (better) job positions
4. Other Specific Notes:.....

26. If no one wants to participate in the apprenticeship, can you tell us what are the main reasons or barriers to participating in the apprenticeship at present? (Multiple reasons can be selected)

1. Busy doing your current job, unable to arrange time

2. Limited qualifications, so I don't want to participate

3.. I don't know which vocational training brings economic efficiency

4. If you participate in school, you will have to take time off work (no income)

5. Satisfied with their current job, so there is no need for other apprenticeships

6. Other, specify

27. What is your level of Response to the skill requirements of your current job? Rated according to 5 levels: 1 is the Lowest Level: Not Fulfilled: 1 and the Best Response Level is 5 Or write code 0 means Not applicable- Not related to the field of study

		Degree
I	**About professional knowledge**	
1	Forms of renewable energy and the benefits of using renewable energy	
2	Structure and principle of operation of wind turbines (or solar cells)	
3	Wind turbine design and installation process (solar cell farm)	
4	Wind power system operation and maintenance process (solar cell farm)	
5	Safety measures in the installation and operation of renewable energy systems.	
	Other knowledge, specify:	
II	**About vocational skills practice**	
1	Ability to read and analyze drawings of industrial electrical equipment and systems	
2	Use specialized design software such as AutoCAD, PVSyst, or WindPRO.	
3	Designed for wind and solar power systems.	
4	Installation of renewable energy systems according to technical standards.	
5	Virtuallymaintain the equipment of wind and solar power systems.	
6	Identify and prevent risks during system installation and maintenance	
7	Detect and repair minor damages, solve technical problems	
8	Collect, analyze data, and report on performance indicators	
9	***Other skills, specify:***	
III	**Soft Skills**	
	1. Teamwork and collaboration skills	
	2. Effective time management to complete tasks on time	

	3. Ability to be creative and innovative in improving technology and processes	
	Other skills, specify:	

28. What are your plans for employment in the near future?

(1) Continue to work in your current job position at the enterprise (unchanged)

(2) Still working at the business but will switch to another better job

(3) Find a new job (please tell us the reason: and continue to answer question 29)

.....)

(4) Others (Specify Notes):

29.1 In your opinion, what are the biggest barriers and difficulties for you if you have to find a new job?

1. Difficulty adapting to a new job *2. High age, low recruitment opportunities*

3. Unsatisfactory health *4. No more suitable job positions*

5. Other opinions: .....

29.2 What support would you like to receive in finding a new job or improving your current job?

.....

Thank you for your comments

TOOL 4. HOUSEHOLD SURVEY IN NINH THUẬN PROVINCE

The information provided by you is completely confidential, only for research purposes in order to propose solutions to support vocational training and ensure sustainable employment, meeting the needs of renewable energy development in Ninh Thuận province

A. GENERAL HOUSEHOLD INFORMATION

Households are requested to select a household member between the ages of 18-60 who is employed – including part-time workers – to be represented to answer the following contents:

1. Household address: .....

2. Full name of the interviewee: .....

3. Gender: 1.Male 2.Female

4. Year of birth: .....

5. What is the highest level of technical expertise? **(Insert corresponding code).....**

☐1. No technical qualifications

☐2. Technical workers without vocational certificates/certificates

☐3. Short-term Certificate/Certificate of Apprenticeship (less than 3 months)

☐4. Vocational Primary/Certificate/Short-term Apprenticeship Certificate (from 3 to less than 12 months)

☐5. Vocational Intermediate/Professional Intermediate

☐6. Vocational Colleges/Professional Colleges

☐7. Colleges and universities and higher

6. Please indicate the total number of people permanently residing in the household..... person

7. Families belonging to households:

1. Poor households ☐ 2. Near-poor households ☐ 3. Family Policy ☐

4. Not falling into any of the above cases

8. Please tell us about the economic activities of household members from full 18 to 60 years old and capable of working according to:

	South	**Female**
1. Currently in school (Full-time)		
2. Being at work (or studying at work)		
3. Unemployed and **looking for a job**		
4. Staying at home as a housewife (housework that does not generate income...)		
5.Other, specify		

(e.g. Not going to work and not wanting to find a job)		

B. IMPACTS OF RENEWABLE ENERGY DEVELOPMENT

9. What is your current main job? (describing some of the main job tasks/)

.....

