AUGUST 2025
No 368

Authors
Luu The Anh
Pham Le Quan

Coordination
Cecilia Poggi

Research papers

Environmental Policies for Supporting Sustainable Energy Transition in Vietnam

Evaluation and Policy Recommendations

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.

Environmental policies for supporting sustainable energy transition in Vietnam: Evaluation and policy recommendations

Authors

LUU The Anh
Central Institute for Natural Resources and Environmental Studies (VNU-CRES), Vietnam National University, Hanoi

PHAM Le Quan
Central Institute for Natural Resources and Environmental Studies (VNU-CRES), Vietnam National University, Hanoi

Coordination

Cecilia Poggi (AFD)

Abstract

Vietnam has long been an active member of international efforts to address environmental challenges. In the pursuit of the goals of environmental protection, greenhouse gas emission reduction and climate change response, Vietnam is transitioning to renewable energy sources to reduce dependence on fossil fuels. In recent years, Vietnam has proactively improved its legal system on environmental protection and implemented many policies for renewable energy development. This paper presents the results of the review of environmental protection policies supporting a sustainable energy transition in Vietnam. The analysis is based on regulations of three main policy frameworks including the Law on Environmental Protection 2020 and its guiding legal documents; Renewable Energy Development Strategy to 2030 with vision to 2050; and National Power Development Plan for the period of 2021-2030 with vision toward 2050. On that basis, the findings identify some gaps in environmental protection policies for renewable energy development projects and propose policy improvements.

Keywords
Environmental regulation; Energy; Government policy; Vietnam.

Acknowledgements
This research is part of the GEMMES Viet Nam 2 program (C3-WP3 project) and has benefited from the financial support of the French Development Agency. We acknowledge the role of Dr. Cecilia Poggi in providing significant supervision during the preparation of this article, and thank Dr. Eva Tène and the Expert Panel members, Do Xuan Lan and Nguyen Thu Phuong for their valuable comments.

JEL Classification
Q58; Q48; P28.

Original version
English

Accepted
July 2025

Résumé

Le Vietnam est depuis longtemps un membre actif des efforts internationaux visant à relever les défis environnementaux. Dans la poursuite des objectifs de protection de l'environnement, de réduction des émissions de gaz à effet de serre et de lutte contre le changement climatique, le Vietnam passe aux sources d'énergie renouvelables pour réduire sa dépendance aux combustibles fossiles. Ces dernières années, le Vietnam a proactivement amélioré son système juridique en matière de protection de l'environnement et mis en œuvre de nombreuses politiques pour le développement des énergies renouvelables. Ce papier présente les résultats d'un examen des politiques de protection de l'environnement soutenant une transition énergétique durable au Vietnam. L'analyse est fondée sur les règlements de trois grands cadres politiques, la Loi sur la protection de l'environnement 2020 et ses documents juridiques directeurs ; la Stratégie de développement des énergies renouvelables à l'horizon 2030 avec une vision à l'horizon 2050; et le Plan national de développement énergétique pour la période 2021-2030 avec une vision vers 2050. Sur cette base, les conclusions identifient certaines lacunes dans les politiques de protection de l'environnement pour les projets de développement des énergies renouvelables et proposent des améliorations.

Mots-clés
Réglementation environnementale; Énergie; Politique gouvernementale; Vietnam.

Remerciements
Cette recherche s'inscrit dans le programme GEMMES Viet Nam 2 (projet C3-WP3) et a bénéficié du soutien financier de l'Agence française de développement. Nous reconnaissons le rôle de Dr Cecilia Poggi dans la supervision importante lors de la préparation de cet article, et remercions le Dr Eva Tène et les membres Expert Panel, Do Xuan Lan et Nguyen Thu Phuong pour leurs précieux commentaires.

Classification JEL
Q58; Q48; P28.

Version originale
Anglais

Acceptée
juillet 2025

Introduction

Energy is considered as the lifeblood of socio-economic development and human life improvement (*Johnson and Lambe, 2009; World Economic Forum, 2012*). The need for energy increases with both population growth, industrialization and economic development (*Monbekova et al., 2024; Nepal and Paija, 2019*). As populations grow, increased basic energy demand for heating, cooking and transportation is inevitable. Economic development leads to increased industrial activity and reliance on energy-intensive processes, further driving up demand. However, the overuse of fossil energy resources globally has caused environmental consequences, such as climate change, air and water pollution, biodiversity loss, and depletion of natural resources (*Wang and Azam, 2024*). Many countries around the world are actively pursuing clean and sustainable energy sources like solar, wind, biomass, and geothermal power as resulted the strategic solution to address environmental challenges and reduce reliance on fossil fuels.

Vietnam is also undergoing that global general trend. The demand for energy of Vietnam is increasing to meet the socio-economic development in the context of the industrialization and modernization process of the country. The use of traditional energy sources like fossil fuels not only causes negative impacts on the environment and human health but also affects the safety and sustainability of energy use. Therefore, the development of renewable energy sources and the enhancement of energy efficiency have become urgent issues in Vietnam to achieve sustainable development goals (SDGs) and fulfil the commitment to reduce net emissions to "0" by 2050. Therefore, the adoption of clean and sustainable energy has emerged as a key development trend in Vietnam, particularly as the country faces significant environmental challenges. The Government of Vietnam has issued many policies to support and encourage investors to participate in the development of clean and sustainable energy sources, thereby enhancing energy security and environmental protection.

However, development practices in Vietnam over the past years have shown that the socio-economic growth in general, and the energy sector development in particular, have also caused negative impacts on the environment and natural assets, for example: solar and wind projects affecting ecosystems, deforestation for hydropower, etc. In order to achieve environmental sustainability along with economic development and sustainable energy transition, the Government of Vietnam is focused on creating and refining the legal and institutional foundations for environmental protection,

as well as adjusting various policies in the energy sector, including encouraging the development of renewable energy and reducing dependence on fossil energy. This includes focusing on building and perfecting institutional frameworks, laws, and regulations related to natural resources and environmental management. Specifically, efforts are concentrated on developing guiding documents, implementing existing laws, and considering amendments to laws like the Law on Environmental Protection (LEP) 2020 (National Assembly of the Socialist Republic of Vietnam, 2020) and the Law on Biodiversity. The government also aims to promote environmental awareness, increase public engagement, and strengthen international cooperation in environmental matters.

Environmental protection policies play a key role in balancing energy production and ecological conservation. This study aim to review environmental protection policies supporting sustainable energy transition in Vietnam based on regulations of three main policy frameworks: the LEP 2020 (*Law No. 72/2020/QH14*) and its guiding legal documents; the Renewable Energy Development Strategy to 2030 with vision to 2050 (REDS) (*Decision No. 2068/QD-TTg dated 25 December 2015*); and the National Power Development Plan for the period of 2021-2030 with vision toward 2050 (PDP8) (*Decision No. 500/QD-TTg dated 15 May 2023*). These regulations aim to promote sustainable development by enhancing energy efficiency, addressing climate change, and ensuring energy security and economic viability. By contrasting these frameworks for environmental protection in the energy sector, this analysis reveals the advantages and disadvantages of different regulatory strategies, such as financial mechanisms, the efficacy of policies, and international compliance. It also provides insights into the best practices and possible avenues for balancing environmental and economic priorities.

1. Methodology

The method used in this study includes policy analysis through available documents and consultation with experts in the field of environmental protection and energy development. The combination of policy analysis based on available documents and expert consultation helps to synthesize and evaluate policies systematically and increase practicality.

A policy analysis aims to identify gaps and limitations in current environmental protection policies and laws related to supporting sustainable energy transition. Based on the analysis results, it is possible to propose solutions aimed at promoting the energy transition with a particular accent towards sustainability.

This study focuses on analyzing gaps in policy definition and design, especially aspects that have not been addressed or addressed vaguely in current energy and environmental protection policies. This includes looking at gaps in policy objectives, unarticulated strategies, or unaddressed issues that may affect the effectiveness of policy implementation. Understanding these gaps helps identify potential factors that could make it difficult to achieve future policy goals.

The study employs the following methods:

(i) Policy analysis

The framework for policy analysis adopted as follows:

- Policy overview: The study reviews existing policies on energy development and related environmental management policies, including Law on Environmental Protection 2020 (LEP 2020) and its implementing legal documents; REDS; PDP8 that was approved by Prime Minister in Decision No. 500/QD-TTg dated May 15, 2023.
- Clearly identify the objectives, scope and orientation of current policies on topics such as emission reduction, increasing the proportion of renewable energy, or protecting natural resources, to understand the extent to which current policies have covered the energy transition process. The study reports it as a policy information matrix.
- Detect gaps and overlaps between documents, including issues such as regulations on waste from solar panels, emission standards for green hydrogen that have not been mentioned or are not specific while these are environmental risks that need to be considered when switching to renewable energy.
- Challenges in law enforcement due to contradictions or inconsistencies in laws or in law enforcement guidelines. Including major issues such as the Law on

Environmental Protection requiring a strict Environmental Impact Assessment (EIA), but the power planning allows rapid investment while bypassing control procedures.