10. His/her own salary-average income/monthIf the income cannot be answered accurately, the estimate shall be made according to the following intervals:

1. Less than 3 million VND		2. From 3-5 million VND	
3. From 5-7 million VND		4. Over 7 – 9 million VND	

11. Is there anyone in the family who is currently <u>working</u> in wind/solar power plants or the renewable energy industry? If so, please tell us specifically about the number of people working and the work you are doing?

.....

12. In your opinion, is this job stable and has a good income? (*Comparison of income and working conditions with the employment of other household members)*

.....

13. Does the development of renewable energy (wind power, solar power) in Ninh Thuận province affect the production and business activities of their households?

(1). No influence

(2). Influential but insignificant

(3). The impact is quite large, namely:

.....

.....

14. And indicate the solution that has been implemented to minimize the negative effects (if any) on his family

.....

.....

15. Every month, what percentage of household income does the cost of energy (electricity, petrol for vehicles) account for? ..... %

And what is your assessment of this cost?

1. Too expensive		2. Expensive		3. No cost		4.Minimal cost (savings)	

C. IMPACTS OF RENEWABLE ENERGY DEVELOPMENT

16. In your opinion, how will your family's energy consumption costs tend to change in the coming time (2025-2030)? And tell the reason for such a statement?

	Select
1. The proportion of expenditure on energy remains unchanged in total household expenditure	
2. The cost ratio will increase significantly due to the increased demand for use	
3. Increased but insignificant costs	
4. Costs will be reduced due to the production of more electricity from renewable energy sources	
5. Unknown/Unknown	

17. Assessment of the impact of renewable energy development on the situation of the locality and his/her household

	Impact Level		
	No change	Improve 1 part	Improve distinct
Impact Group 1			
1. Better development of the local economy			
2. Creating many new jobs for local workers			
3. Workers with higher incomes			
4. Improved environmental landscape			
5. Stable and complete power supply			
6. The general income of laborers in the family increases			
Impact Group 2	**Degree**		
	Unaffected	Less influence	Influence distinct
7. Impact on production (e.g. Lack of land for agricultural production...			
8. Noise-making wind turbines, ...			

9. Influence on the habitat of living organisms			
10. Temperature Sense			
11. Other, specifically:			

D. TRAINING NEEDS

18. Currently, is there anyone in your family who wants to go to vocational training?

1. No one wants to study ☐ 2. Not sure ☐ 3. There are people who want to learn a job ☐ 4. There are many people who want to learn a job ☐

If so, what kind of apprenticeship do you want to receive and in what form?

1. Name of the profession you want to study (you can add the time you want to study next to the job title)	Marking an X on the form of learning		
	Focused Learning	Work and study	Online learning
1.			
2.			
3.			

19. If no one wants to participate in the apprenticeship, can you tell us what are the main reasons or barriers to participating in the apprenticeship at present? *(Multiple reasons can be selected)*

1. Busy doing your current job, unable to arrange time
2. Limited qualifications, so I don't want to participate
3.. I don't know which vocational training brings economic efficiency
4. If you participate in school, you will have to take time off work (no income)
5. Satisfied with their current job, so there is no need for other apprenticeships
6. Others, specifically inscribed.....

20. When you learn a job, what do you or your family want to be supported with?

1. Job search support

2. Support the supply of input materials

3. Support for consumption of output products (advertising and product consumption)

4. Support for loans to conduct production and business by themselves

5. Other, specifically inscribed .....

Thank you for participating in the interview!

TOOL 5. IN-DEPTH INTERVIEW QUESTIONNAIRE FOR TEACHERS TEACHING SUBJECTS RELATED TO THE RENEWABLE ENERGY SECTOR

The information provided by the teacher is completely confidential, only for research purposes to propose solutions to support vocational training and ensure sustainable jobs, meeting the needs of renewable energy development in Ninh Thuận province.

Thank you very much for your cooperation!

A. PERSONAL INFORMATION

1. **Respondent's name:** .....

2**. Working position:** .....

1. Managers ☐ 2. Head of Department: ☐ 3.Teacher: ☐

3. Academic Qualifications:

1.University ☐ 2. Master's Degree ☐ 3. Dr. ☐

4. **Major/subject being taught**: .....
5. **How many years have you been teaching this subject?**

1. Less than 1 year ☐; 2.From 1-3 years ☐;

3. From 3-5 years ☐; 4.Over 5 years ☐

B. TRAINING PROGRAM: KNOWLEDGE AND SKILLS

6. Please tell us about the important training programs you are teaching to students related to the renewable energy industry?

1. Professional knowledge

.....

2. Vocational skills

.....

3. Other soft skills:

.....

7. What practical activities and internships at enterprises or projects does the training program include? (*specifically about internship activities at the enterprise?)*

.....

8. In general, according to teachers, does the current program meet the requirements of the renewable energy industry? Tick (X) the appropriate cell according to the following scale:

1- Very low response – Less than 30% of requests

2. Low response "from 30% to less than 50% of requirements"

3. Accept "from 50 to less than 70% of the requirements;

4. High response "from 70% to less than 90% of requirements"

5. Very high response" from 90% to 100% requirement

C. DISCUSSION ISSUES

9. How do you evaluate the content of the current training program? *Responsive content (specify)*

.....

Are there any other contents in the program that you think need to be improved or updated?

.....

10. In your opinion, do the students after completing the training program have enough knowledge and skills to work effectively in the industry?

.....

How do you assess the job opportunities in the renewable energy industry of students after completing the training program? (Is it convenient and easy to find a job in renewable businesses in Ninh Thuận? If not, what are the main difficulties and obstacles?

.....

.....

11. What programs and activities are currently being implemented by the university to support students to find jobs after graduation?

.....

What programs support students to develop their careers after work?

.....

.....

12. Is there any way to collect feedback from students and businesses about the training program? Examples of some recent changes or improvements in this feedback-based training program?

.....

.....

13. Assessment of challenges and opportunities in vocational training

What do you see as the biggest challenges in vocational training in the renewable energy industry?

.....

.....

What opportunities do you see to improve and develop the vocational training program in the future?

.....

.....

14. Please tell us some solutions/lessons that you have gained to be able to apply to improve the efficiency and quality of training courses?

.....

.....

15. Do you currently need to be fostered and trained to improve your knowledge and skills in the field of renewable energy? If so, please tell us specifically about:

- What do you want to be trained for?
- Training method
- Desired support received during training

.....

Thank you very much!

TOOL 6. SURVEY ON GRADUATES IN THE TRAINING FIELD OF RENEWABLE ENERGY

The information provided by you is completely confidential, only for research purposes to propose solutions to support vocational training and ensure sustainable jobs, meeting the needs of renewable energy development in Ninh Thuận province

A. GENERAL INFORMATION

1. Full name: .....
2. Information about the student's training course

Grade: .....**Faculty**:.....

Disciplines/Professions:.....

3. **Training level:**

☐ Vocational College ☐ Intermediate Vocational ☐ Primary Vocational

4. **Gender** ☐ South ☐ Female
5. **Year of birth** (solar calendar):.....

6. Have you ever had a job?

1. Never worked -> Sentence 9
2. This is the first job since graduating from school -> Sentence 7
3. Once had a job and changed --> Sentence 7

7. **When did you get your first job**?