(ii) SWOT analysis: This method identifies the strengths, weaknesses, opportunities, and threats of current policies. From this analysis, gaps can be identified and improvement measures proposed.

(iii) Comparative analysis: Vietnam's policies are compared with those of other countries in the region or the world to identify gaps and learn from their successful experiences.

(iv) Expert consultation: In-depth interviews with key informants (environmental experts) from the Institute of Energy, Electricity Company were conducted. And a consultation workshop organized by VNU-CRES involved 20 experts from fields including environmental policy, energy policy, environmental economics, wind energy, and marine thermal energy to discuss and identify pressing issues and contexts of energy development with respect to environmental policies, focusing on: (1) regulatory analysis from the workshop participants' perspectives; and (2) existing gaps. The experts came from different organizations, including Institute of Energy, Electric Power University (EPU), Faculty of Environmental Science of Vietnam National University, Institute of Sea and Island Research, Institute of Strategy and Policy on Science and Technology (NISTPASS) to discuss and complete the policy analysis.

Thus, the research team engaged in the following implementation steps:

- Step 1: Collect and synthesize relevant policy documents
- Step 2: Analyze policy content: focuses on the objectives, impacts, gaps, challenges in implementation of the policies.
- Step 3: Compare policies in the same field in different countries and regions: compare Vietnam's policies with policies of countries in the region to identify strengths, weaknesses and opportunities for improvement.
- Step 4: Consult experts to verify the results of content analysis; Ensure that the analysis coveres all the related regulations, Collect expert opinions on the gaps and challenges in implementing policies; Consult recommendations based on experts' practical experience.

2. Policy information matrix

The table below depicts a summary of policy overview in the form of a policy information matrix.

Table 1. Policy matrix for environmental policies

Pillars	LEP 2020 (Law No. 72/2020/QH14)	REDS (Decision No. 2068/QD-TTg dated 25/11/2015)	PDP8 (Decision No. 500/QD-TTg dated 15/5/2023)
Policy objectives	- Prevent environmental pollution. - Restore ecosystems and manage natural resources. - Promote public participation in environmental protection. - Promote sustainable development.	- Increase renewable energy share. - Reduce greenhouse gas (GHG) emissions. - Promote sustainable energy. - Promote socio-economic development. - Encourage technological innovation and development.	- Ensure national energy security. - Transition to green energy. - Reduce emissions. - Promote renewable energy. - Enhance energy efficiency. - Strengthen energy governance.
Scope of impacts	- National level. - Covers all sectors including energy.	- National level. - Focus on renewable energy (solar, wind, biomass, small hydro power). - Targets both public and private sectors. - Public awareness and education.	- National energy grid. - Focus on integrating renewable energy sources. - Targeted sectors include electricity production. - Expansion of renewable energy.

Pillars	LEP 2020 (Law No. 72/2020/QH14)	REDS (Decision No. 2068/QD-TTg dated 25/11/2015)	PDP8 (Decision No. 500/QD-TTg dated 15/5/2023)
			- Promote and develop emerging technologies. - Develop and invest in the electricity market.
Financial mechanisms used/usable from the policy	- Diversified investment sources. - Environmental protection fees. - Prioritization of key environmental tasks.	- Corporate income tax exemptions. - Land use, land and water surface rental incentives for renewable energy projects. - Preferential loans. - FIT price mechanism for solar and wind power. - PPAs mechanisms for selling and buying renewable energy. - PPPs to develop renewable energy to reduce financial risks and protect investors. - Grants and loans. - Carbon pricing.	- Investment incentives for renewable energy projects. - Green bonds and public-private partnerships encouraged.
International alignment	- Aligned with Nationally Determined Contributions (NDCs) (Paris Agreement 2015). - Commitment to international	- Commitment to net-zero emissions by 2050. - Aligned with global renewable energy goals. - Paris Agreement on climate change. - SDGs. - ASEAN renewable energy targets.	- Aligned with Paris Agreement and COP26 commitments. - Aims to meet or exceed international energy transition targets. - SDGs.

Pillars	LEP 2020 (Law No. 72/2020/QH14)	REDS (Decision No. 2068/QD-TTg dated 25/11/2015)	PDP8 (Decision No. 500/QD-TTg dated 15/5/2023)
	environmental standards.		- ASEAN energy cooperation. - Partnerships with development agencies.
Effectiveness	- Improves legal framework by clarifying environmental regulations, strengthening enforcement mechanisms, integrating climate change mitigation and sustainability goals, introducing stricter corporate environmental responsibilities, enhancing public participation, and applying stronger penalties for violations.. - Ongoing challenges in enforcement	- Significant growth in solar and wind energy. - Biomass and other renewables are less developed. - Successful in attracting investments.	- High growth in renewable energy output (48% by 2022). - Some projects delayed or altered due to fluctuating conditions. - Dependent on external market and technology trends. - Clear goals aligned with International Commitments. - Phased coal thermal power reduction. - Requires significant investment (estimated 135 billion dollars by 2045). - Regulatory and administrative bottlenecks. - Energy storage and technology gaps.

Pillars	LEP 2020 (Law No. 72/2020/QH14)	REDS (Decision No. 2068/QD-TTg dated 25/11/2015)	PDP8 (Decision No. 500/QD-TTg dated 15/5/2023)
	and consistency.		
Regulatory stringency	- High, but with implementation challenges at local levels. - Some regulations remain general or vague.	- High. - Strong incentives for renewable energy investments. - Policy driven by international commitments.	- Ambitious, but dependent on technological advances and external factors (e.g., climate change). - Stringent targets for renewable energy share.
Policy challenges identified	- Inconsistent implementation at local levels. - Overlapping regulations and unclear legal provisions in some areas.	- Technological and market fluctuations impacting policy stability. - Need for more comprehensive renewable energy legislation.	- Technological and market unpredictability. - Infrastructure challenges. - Need for diversification of renewable energy sources.
Environmental challenges to prioritize in next 10-20 years	- Climate change and GHG emissions. - Plastic and solid waste management. - Construction and demolition waste management.	- Transition to low-carbon energy mix. - Grid integration challenges. - Energy storage development. - Waste management. - Climate change adaptation.	- Renewable energy development. - Hydropower management. - Energy storage. - Coal transition. - Gas infrastructure development. - Waste management. - Flexible power source.

Pillars	LEP 2020 (Law No. 72/2020/QH14)	REDS (Decision No. 2068/QD-TTg dated 25/11/2015)	PDP8 (Decision No. 500/QD-TTg dated 15/5/2023)
	- Hazardous waste management. - Air and water pollution. - Biodiversity conservation.		- International cooperation.
Recommendations	- Strengthen local enforcement mechanisms. - Clarify legal provisions. - Promote stakeholder engagement and public participation to support environmental protection.	- Provide tax incentives and fund research to promote affordable energy storage solutions and technological innovation. - Decentralized energy access through rooftop solar, microgrids, and community-based projects. - Promote sustainable energy with offshore wind infrastructure with international cooperation.	- Improve the high voltage lines and storage for energy security. - Diversify renewable energy sources beyond solar and wind. - Enhance regional cooperation for green transition.

Source: Authors' own compilation. Original.

3. Results

Policy ambition and environmental protection policies has contributed to creating positive changes in environmental protection results and activities in Vietnam. Awareness of responsibility and action in environmental protection has changed dramatically, attracting the attention of the whole society. The method of managing and solving environmental

problems has changed from passive response to proactive control, prevention, and control of projects with high risk of causing environmental pollution to contribute to sustainable economic growth.

3.1. Connections between current renewable energy and environmental policies in Viet Nam

a) Viewpoints and environmental protection policies of Vietnam since Innovation Day (1986) to date

Since the Doi Moi policy implementation (1986) to date, the viewpoints on environmental protection has been deeply and consistently recognized by our Party, directed throughout, and set increasingly higher goals through Party Congresses. Concerning issues arising from practice have been concluded throughout the Party Congresses for improving the viewpoint on environmental protection according to the context of the country's development and the trend of the times. This system of viewpoints continues to be specified in resolutions and directives on environmental protection of the Politburo and the Central Executive Committee of the Party through the terms. Along with economic and cultural development, and social security guarantee, environmental protection mission has always been directed by the Party, the State, at all levels and sectors. Therefore, Vietnam has achieved many important results in natural resource management and environmental protection. The role of environmental protection mission is recognized as being equal important to economic growth, cultural development and social security assurance.

The Platform for National Construction in the Transitional Period to Socialism in 1991 (amended and supplemented in 2011) set out the direction of *"strictly adhering to environmental protection, maintaining ecological balance for present and future generations"*. Directive No. 36/1998/CT-TW dated 25 June 1998 of the Politburo on strengthening environmental protection during the period of industrialization and modernization of the country, raised the basic viewpoints that have been the guiding principle up to now, that is *"Environmental protection is the cause of the entire Party, the entire people and the entire army; Environmental protection is a fundamental and inseparable content in the guidelines, policies and socio-economic development plans of all levels and sectors, and is an important basis for ensuring sustainable development and successfully implementing the cause of industrialization and modernization of the country"*. Viewpoints and policies on environmental protection continue to be specified in Resolution No. 41-NQ/TW of the Politburo (9th tenure) dated 15 November 2004 on environmental protection during the period of accelerating industrialization and modernization of the

country; Directive No. 29-CT/TW dated 21 January 2009 of the Secretariat on continuing to promote the implementation of Resolution No. 41-NQ/TW; Resolution No. 24-NQ/TW dated 3 June 2013 of the Central Executive Committee of the 11th tenure on proactively responding to climate change, strengthening resource management and environmental protection; Conclusion No. 56-KL/TW dated 23 August 2019 on continuing to implement Resolution No. 7 of the 11th tenure Central Committee on proactively responding to climate change, strengthening resource management and environmental protection. Up to now, the Party and the State have agreed to clearly define the viewpoint that *"it is necessary to put the requirements of natural disaster prevention and control, climate change response, resource management and environmental protection at the center of development decisions; the environment is not only a living space for humans, but also a condition, foundation and prerequisite for socio-economic development. Do not trade the environment for economic growth; carry out screening and investment selection based on environmental criteria. Ensure harmony of interests, create incentives to encourage relevant parties to actively participate in climate change response, effective management, exploitation and use of resources and environmental protection*".

At the Resolution of the 13th National Party Congress, the viewpoints and policies on environmental protection have been further developed, expanded, supplemented, perfected and deepened by our Party and State, thereby helping to penetrate deeply into all areas of social life:

- *Firstly,* environmental protection mission aims at the ultimate goal of ensuring the right to live in a clean environment for the people. This is clearly shown in the viewpoint of "taking environmental protection and people's health as the top priority; resolutely eliminating projects that cause environmental pollution, ensuring the quality of the living environment, protecting biodiversity and ecosystems". Environmental protection work is based on proactive prevention, combined with overcoming pollution, degradation and improving environmental quality.

- *Secondly,* raise the priority level and affirm the role of environmental protection as a fundamental condition and prerequisite for sustainable socio-economic development; environmental protection is both a goal and a task placed at the center of development decisions; economic development must be in harmony with nature, respect natural laws, and not trade the environment for economic growth.

- *Thirdly,* continue to affirm "management, exploitation, rational, economical, effective and sustainable use of resources" in the process of socio-economic development. Accordingly, the State must unify the management, exploitation, rational, economical, effective and sustainable use of resources; complete the basic investigation, assessment, and construction of a database on land, water, forest, sea and island resources, minerals, and biodiversity.

Strengthen control of resource exploitation activities; combat, prevent and strictly handle all violations of the law on resources and the environment.

- *Fourthly,* facilitate the transformation from the traditional (linear) economic development model to building a green, circular, and environmentally friendly economy. For the first time, the development of a circular economy was identified in the Resolution of the 13th National Party Congress, demonstrating the political determination to develop a sustainable economy, associated with environmental protection, resource conservation, promoting reuse, recycling and energy recovery from waste. This deepens and continues to affirm the viewpoint of sustainable development of the country based on green transformation, circular economy, etc.

- *Fifthly,* the orientation for the country's development in the period of 2021-2030 emphasized "continuing to strongly innovate thinking, building and perfecting synchronous institutions for sustainable development in economics, politics, culture, society and environment". The lack of synchronization in Vietnam's development is due to a number of problems such as lack of close coordination in policy implementation, uneven allocation of resources, weak law enforcement, and limited capacity to deploy new technologies. These factors make it difficult to effectively connect economic, political, social and environmental goals. Promoting the socialization of activities to protect natural resources and the environment; encouraging private enterprises to participate in environmental protection work, especially in solid waste treatment. Strengthening education, raising awareness, sense of respect and compliance with environmental protection laws.

- *Sixthly*, proactively and effectively adapt to climate change, prevent, combat and mitigate natural disasters based on building a system and mechanism to monitor climate change; forecast and warn of natural disasters; protect, inspect, check and handle violations in the field of natural resource and environmental management; implement green growth; develop a circular economy, low waste, low carbon, reduce greenhouse gas emissions.

- *Seventhly*, grasp and handle well the great relationship between economic growth and cultural development, implementing progress, social justice and environmental protection. Economic growth with progress, social justice and environmental protection are key issues of innovation theory, and at the same time are very basic contents of development theory in the country. Reasonable and correct resolution of the relationship between economic growth with progress, social justice and environmental protection are inevitable requirements of the development process, most directly of socio-economic development, towards sustainable development.

These views on environmental protection are consistent with the general trend of the world, notwithstanding the current backlash against ecological transitions in certain political and economic spheres. Vietnam is making efforts with the international community to realize the

development goals set by the United Nations. Thus, continuing to choose and pursue sustainable development goals in the coming periods is a high political determination and a consistent guiding viewpoint in the leadership of the Party and State.

b) Current renewable energy policies

Vietnam's current renewable energy policies are strongly linked to its environmental policies, aiming to transition from fossil fuels to cleaner energy sources and mitigate climate change. This shift is driven by both environmental needs and the economic opportunities associated with green energy. This connection is also evident in Vietnam's commitment to reducing greenhouse gas emissions, transitioning to a low-carbon economy, and achieving net-zero emissions by 2050. Policies to support investment in renewable energy have been implemented, including financial support, tax reductions and investment support:

(i) Financial support: The Government provides grants, loans with preferential interest rates, and investment capital support for renewable energy projects.

(ii) Tax reduction: Renewable energy projects are fully exempted or have their taxes reduced according to the provisions of law.

(iii) Investment support: The Government provides other policies such as support for investment in equipment, technology, consulting and project management, and training of specialized human resources in the field of renewable energy.

These policies to support investment in renewable energy have been successfully implemented in Vietnam, contributing to the development of renewable energy projects and promoting the use of clean energy sources, helping to reduce environmental pollution and protect public health. At the same time, a policy on renewable electricity purchase price has been developed with the aim of encouraging investment in renewable energy projects. The purpose of this policy is to ensure stable profits for investors investing in renewable energy projects and at the same time contribute to environmental protection and pollution reduction. Solar and wind power projects have been deployed on a large scale, contributing to the country's electricity production. The renewable electricity price policy has been successfully implemented in Vietnam and has attracted a lot of investment in renewable energy projects. By creating a stable investment environment, this policy helps investors calculate and plan their investment in renewable energy projects effectively. This also means enhancing the sustainable development of the energy sector and contributing to reducing the demand for using toxic fossil energy sources, minimizing negative impacts on the environment.

In addition, the policy also promotes the use of renewable energy in production and other fields, reducing air pollution. The development of industrial zones using renewable energy and waste treatment facilities using renewable energy is also one of the important goals of the renewable energy development policy in Vietnam. The impact of the policy on the environment and economy is assessed positively, and this policy has prospects in the future.

3.2. Environmental protection policies according to LEP 2020

a) Financial mechanisms used/usable from the policy

There are various investment sources under regulations of the LEP 2020, and that are essential to environmental protection activities. The Government of Vietnam uses national and local budgets to finance high priority initiatives such as waste management, pollution control, and climate resilience. International institutions have given grants or loans to help Vietnam in biodiversity conservation, environmental sanitation improvement, and renewable energy development. Public-private partnerships (PPPs) help share risks and costs in waste treatment and renewable energy by encouraging infrastructure investments from the private sector. Green bonds and environmental bonds attract investors for sustainable projects, while consistent funding for pollution control and ecosystem restoration is ensured by national and municipal environmental protection funds. Moreover, funding is further strengthened by revenue from environmental levies and corporate social responsibility efforts, in addition to support from community funds and NGOs. In particular, for production and business enterprises that generate waste (wastewater, exhaust gases, solid waste), it is mandatory to invest in waste treatment systems and build environmental protection works to ensure that waste is treated to meet environmental technical standards before being discharged into the environment.

Environmental protection fees are used to fund pollution control and sustainable management, which include charges for waste discharge (wastewater, emissions, and solid and hazardous waste). Furthermore, the exploitation of natural resources, such as mining, logging, and water extraction, is also subject to fees to mitigate environmental harm and promote sustainable practices. Plus, fees for services such as collecting and treating solid waste guarantee that profits are put back into regional initiatives such as ecosystem restoration, eco-friendly. The "polluter pays" idea is emphasized in this paradigm, which holds people and institutions financially responsible for protecting the environment,

technology, and pollution remediation.