1. Have a job before graduation
2. Less than 1 monthAfter Graduation
3. From 1-3 months after graduation
4. More than 3 months after graduation

8. Please tell us the reason why you have changed or no longer do that job? (Choose 1 most important reason)

☐1. Losing jobs (old businesses stopping/downsizing...)
☐2. Changes for salary/income reasons
☐3. Changes to improve working conditions
☐4. Change to have opportunities for learning and career development
☐5. Other reasons (Specify the record)

9. Please tell us your current employment situation (Tick 1 box and answer the next sections as instructed)

	Continue to answer part B,E
☐1 Salaried work →	Continue to answer part B,E
☐2 Self-production and business →	
	Continue to Part C,E
☐3. Unemployed →	
	Continue to Part D,E
☐4. Continuing to go to school→	

B. FOR PEOPLE WHO ARE EMPLOYED, SELF-EMPLOYED OR STUDY-AND-WORK

10. Job title (or brief description of the task you undertake) : .....

11. Your current job position is:

1. People who are apprentices/probationers
2. Contracted employees/officers

3. Team Leader/ Team Leader
4. Managers and leaders
5. Other locations

12. Indicate the production/business field of your company you are working in:

☐ 1. Agriculture – Forestry – Fishery

☐ 2. Functional industries

☐ 3. Renewable energy

☐ 4. Construction

☐ 5. Services (Tourism and Wholesale, Retail)

13. How many months have you been working at your current job: .....

14. Does the current job USE the knowledge and skills related to the jobs you have done in the past?

1. Unrelated

2.Related 1 part

3.Very relevant

15. What kind of contract do you have for your current job?

☐1. Indefinite-term labor contract

☐2. Definite-term labor contract

☐3. Labor contracts are seasonal or according to a certain job with a term of less than 12 months.

☐4. Labor contract has not been concluded

☐5. Not subject to labor contracts

16. Do you participate in social insurance? (can choose both 2 and 3)

1) Nope; 2) Yes, Compulsory Social Insurance; 3. Yes, voluntary social insurance

17. Average working hours/week: ..... (hours)

18. What is your average monthly salary/income from this job?

+ Salary (including overtime pay) ..... (1000 VND)

+ Other benefits (shift meals, travel support, housing expenses) ..... (1000 VND)

+ Holiday and Tet bonuses (travel, other unexpected supports (calculated for the whole year*) ..... (1000 VND)

19. What is your assessment of the environment and working conditions at your company?

1. Good, comfortable **2. Normal** **3. Acceptable 4.** Tired 5. Very tired (irritable)

20. What is your <u>level of Satisfaction</u> with the requirements of the job? Rated according to 5 levels: **1** is the Lowest Level: *Not Satisfied: and 5 is the Best Level of Satisfaction Or write code 0 means Not applicable- Not related to the field of study*

		Degree
I	**About professional knowledge**	
	MISSING knowledge, specify:	
II	**About vocational skills practice**	
	Skills MISSING PROFESSION, specify:	

III	**Soft Skills**	
	Soft skills are MISSING, specify:	

21. Assess the suitability of the current job for the trained profession/technical expertise:

☐ 1. Inappropriateness -> Verse 22

☐ 2.Less Appropriate -> Sentence 22

☐ 3. Fit 1 part ☐ 4. Fit ☐ 5. Very suitable

22. If the judgment is inappropriate or inappropriate, please tell us the reason?

☐1. Jobs that are not or less related to the profession and trained profession

☐2. Because they are new to work, it takes time to learn and adapt

☐3. Because the technology of the enterprise is still very new, not trained at school

☐4. Other (Write Specific).....

-> MOVE TO PART E TO ASSESS THE QUALITY AND TRAINING NEEDS

C. FOR PEOPLE WHO ARE UNEMPLOYED

10. How are you currently looking for a job?

1. Work in accordance with the trained expertise

2. The job has a higher salary/income than the previous job

3. Conditional work, better working environment than previous work

4. Work has the opportunity to learn, improve and advance

5. Other reasons (Specify inscription).....

11. **Please tell us the specific reasons why you have not found a job**? ***(select up to 3 reasons)***

1. The trained profession has a surplus of labor in the market
2. Vocational skills do not meet job requirements
3. Foreign language failure
4. Computer proficiency is not up to
5. Lack of work experience