The LEP 2020 focuses on addressing key challenges through targeted strategies. It is key to adopt cleaner technologies to reduce pollution from industrial activities, agriculture, and urban pollution. To lessen the strain on landfills, waste management places a high priority on recycling, waste-to-energy (WTE) initiatives, and circular economy models. Climate change adaptation and mitigation include investments in renewable energy, resilient infrastructure, and emission reductions. Biodiversity conservation and ecosystem restoration aim to protect sensitive areas and endangered species. The promotion of green technologies and sustainable practices supports eco-friendly growth, while environmental health initiatives and community awareness programs link public health to improved environmental quality. Research and development in green technology, alongside the restoration of polluted and degraded areas, further strengthen Vietnam's commitment to sustainable environmental management.

b) Adjustment scope related to power development projects

The adjustment scope of the LEP 2020 applies to development projects in general and energy projects in particular. The LEP 2020 mandates screening of the project with high potential for environmental pollution. It has stipulated that projects and businesses align with sustainability principles by integrating environmental goals into broader sustainable development objectives. It also reflects the Vietnamese Government's efforts to implement global commitments, such as the Paris Agreement, the Net-Zero emissions target by 2050, etc. Third, more specific regulations on the protection of natural environmental components (surface water, groundwater, air, soil), natural heritage, biodiversity conservation and waste management. The environmental technical regulations on vibration, noise and pollutant concentration limits are being established more strictly, which enhances enforcement and reduces regulatory uncertainties.

The need for waste management and pollution control is reinforced by investment in green technologies and a commitment to the circular economy. The Vietnames government treats climate change adaptation and mitigation as paramount, with legally binding goals for emissions reduction and increases in renewable energy. Biodiversity conservation and ecosystem restoration is, thus, directly prioritized, which eventually rests on how the EIA is carried out, through conservation projects and community action. It also establishes project oversight long after work is completed and more stringent evaluation of higher-risk projects. It promotes the adoption of green technologies and circular economy models by providing

tax breaks and financing support. It uses public-private partnerships and new methods of financing like green bonds to fund large-scale environmental projects. Public awareness programs, the Environment Protection Act emphasizes participation of the public, and transparency in the process of environmental decision making. The LEP 2020 closes with sanctions and stricter measures for enforcement, with a view towards creating a strong legal basis for environmental protection/enforcement in Vietnam.

Vietnam is facing many obstacles in protecting natural environment. These include limited enforcement and resources, such as inadequate funding, staffing, and equipment that make it challenging to monitor compliance, especially in remote areas or industrial sites. The fragmented regulatory framework of the country involves several regulators at central and state levels, leading to overlapping functions and inconsistent enforcement. These disparities are compounded by regional differences, with affluent areas (such as the Red River Delta, the Southeast regions) better able to develop and enforce regulations than poor areas (such as the Central Highlands, the Midlands and Northern Mountains and the Mekong River regions). Moreover, blighted data and monitoring systems make it difficult to properly track environmental health, and lenient penalties do not discourage violations against the environment, with large corporations bearing the brunt of such violations.

The EIA process is inadequate and inconsistent,. The EIA has not fully assessed the environmental and community impacts, especially in terms of long-term impacts. The implementation process also lacks synchronization between localities, and standards have not been updated to keep up with the development of the industry. There is a need to improve the quality of reporting, strengthen monitoring, and increase community engagement to protect the environment more effectively. There is no follow up monitoring, and the lack of public awareness keeps the community on the sidelines. The rapid development of industrial sectors as well as various acts of corruption create tensions between economic growth and environmental protection goals. Some enterprises avoid strict regulations with bribes or deliberately do not fully comply with environmental protection measures as approved in the environmental impact assessment report (Clausen et al., 2010). Other cases, enterprises have completed the construction of wastewater and exhaust gas treatment systems, but do not operate them regularly, or treated wastewater and exhaust gas do not meet environmental technical standards but still discharged into environment, or underreporting. During the period of January 2016 to August 2022, the Ministry of Natural Resources and Environment conducted inspections at 2,364 enterprises and industrial parks that have large sources of waste and high risks of causing environmental pollution. As a result, 878 enterprises were fined for violating environmental pollution discharge. During the period of 2017-2021, the environmental police force inspected

and detected 121,654 cases of environmental law violations; prosecuted 1,540 cases/2,108 subjects; administratively sanctioned 81,439 cases (*Ministry of Natural Resources and Environment, 2022*). Finally, although the law incentivizes green technology, companies, particularly small and medium-sized enterprises (MSEs), frequently lack the financial and technical assistance necessary to implement the measures it sets forth, restricting broader compliance with and environmental benefits under the LEP 2020.

The regulations on strategic environmental assessment (SEA) is applied to energy development strategies and PDP. The regulations on preliminary environmental impact assessment (PEIA) and EIA is applied to energy development investment projects. These regulations are clearly stated in the legal documents system on environmental protection (**Appendix A.1**).

Environmental policies in Vietnam are playing a crucial role in driving its energy transition efforts. By imposing stricter standards on businesses and promoting clean energy sources, the government is encouraging a shift away from fossil fuels and towards a more sustainable energy future. Environmental regulations are impacting Vietnam's energy transition aspects: stringent regulations, prioritizing clean energy, promoting energy efficiency, supporting renewable energy, addressing climate change, mainstreaming environmental protection, developing a carbon market.

c) Regulatory stringency

There remain many hurdles in term of either institutions, finance, technology, public awareness or enforcement in implementing the LEP 2020. There are two main institutional challenges to implementing the LEP 2020 in Vietnam: (1) Coordination issues between different agencies and local authority, and (2) policy misalignment between national environmental policies and local policies prioritizing economic growth. These challenges can hinder effective environmental efforts. Lack of finances manifests in small budgets or limited access to funding for green technologies and being overly reliant on external resources such as foreign aid. Capacity-related obstacles consist, among others, of limited expertise, insufficient monitoring infrastructure and challenges in complying with increasingly stringent environmental standards. There is limited public engagement and awareness (not enough community involvement, opposition to change, lack of awareness campaigns), which undermines public acceptance. Finally, there is the problem of weak enforcement mechanisms, corruption and differences in application of the law which further degrade the efficacy of local environmental protections.

There are unclear and not detailed references to some key areas in the LEP 2020. As such, environmental parameters, pollution thresholds, definitions of "eco-friendly" practices, or “environmentally sensitive areas” are rather vague, resulting in discrepancies in compliance and enforcement. Requirements for waste management do not pinpoint any hazardous waste classification, disposal method, or household waste segregation, leaving local authorities and citizens asking for clear operational guidance. Also, EIA process requirements are quite unclear concerning project criteria and post-approval monitoring, leading to inequities in application and enforcement. Public participation and transparency are not encouraged enough, but because there are no well laid down guidelines on community engagement and data sharing, public scrutiny and participation are left in limbo. Mechanisms to implement some environmental protection policies such as the role of community monitoring equally lack clarity, with interpretations on penalties and monitoring processes diverted, thus watering down effectiveness in deterrence. Lastly, no clear definitions of financial incentives towards greener investments are provided, thus making it very difficult for local governments and businesses to access support needed for sustainable operations.

d) Recommendations

The following improvements are proposed for proper strengthening of local environmental protection in Vietnam. Local authorities should adopt the combined use of the environmental monitoring station networks at national and provincial levels, such as existing continuous automatic monitoring stations (surface water and air quality) and periodic monitoring points (surface water, ground water, air, sediment and soil quality), using a unified data system to track trends in pollution and complement coordination efforts. Inspections must occur more frequently and be thorough, with guidelines or operating protocols standardizing inspection for industries and waste management. Very clear penalty guides, and alternatives for progressive sanctions on repeated offenders, must be in place; community reporting systems such as anonymous hotlines should enable citizens to play their part in detection. Strengthened capacity for enforcement officers and the of legal-efficient environmental units would instill soundness. Transparency could be furthered by publicizing environmental violations caused by enterprises and individuals in the mass media as mentioned in Clause 1 Article 72 of the Law on Handling of Administrative Violations 2012, while public awareness campaigns could enhance participatory efforts. Finally, make the establishment of a specialized environmental courts and availability of legal services possible so that the communities could hold the perpetrators accountable, and remedy should ease the process (*WHO, 2021; Department of Environment, 2024*). This becomes

necessary to improve the effectiveness of trials and meet the demands and requirements of the country's development practices as well as meet the requirements of Vietnam's international integration.

The upshot is that stronger environmental enforcement will see active participation of other stakeholders, thereby ensuring even environmental implementation. These offer sufficient guidelines to local authorities on inspection protocols, pollution limits, and penalties to be imposed to ensure that such requirements are uniformly implemented. Further coordination among the different agencies, given that they belong to the sectors of environment, police, and health, would ameliorate compliance requirements for such operations. In addition, industry and SMEs require direct regulations in pollution, wastes, and emissions, as well as straightforward compliance guidelines. Communities must understand their rights, which allow for consumption of environmental data and allow one to enforce or report violations against them. Legal rules giving more clarity on penalties and evidence would assist lawyers and environmental advocates; this would also assist NGOs in their monitoring activities on compliance. Lastly, detailed guidance on environmental damage and related fines must be given to the judiciary to ensure consistent and fair decisions.

A response to environmental challenges in Vietnam must include important improvements towards investing in different types of advanced technologies or environmentally friendly technologies. Factors for air quality monitoring can be dramatically improved by launching real-time sufficient monitoring of, for instance, $PM_{2.5}$ and nitrogen dioxide, and more generally industrial emission reduction technologies, such as scrubber and filter installations. Low-emission vehicle technologies such as electric vehicles and clean public transport could further reduce urban air pollution. With water management, resources can be financed into advanced wastewater treatment grouped with agricultural runoff management technologies and highly advanced water monitoring systems, which would ensure cleaner water and make it accessible. For solid waste management, substantial waste sorting and recycling automation, WTE innovations, and composting of biodegradable waste would lessen the pressure on landfills while promoting recycling. Renewable energy technologies such as photovoltaic, wind, and biogases would help lower further Vietnam’s dependence on fossil coal and lessen this pollution while aiding sustainable transitions to energy use. Finally, in climate resilience, flood monitoring systems, green infrastructure, and drought-resistant agriculture are crucial for climate change adaptation, protecting communities, and improving the sustainability of infrastructure.

3.3. Challenges for some renewable energy development

a) Challenges for some renewable energy sources

Despite their great potential, biomass, hydropower, WTE, and geothermal face countless challenges. Biomass is faced with the challenge of getting a high-upfront investment with reliable supply chains, competition with land for agriculture, while efficiency and emissions remain concerns (Lyu et al., 2024). Small and medium hydropower projects face environmental opposition, socio-political constraints, geographic and economic limitations, and funding difficulties (Consultation workshop at CRES, 2024). WTE faces hurdles in waste management, high costs, and public opposition on account of health threats. Geothermal is an underutilized energy source due to limited exploration, great cost, and infrastructural limitations. Regulatory impediments, for example the unclear policies and prolonged approval processes, will also impede the propulsion of these technologies. Competition between this and cost-efficient solar and wind systems, coupled with public understanding and market demand obstacles, also poses economic and social challenges.

b) Regulatory stringency

The stringent regulations in the renewable energy sector of Vietnam aim to balance the goal of protecting the environment and promoting economic growth with that of social welfare. They impose standards seeking to minimize the adverse environmental impacts from the projects. These standards include emissions, biodiversity, and resource use to attune local projects with climate objectives such as those under the Paris Agreement, Net Zero emissions by 2050 of Vietnam Government's commitment. Regulations ensure the protection of local communities, with equitable land use, rationalizing land compensation, and safety measures for workers, promoting employment and sustainable development. The technical standards also prescribe reliability, safety, and compatibility of the power generation with the grid for renewable technologies. A clear regulatory framework will attract investments by exercising risk controls and give the investors much-needed confidence in every emerging technology. Health and safety standards will address concerns from the general public and therefore win the support of society. Land-use and environmental approvals will prevent conflict with agriculture and conservation, while rigged long-term policies will ensure collaboration between Vietnam and the ambition of global climate targets and SDGs.

Vietnam's renewable energy strategy offers a powerful commitment to climate action under the Paris Agreement and SDGs; however, it faces challenges due to ambiguities in political implementation and the absence of actionable mechanisms. While pledging to

mitigate greenhouse gas emissions and promote clean energy, uncertainty prevails because there are no clear interim targets, carbon pricing, and sector-specific timelines laid out. Efforts for aligning with SDG 7 (*United Nations, 2023*) and ASEAN energy collaboration goals exist; however, they lack detailed roadmaps-especially for equitable access to energy and regional integration. Vietnam calls for international financial support and technology transfer but has defined no specific mechanisms and accountability for such support (Socialist Republic of Vietnam, 2022). Furthermore, strategies for energy security and climate resilience have not set out a clear path for users to equilibrate mitigation and adaptation actions, creating concern over how such markets would deal with intermittent renewable energy and the vagaries of the world energy market (*United Nations, 2015*).

c) Recommendations

The renewable energy framework in Vietnam needs to act toward setting quite specific, concrete goals alongside the reduction of fossil fuel reliance, energy security enhancement, and economic expansion in accordance with Decision No. 2068/QD-TTg and international commitments that the country has made.

Precise definitions and standards would, therefore, ensure consistent interpretations and applications, and set measurable targets as a means of establishing accountability and in efforts of evaluations in terms of progress. Incentives like tax breaks, grants, and soft funds are necessary to pull in investments, notably for small enterprises and rural-based projects.

Streamlining land usage and infrastructure development, especially support of rooftop solar installations, also encourages the proper development of projects (Vietnam Communist Party Central Committee, 2020). Solid regulatory frameworks, such as independent oversight bodies, strict environmental impact assessments, and harsh enforcement of compliance, will ensure quality and sustainability of a project.. Public awareness through participatory monitoring processes strengthens transparency, accountability, and community involvement. Finally, policy flexibility, in its periodic reviews and allowance for adaptability to the new developments in technology and market particulars, is going to empower Vietnam in responding to changing technologies and markets and serve its interests further curb national competitiveness and resilience in the renewable energy sector.

To speed up the acceptance of various renewable energy sources, targeted incentives should be introduced across emerging sectors. With respect to biomass, these could include feed-in tariffs, subsidies for advanced processing technologies, and carbon credit schemes to encourage more effective economic implementation. Exploration grants, tax holidays,

and infrastructure support for accommodating remote areas would support geothermal energy development. Ocean energy, such as tidal and wave power, would benefit from R&D funding, a reduction of import duties on equipment for special scientific studies, and an expediting of various permit requirements in demonstration zones. In view of small hydropower, it would be more prudent to provide incentives focusing on rural electrification grants, community ownership programs, and environmental offset credits. For emerging technologies, this includes biofuels and hydrogen as possible alternative fuels in the energy mix, and will require pilot project funding, indices of advanced R&D activities that relate to tax incentives and subsidizing clean fuels infrastructure. Cross-cutting measures, including renewable energy bonds, workforce training programs, and trading in green certificates, will fill up the general framework towards promoting renewable energies for sustainable development and innovation.

3.4. Financial mechanisms for promoting renewable energy development

a) Financial mechanisms used/usable from the policy

The policy provides for a variety of investment incentives. These incentives take the form of tax benefits, including preferential corporate income tax rates and exemptions from import duties on renewable energy equipment, along with exemptions from land rent and priority access to land for legitimate projects. There are also opportunities for green financing coming from national and international funds. Feed-in tariffs (FITs) for renewable energy projects and simplified power purchase agreements will be offered to power projects. Another incentive includes granting priority in connecting renewables to the grid and expediting the licensing process. Additionally, Just Energy Transition Partnership plays a key role to promote renewable energy transition by assisting Vietnam financially, technologically, and through policy support to ensure that energy transition is sustainable and equitable. Other supported sectors include R&D, energizing technologies such as energy storage, green hydrogen, and floating offshore wind, and working with international development agencies to attract foreign direct investment.

Green bond management falls under the support of the Ministry of Finance, which formulates regulatory architecture for issuance, and the Vietnam Development Bank, which channels funds to renewable energy and climate-resilient projects. State-owned agencies such as Vietnam Electricity may issue green bonds for projects such as grid extension; international groups, such as the Asian Development Bank, assist commercial banks in financing and maintaining conformity with green bond standards. Green bonds essentially

facilitate financing of solar, wind, biomass and grid modernization projects, hence enhancement of energy efficiency.

For public-private partnership (PPP) projects, the Ministry of Planning and Investment coordinates and regulates them, while the Ministry of Industry and Trade oversees the energy generation and transmission initiatives under the PDP8. Smaller projects are subject to approval from provincial authorities, while the state-owned entities, including EVN, often engage in the provision of proactive support to projects in pre-existing infrastructure. The private sector provides funding, technical expertise, and international agencies such as the International Finance Corporation provide co-financing and risk guarantees. These PPPs would usually be oriented towards large-scale renewable energy projects, grid modernization, local generation of electricity.

b) Regulatory stringency

The PDP8 of Vietnam earmarks ambitious renewable energy targets. By 2030, renewables, other hydropower, are expected to account for 30-39% of the total installed operational capacity and will reach 47-50% by 2050. Solar energy should contribute 13,000 to 15,000 MW by 2030 with a hugely accelerated target of 168,594 MW by 2050, inclusive of off-grid systems for rural access. Wind energy targets include 21,880 MW of onshore capacity by 2030 and 6,000 MW offshore, before expanding to 91,377 MW by 2050. Biomass and WTE are forecast to generate 2,270 MW by 2030 and 6,015 MW by 2050. Hydropower is to be kept at 18,346 MW by 2030 with an emphasis on optimization. Finally, coal thermal power capacity is to be capped at 30 GW by 2030 and phased out by 2050 in line with a transition to sustainable energy.