6. Other reasons are requested to be clearly stated.....

-> MOVE TO PART E TO ASSESS THE QUALITY AND TRAINING NEEDS

D. FOR PEOPLE WHO ARE CONTINUING TO STUDY

10. Why do you continue to study?

1. Advanced learning
2. Apprenticeship due to <u>not being able to find a job</u> in the profession
3 Apprenticeship due to wanting to <u>do a job different</u> from the one you have learned

Other reasons:

..... 11. **Please tell us the name of the profession/skill and level of qualification that you *are studying:***

11.1 Occupation/training skills: .....

11.2 Course Level:

1. Universities 2. College 3. Intermediate 4. Primary

Other, specify:.....

CONTINUE TO ANSWER QUESTIONS 12,13 IN SECTION E AND END THE INTERVIEW

E. ASSESSMENT OF TRAINING QUALITY AND DEMAND

23. **Tell your evaluation of the quality of training at the school**

1. Good 2. Good 3. Relatively good
4. Not good 5. Very bad

24. Do you need to continue your studies now?

1.Yes 2.No-> Sentence 15

24.1 If so, please tell us the name of the profession you would like to continue studying?

:.....

24.2 Level of further study:

1. Universities 2. College

3. Intermediate 4. Primary 5.Other, specify:.....

25. If there is no need to continue learning, please tell us what are the main reasons or barriers to participating in vocational training at present? (Select up to 3 reasons)

1. Busy doing your current job, unable to arrange time

2. Limited qualifications, so I don't want to participate

3. I don't know which profession to learn to bring economic efficiency

4. If you participate in school, you will have to take time off work (no income)

5. Satisfied with their current job, so there is no need for other apprenticeships

6. Others, specifically inscribed.....

Thank you for responding!

TOOL 7. SURVEY OF STUDENTS STUDYING AT NINH THUẬN VOCATIONAL COLLEGES

We encourage you to take some time to answer this survey. The information provided by you is completely confidential, only for research purposes to propose solutions to support vocational training and ensure sustainable jobs, meeting the needs of renewable energy development in Ninh Thuận province

A. GENERAL INFORMATION

1. **Full name**: .....
2. **Gender: ☐ 1. Year ☐ 2. Female**
3. **Year of birth (solar calendar): .....**

4. Ethnicity: ☐ 1.Sutra ☐ 2. Other ethnic groups
5. Current living area: ☐ 1. Urban 2. ☐ Rural

6. **Information about the trainee's training course**

6.1 Grade: .....Faculty:.....
6.2Training Disciplines/Professions:.....
6.3 Training level: ☐ 1College ☐ 2. Intermediate

B. PLANS AFTER GRADUATION

7.1 After graduation, do you plan to work in occupations related to the field of Industrial Electrical and Electronics?

☐ 1.Yes

☐ 2. No-> answer 7.2

☐ 3. Undecided

7.2 If you do not want to work in a career related to Electrical and Industrial Electronics, please tell us the reason? (Choose multiple options if needed)

- 1. Unattractive salary
- 2. Lack of opportunities for advancement
- 3. Difficulties in finding suitable jobs
- 4. Changing career orientation
- 5. For other reasons, specify the .....

8. What area do you plan to work in? (Choose multiple options if needed)

- 1. Working locally (in Ninh Thuận province)
- 2. Work in a neighboring province
- 3. You can work in any province
- 4. Work Abroad
- 5. Other intentions, specifying .....

9. Do you intend to work at any company, wind or solar power company after graduation? If so, please tell us specifically

- 1. Yes (clearly stating the name of the enterprise intended to work): .....
- 2. Unknown
- 3. Not planning to work for a renewable energy business

10. If you plan to work in the renewable energy sector, what are the main reasons why you chose this field? (Choose multiple options if needed)

- ☐ Opportunities for future career development
- ☐ Good salary and remuneration
- ☐ Contributing to the environment and sustainable development
- ☐ Equipped with relevant knowledge and skills during the learning process
- ☐ Contributing to the development of the renewable energy industry in Ninh Thuận province
- ☐ I love this field

For other reasons, specify .....