The PDP8 has numerous vague and ambiguous goals that need to be clarified. While renewable energy capacity targets are visible on the surface, the distribution of renewables over such sectors as industrial, residential, transportation, etc. is not clear, leading to uncertainty as to what role renewables play in industrial electrification or electric vehicle infrastructure development. In terms of planning, it is essential to develop specific strategies for each sector to distribute renewable energy, with a focus on electrification and electric vehicle (EV) infrastructure. The integration of smart grids will optimize the flow of renewable energy and facilitate the connection of electric vehicles to the grid. Simultaneously, it is important to ensure the large-scale deployment of EV charging stations powered by renewable energy. Regarding regulatory, it is necessary to establish policies to promote the use of renewable energy in transportation and support the development of electric vehicle infrastructure. Energy efficiency standards for the transport sector also need to be

established to prioritize the use of renewable energy. In addition, it is important to regulate the expansion of electric vehicle charging infrastructure and ensure its connection to renewable energy sources.

Offshore wind development targets are ambitious, although specific steps and plans beyond 2030 cannot be identified, contributing to gaps in planning for future expansion. Policy refers to the potential of green hydrogen, albeit without any potential range or timelines; mention is made about the criticality of energy storage as an option, although there are no targets or strategies put forth in that direction. Financial mechanisms such as green bonds and PPPs receive positive traction, but no projections or commitments were provided for their funding. Lastly, small-scale solar support and the off-grid solutions were indicated to be part of the plans, yet microgrid development did not have targets. Finally, a considerable amount of emphasis is placed on job creation in the renewable energy sector, yet measurable goals directed toward training and employment of the workforce do not exist.

c) Recommendations

Vietnam is expected to face significant challenges in its energy infrastructure that are likely to pose barriers in the successful implementation of the PDP8. The country has an outdated energy grid that is unequipped to integrate large-scale renewable energy sources, which results in renewable energy curtailment, transmission bottlenecks, and unreliable service- especially in rural areas (CRES Consultation workshop, 2024). Energy storage solutions are also underprovided, large-scale battery storage is almost non-existent, and the policies incentivizing their deployment are rather ineffective. There are multiple barriers to offshore wind energy, a key component of the plan, including a shortage of port facilities, complex transmission infrastructure, and a poor local supply chain. Rapid urbanization and industrial demand are straining the grid while remote areas still lack access to reliable energy (Vu Duc Quang, 2021). Delays caused by complicated procedures for obtaining construction permits and local opposition further delay transmission line construction. Investment requirements are a major challenge to the integration of smart grid technologies, whilst availability of skilled labor is also very limited. LNG infrastructure, crucial to the transition from coal, suffers from a lack of storage capacity and insufficient pipeline networks. Cross-border energy trade faces a barrier from lack of transmission infrastructure and the ever-present political complexities with neighboring countries (IEA, 2019). Added to this, the vulnerability of its energy systems to extreme weather events and insufficient climate-resilient infrastructure remains a challenge for their resilience against climate change (Nor, 2019).

The key actions to tackle the energy infrastructure challenges in Vietnam and accomplish the goals of the PDP8 would be modernization of grids, where investments are to be made in high-voltage transmission lines, digital grid systems, and energy storage together with smart grid technologies. As mentioned in the government's Decree on rooftop solar power development, energy storage solutions should have tax credits or subsidies as inducements, while affordable storage technology further research should be initiated (Huyen My, 2024). In the end, what matters is the improving energy access through decentralization entirely, for instance rooftop solar installations, microgrids, and more community-based energy solutions. Increase stakeholder participation to reduce public opposition as well as speed up administrative processes such as land acquisition and permitting for transmission projects to avoid delays. Establish dedicated port infrastructure and supply chains as well as cooperative engagements with international organizations to fund recently developed underwater transmission infrastructure-all these things will push for an offshore wind extension. Planning for energy infrastructure must incorporate climate resilience by utilizing climate-adaptive materials and designs, especially in areas that are vulnerable to flooding and coastal erosion regions. Thirdly, regional cooperation should be consolidated through more cross-border energy trade agreements and interconnector investment to achieve unimpeded power exchange with neighbor regions. (*Minh Ha-Duong, 2024; Melissa Brown, 2021*).

Among its many challenges that require strategic diversification, Vietnam's renewable energy sector has strong potential. Despite being based on agriculture, biomass energy remains underutilized. Opportunities remain with advanced conversion technology and non-edible feedstocks. Cleaner technologies like anaerobic digestion provide a solution to the environmental issues and high costs that impede WTE operations. Hydropower is rafting towards saturation with its quest for development into small-scale and micro-hydropower projects, along with pumped-storage ones. Offshore wind has targets that are higher but needs investments in floating wind technology and international partnerships (Global Wind Energy Council [GWEC], 2022; International Renewable Energy Agency [IRENA], 2024). Solar energy is usually successful through ground-mounted systems, but there needs to be more rooftop and floating solar so that the grid does not stay congested (Ngoc Minh, 2023). Geothermal energy remains untouched because it is too costly and has very little support when it comes to policies. Several pilot projects for targeted exploration may unlock the potential. Tidal energy and wave energy are just developing and would benefit from research and development and working together to further understand Vietnam's coastal resources. Finally, green hydrogen is indicated in the PDP8 but is currently deterred by very high production costs and a lack of infrastructure. However, the potential for green hydrogen

can be tapped through oodles of renewable energy and its application in some industries, such as steel and ammonia production (*Brown M., 2021*).

The public involvement mechanisms through which Vietnam can enhance its transition to renewable energy are diverse. First, it could stage national and local ideal-oriented education campaigns on renewable energy, climate change, and energy efficiency via television, social media, and school curricula. This would proceed by way of inspiration drawn from Denmark and Germany in educating their populations about renewable resources. Second, developing community-based renewable energy projects such as solar microgrids in rural areas could promote the ownership of energy access within these communities, as proved by successful examples in Germany and Kenya. Public consultations and participation in energy planning can make the developments transparent and reduce conflicts as they have been seen in Norway and Canada. Also, create incentives through subsidies and tax rebates for energy-efficient appliances and renewable energy systems to behavior change in the Netherlands and Japan. Digital platforms or mobile apps can further engage the general public in real-time electricity consumption tracking, feedback on policy, and participation in energy-saving challenges as seen in the case of Estonian and South Korean systems. Finally, create collaborative policy design by involving civil society organizations, NGOs, and industry stakeholders to ensure inclusive energy policies, such as those established in Sweden and India. Together, these strategies can deepen Vietnam's technological renewable energy undertaking with broad public participation and support participatory engagement in energy decisions among its diverse populace.

3.5. Vietnam's renewable energy development policy compared to regional policy benchmarks

a) ASEAN Plan of Action for Energy Cooperation and ASEAN Economic Community Blueprint 2025

Decision No. 2068/QD-TTg is intending for renewable energy to account for 15-20% of Vietnam's total primary energy supply by 2030, while Decision No. 500/QD-TTg calls for the road towards achieving 70% renewable energy capacity by 2050. ASEAN Plan of Action for Energy Cooperation (APAEC) is helpful for these goals as this includes initiatives within such as ASEAN Power Grid project that facilitates cross-border renewable energy trading and grid integration, and the ASEAN Renewable Energy Targets that will collectively attain 23% of renewable energy share in the primary energy supply of ASEAN by 2025. Vietnam might be

looking at APAEC to put emphasis on developing solar, wind, and biomass technologies with regional cooperation and joint research initiatives. The PDP8 now turns to the development of smart grids for effective integration of renewable energy. APAEC provides support to Vietnam under Decision No. 2068/QD-TTg and the PDP8 to attract the private sector's investment and knowledge sharing thus helping the country realize its ambitious targets in renewable energy and to contribute towards the regional energy security and sustainability of ASEAN (*ASEAN Secretariat, 2015*).

The Asean Economic Community Blueprint 2025 highlights sustainable economic growth through regional integration and energy sustainability, particularly through support for initiatives under the APAEC, Phase II: 2016-2025. Some of the targeted interventions are trade and investment facilitation for renewable energy technologies, improving energy efficiency, and the development of regional frameworks for green finance. Bringing advanced technologies into Vietnam focuses on gaining a technological edge, building capacity in renewable energy project development, and utilizing ASEAN-wide initiatives to address Vietnam's core needs for achieving its renewable energy and emissions reduction goals, bridging the gaps identified in Decision No. 2068/QD-TTg (*ASEAN Centre for Energy, 2015*).

b) Thailand's Power Development Plan 2015-2036

The PDP8 of Vietnam and Thailand's PDP 2015-2036 are comparable in a number of ways, including how they handle energy planning and the promotion of renewable energy. While the PDP of Thailand targets a 30% renewable energy capacity by 2036, the PDP8 of Vietnam given a target of approximately 70% renewable capacity by 2050. These plans simultaneously prioritize further modernization of the respective power grid systems to be able to accommodate the variable renewable energy sources, such as solar and wind as well as promoting development of smart grids for stability and efficiency. Moreover, both countries are interested in promoting energy cooperation between them at the regional level while encouraging private sector investment and new innovative technologies to meet the long-term goals envisioned in sustainability and climate initiatives (*Energy Policy and Planning Office, 2015*).

c) Japan's Basic Energy Plan (2021)

The basic energy plans of Japan in 2021 and the renewable energy goals of Vietnam treat the same issues in many ways directly, especially in boosting renewable energy adoption, as required by their respective policies in reducing carbon emissions and promoting sustainability. Japan's Basic Energy Plan set ambitious renewable targets, specifying that renewables would account for 22-24% of the nation's power mix by 2030, with a strong emphasis on solar, offshore wind, and biomass growth. Likewise, in setting out the renewable energy targets for Vietnam, Decision No. 500/QĐ-TTg, along with the supporting policies, reveals the aspiration for a marked increase in renewable sources for electricity generation compatible with climate objectives. Both plans emphasize the need for further development in solar and wind energy.

While Japan is looking to add solar capacity with the introduction of next-generation photovoltaics and floating wind technology, Vietnam is also extending investments in solar energy, especially through its Solar Power Development Program and other incentives to stimulate growth. Japanese integration of renewables into the energy market will be done through policy-driven market reforms such as a bidding system and long-term price targets. However, for comparison, Vietnam took the same direction with its FIT system to encourage renewable investment. Therefore, these plans emphasize technology, innovation, and regulations as important transition avenues toward a cleaner and renewable energy future. These demonstrate the strong regional and international trend toward enforcing global climate commitments (*Agency for Natural Resources and Energy, 2021*).

d) EU's policies

EU policies and Vietnam's renewable energy goals are aligned with each other to increase the share of renewable energy and to mitigate climate change. Similarly, both focus on increasing solar, wind, and biomass energy, where the EU Renewable Energy Directive has set a target of 32% of renewables by 2030, while Vietnam aims to have 15-20% of primary energy from renewables by 2030. It can also be stated that the EU Green Deal and the Vietnam's LEP 2020 have been set to achieve carbon neutrality; the latter aims at emission reduction as well as a call for sustainable development of energy. Furthermore, there is an acknowledgment of the requirement felt by green financing in both regions for supporting renewable energy projects: through the EU Green Deal Investment Plan that mobilizes investments, and in Vietnam, attracting private sector investment in clean energy (*European Commission, 2024*).

4. Conclusions

Vietnam's energy policy is geared towards a clean energy transition as well as to reduce reliance on fossil fuels. The Government has issued numerous policies to support renewable energy development, such as REDS, and the PDP8, in which priority is given to wind power and solar power projects. However, there are no specific guidelines to harmonize renewable energy development with environmental protection goals, or criteria to select environmentally friendly renewable energy projects.

This study focuses on evaluating Vietnam's environmental management policy as it relates to renewable energy development. The findings show that renewable energy and environmental policies have begun to be more closely linked, reflecting efforts towards sustainable energy development. Although policies to support the development of renewable energy have been issued, there is still a lack of strict environmental management criteria to control potential negative impacts on natural resources and ecosystems, especially in wind power development projects, solar power. There are no specific criteria for land and water use area, deforestation rates for wind, solar, and hydropower projects, or criteria for selecting project sites to avoid areas of high biodiversity, important wetlands, and important natural landscapes. The findings also point out that renewable energy projects, especially wind and solar, can have significant environmental impacts due to large areas in terms of land or water use requirements and infrastructure changes.

Ineffective land management can lead to unsustainable use of resources, negatively impacting the environment, disrupting ecosystems, and possibly deteriorating natural landscapes. In addition, the rapid development of renewable energy projects has caused an overload for transportation and the power grid. Yet environmental protection policies have not been implemented synchronously with renewable energy development policies. Regulations on screening investment projects, preliminary environmental impact assessment, and environmental impact assessment have not been fully and effectively implemented in some localities.

Vietnam's environmental management policy has made significant progress in protecting the environment and promoting the development of renewable energy. While Vietnam has made strides in renewable energy development, its environmental management policies concerning renewable energy projects still faces significant challenges: (i) it lacks specific standards and regulations to monitor and manage pollution from renewable energy projects; (ii) there are significant gaps in its monitoring and supervision mechanisms.; and (iii) it lacks risk mitigation measures. Some renewable energy projects can have negative

impacts on the ecological and environmental aspects, such as affecting the ecosystem and the lives of local communities, land and water surface occupation. This requires measures to mitigate impacts and ensure community participation in the project development process.

To support sustainable energy transition, Vietnam's environmental management policy needs to (i) develop and improve specific regulations and standards to monitor and manage pollution from renewable energy projects; (ii) develop effective monitoring and inspection mechanisms to minimize environmental pollution and ensure that renewable energy projects comply with environmental regulations; (iii) ensure that renewable energy projects do not cause negative impacts on the local environment and the lives of local communities. This requires programs to support impact mitigation and ensure community participation in the project development process.

Bibliography

AGENCY FOR NATURAL RESOURCES AND ENERGY. (2023). *FY2021 Energy Supply and Demand Report (Revised Report)*. Ministry of Economy, Trade and Industry, Japan. https://www.meti.go.jp/english/press/2023/0421_003.html

ASEAN CENTRE FOR ENERGY. (2015). *ASEAN Energy [Report]*. ASEAN Centre for Energy. Retrieved from https://aseanenergy.org/publications/asean-energy/

ASEAN CENTRE FOR ENERGY. (2017). *ASEAN power grid: Integration and cooperation to ensure energy security and sustainability*. Jakarta: ASEAN Centre for Energy. https://aseanenergy.org/publications/asean-power-grid-integration-and-cooperation/

ASEAN SECRETARIAT. (2015). *ASEAN Plan of Action for Energy Cooperation (APAEC) 2016–2025: Enhancing regional energy security and sustainability*. Jakarta: ASEAN Secretariat. https://asean.org/storage/2017/02/ASEAN-Plan-of-Action-for-Energy-Cooperation-2016-2025.pdf

BROWN, M. (2021). Why corporate credit ratings agencies shy away from climate risks: An interview with Melissa Brown, IEEFA. *Energy Tracker Asia*. https://energytracker.asia/why-corporate-credit-ratings-agencies-shy-away-from-climate-risks-an-interview-with-melissa-brown-ieefa/

CLAUSEN, A., VU, H. H., & PEDRONO, M. (2010). An evaluation of the environmental impact assessment system in Vietnam: The gap between theory and practice. *Environmental Impact Assessment Review, 30*(5), 252-259. https://doi.org/10.1016/j.eiar.2010.04.008

DEPARTMENT OF ENVIRONMENT. (2024). *Legal services to support community accountability and facilitate remedies for affected populations.*

EUROPEAN COMMISSION – DIRECTORATE GENERAL FOR ENERGY. (2024). *State of the Energy Union Report 2024: A stronger, greener and more secure Energy Union (COM/2024/404 final)*. Publications Office of the European Union. https://energy.ec.europa.eu/publications/state-energy-union-report-2024_en

GLOBAL WIND ENERGY COUNCIL. (2022). *Floating offshore wind – a global opportunity*. GWEC. Retrieved from https://gwec.net/gwec-news/report-outlines-enormous-potential-for-floating-offshore-wind-in-energy-transition

GLOBAL WIND ENERGY COUNCIL. (2022, March 11). *Floating offshore wind – A global opportunity*. GWEC. https://gwec.net/gwec-news/report-outlines-enormous-potential-for-floating-offshore-wind-in-energy-transition

HA-DUONG, M. (2024). Vietnam at the dawn of its energy transition. *Mondes en développement, 2024*(1), 115–136. https://doi.org/10.3917/med.205.0115