11. How do you assess the responsiveness of the Electrical and Industrial Electronics profession you have learned to the requirements of renewable energy businesses?

- ☐ 1. Very fitting, I believe that the knowledge and skills learned fully meet the requirements
- ☐ 2. Suitable, but I need to learn additional skills and knowledge
- ☐ 3. Okay, but more improvements and more training on new technologies in renewable energy are needed
- ☐ 4. Not suitable, more intensive training in renewable energy is needed
- ☐ 5. I'm not sure about this fit

12.Are you interested in learning additional <u>skills or certifications</u> to increase your chances of employment?

- ☐ 1. Yes, specifically: .....
- ☐ 2. Not
- ☐ 3. Haven't thought about it

13. If you want to work for a renewable energy business, what additional skills do you think you need to learn? (Choose multiple options if needed)

- ☐ In-depth knowledge of renewable energy technologies (solar, wind, biomass, etc.)
- ☐ Skills in operating and maintaining renewable energy systems
- ☐ Knowledge of energy management and energy efficiency
- ☐ Skills in planning and implementing renewable energy projects
- ☐ Skills in using software and digital technologies related to renewable energy
- ☐ Teamwork skills
- ☐ Ability to speak a foreign language (English, Chinese, etc.) to work with a foreign partner
- ☐ Different:_____

14. Do you think you might have any difficulty finding a job after graduation?

☐ Lack of practical experience

☐ Lack of soft skills (communication, teamwork, etc.)

☐ Lack of in-depth knowledge of the industry

☐ Highly competitive in the labor market

☐ Lack of information about job opportunities

☐ Requires employers to be more than trained

For other reasons, specify .....

15. What factors influence your decision to choose a job the most after graduation? (Select 1 or more elements)

- ☐ Salary
- ☐ Working Conditions
- ☐ Opportunities for advancement
- ☐ Personal career orientation
- ☐ Desire to be close to family
- For other reasons, specify .....

C. ASSESSMENT OF THE LEVEL OF SATISFACTION WITH THE TRAINING

16. How do you feel the training program is relevant to the practical needs of the Electrical and Electronics industry?

1.Very suitable

2. Fit

3. Suitable interchangeability

4. Inappropriateness

17. Are you satisfied with the teaching method and the support from the faculty during the learning process?

- ☐ Highly satisfied
- ☐ Satisfied
- ☐ Normal
- ☐ Dissatisfied

18. Do the facilities (classrooms, labs, practice equipment) meet your learning needs well?

- ☐ Highly satisfied
- ☐ Satisfied
- ☐ Normal
- ☐ Dissatisfied

19. In general, are you satisfied with the training at the Electrical and Industrial Electronics Vocational College?

- ☐ Highly satisfied
- ☐ Satisfied
- ☐ Normal
- ☐ Dissatisfied

20. **Do you have any suggestions or suggestions for the school to better support students in finding a job after graduation?**

.....

.....

Thank you for your feedback!

Agence française
de développement
5, rue Roland Barthes
75012 Paris I France
www.afd.fr

What is AFD?
Éditions Agence française de développement publishes analysis and research on sustainable development issues. Conducted with numerous partners in the Global North and South, these publications contribute to a better understanding of the challenges faced by our planet and to the implementation of concerted actions within the framework of the Sustainable Development Goals.
With a catalogue of more than 1,000 titles and an average of 80 new publications published every year, Éditions Agence française de développement promotes the dissemination of knowledge and expertise, both in AFD's own publications and through key partnerships. Discover all our publications in open access at editions.afd.fr.
Towards a world in common.

Publication Director Rémy Rioux
Editor-in-Chief Thomas Melonio

Legal deposit 3rd quarter 2025
ISSN 2492 - 2846

Graphic design MeMo, Juliegilles, D. Cazeils
Layout PUB
Printed by the AFD reprography service

To browse our publications:
https://www.afd.fr/en/ressources-accueil