HUYEN MY (2024). Thứ trưởng Nguyễn Hoàng Long chủ trì Hội nghị phổ biến Nghị định 135/2024/NĐ-CP phát triển điện mặt trời mái nhà [*Deputy Minister Nguyen Hoang Long chairs conference to disseminate Decree 135/2024/ND-CP on rooftop solar power development*]. E-Magazine of Industry and Trade. Retrieved from https://tapchicongthuong.vn/thu-truong-nguyen-hoang-long-chu-tri-hoi-nghi-pho-bien-nghi-dinh-135-2024-nd-cp-phat-trien-dien-mat-troi-mai-nha-129263.htm

INTERNATIONAL ENERGY AGENCY (IEA). (2019). *Integrating power systems across borders*. IEA Publications. Retrieved from https://www.iea.org/reports/integrating-power-systems-across-borders

INTERNATIONAL RENEWABLE ENERGY AGENCY. (2024). *The role of offshore wind in the energy transition*. IRENA. https://www.irena.org/digital-content/digital-story/2024/jul/the-role-of-

offshore-wind-in-the-energy-transition/detail

INTERNATIONAL RENEWABLE ENERGY AGENCY. (2024). *The role of offshore wind in the energy transition*. IRENA. Retrieved from https://www.irena.org/Digital-content/Digital-Story/2024/Jul/The-Role-of-Offshore-Wind-in-The-Energy-Transition/detail

JOHNSON, F. X., & LAMBE, F. (2009). *Energy access, climate and development*. Commission on Climate Change and Development. Retrieved from https://www.sei.org/publications/energy-access/

LYU, R., ARISIAN, S., LI, Z., TASKHIRI, M. S., & KIANI MAVI, R. (2024). The role of agricultural biomass in supply chain decarbonization. *Annals of Operations Research*, 1-22. https://doi.org/10.1007/s10479-024-05979-6

MADIBEKOV, A., ISMUKHANOVA, L., OPP, C., SULTANBEKOVA, B., ZHADI, A., ZHUMATAYEV, S., & MADIBEKOV, A. (2024). Plastic pollution in the aquatic ecosystem of the high-mountain Lake Markakol (Kazakhstan): First observations and conclusions. *Applied Sciences*, *14*(18), 8460. https://doi.org/10.3390/app14188460

MINISTRY OF ENERGY & ENERGY POLICY AND PLANNING OFFICE. (2015). *Thailand Power Development Plan 2015 2036 (PDP2015)*. Energy Policy and Planning Office. Open Development Mekong.

MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT OF VIETNAM. (2022). *National report on the status of environmental pollution and environmental protection activities in 2022*. Hanoi: Ministry of Natural Resources and Environment. Retrieved from https://monre.gov.vn/

NATIONAL ASSEMBLY OF THE SOCIALIST REPUBLIC OF VIETNAM. (2020). *Law on Environmental Protection 2020 (Law No. 72/2020/QH14)*. Retrieved from https://vbpl.vn/TW/Pages/vbpq-toanvan.aspx?ItemID=147326

NEPAL, R., & PAIJA, N. (2019). A multivariate time series analysis of energy consumption, real output and pollutant emissions in a developing economy: New evidence from Nepal. *Economic Modelling*, *77*, 164–173. https://doi.org/10.1016/j.econmod.2018.05.023

NGỌC MINH. (2023). *Tín hiệu tích cực từ điện mái nhà [Positive signals from rooftop solar]*. Đại đoàn kết Online. Retrieved from https://daidoanket.vn/tin-hieu-tich-cuc-tu-dien-mai-nha-10254890.html

NGUYỄN ANH TUẤN. (2023). Đánh giá tiềm năng, dự báo phát triển điện địa nhiệt trên thế giới và Việt Nam [Assessment of potential, development forecast of geothermal power in the world and Vietnam]. *Vietnam Energy*. Retrieved from https://nangluongvietnam.vn/danh-gia-tiem-nang-du-bao-phat-trien-dien-dia-nhiet-tren-the-gioi-va-viet-nam-31139.html

NOOR, R. (2019). Transitioning sustainability through cross-border energy trade in South Asia. *MIT Climate*. Retrieved July 17, 2025, from https://climate.mit.edu/posts/transitioning-sustainability-through-cross-border-energy-trade-south-asia

SOCIALIST REPUBLIC OF VIETNAM. (2022). *Nationally determined contribution (NDC) (Updated in 2022)*. Ha Noi, Vietnam. Retrieved from https://unfccc.int/documents/622541

VIETNAM COMMUNIST PARTY CENTRAL COMMITTEE. (2020). *Nghị quyết số 55-NQ/TW của Bộ Chính trị về định hướng Chiến lược phát triển năng lượng quốc gia của Việt Nam đến năm 2030, tầm nhìn đến năm 2045* (Resolution No. 55-NQ/TW of the Politburo on the orientation of the national energy development strategy of Vietnam until 2030, with a vision to 2045). Hà Nội: Đảng Cộng sản Việt Nam. https://tulieuvankien.dangcongsan.vn/Uploads/2020/2/7/27/55-NQ-phat-trien-nang-luong-quoc-gia.pdf

VŨ ĐỨC QUANG. (2021). Lượng tái tạo và vấn đề tích hợp hệ thống điện: Kết luận, kiến nghị (*Renewable Energy and the Issue of Grid Integration: Conclusions and Recommendations*). In *the proceedings of the "Vietnam Clean Energy Development" seminar* (organized by the Electric Power Construction Consulting Joint Stock Company 2, on April 16, 2021). Training and Research Center for Development - PECC2. Retrieved at https://nangluongvietnam.vn/nang-luong-tai-tao-va-van-de-tich-hop-he-thong-dien-tam-ket-ket-luan-kien-nghi-26707.html

WANG, J., & AZAM, W. (2024). Natural resource scarcity, fossil fuel energy consumption, and total greenhouse gas emissions in top emitting countries. *Geoscience Frontiers, 15*(2), 101757. https://doi.org/10.1016/j.gsf.2023.101757

WORLD ECONOMIC FORUM. (2012). *Global Energy Architecture Performance Index Report 2012*. Retrieved from https://www.weforum.org/reports/global-energy-architecture-performance-index-report-2012

WORLD HEALTH ORGANIZATION (WHO). (2021). *Legal services to support community accountability and facilitate remedies for affected populations*. World Health Organization.

List of acronyms and abbreviations

ASEAN	Association of Southeast Asian Nations
APAEC	ASEAN Plan of Action for Energy Cooperation
EIA	Environmental Impact Assessment
EU	The European Union
FIT	Feed-in Tariffs
GHG	Green House Gas
LEP 2020	Law on Environmental Protection 2020
PDP	Power Development Plan
PDP8	National Power Development Plan for the period 2021-2030, vision to 2050
PPP	Public-Private Partnerships
PEIA	Preliminary Environmental Impact Assessment
MW	Megawatt
NGO	Non-Government Organization
SDG	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SME	Small and Medium Enterprises
REDS	Renewable Energy Development Strategy to 2030 with vision to 2050
VNU-CRES	VNU - Central Institute for Natural Resources and Environmental Studies
WHO	World Health Organization
WTE	Waste-To-Energy

Appendix

A.1. Regulations on SEA, PEIA and EIA for energy development projects

The table below summarizes the legal requirements for three types of environmental assessments—SEA (Strategic Environmental Assessment), PEIA (Preliminary Environmental Impact Assessment), and EIA (Environmental Impact Assessment) in energy development projects.

Table A.1.: Regulations on SEA, PEIA and EIA for energy development projects

SEA (Step 1)		PEIA (Step 2)		EIA (Step 3)
1. The subjects required to carry out SEA (specified in Article 5, LEP 2020): a) Energy development strategy. b) Energy master plan. c) PDP.		1. The subjects required to carry out PEIA (specified in Clause 1, Article 29, LEP 2020): Group I investment projects have a high risk of negative environmental impacts, including: a) Projects in the form of production, business, and services that have the risk of causing environmental pollution with large scale and high capacity. b) Projects in the type of production, business, and services that are at risk of causing environmental pollution with average scale and capacity but have		1. The subjects required to carry out EIA (specified in Article 30, LEP 2020): a) Group I investment projects specified in Clause 3, Article 28, the LEP, including: - Projects in the form of production, business, and services that have the risk of causing environmental pollution with large scale and high capacity. - Projects in the form of production, business, and services that are at risk of causing environmental

2. The implementation of SEA (specified in Article 26 of LEP 2020): a) Agencies and organizations assigned the task of establishing the strategy and plans mentioned above are responsible for SEA concurrent with the process of building such strategy and plans b) The strategy's SEA results are integrated in the strategy approval dossier. c) The results of the SEA of the planning are prepared in a separate report attached to the plan appraisal dossier. d) The agency in charge of plan appraisal is responsible for appraising the results of SEA during the plan appraisal process. The strategy approval		environmentally sensitive elements; the project does not belong to the type of production, business or service that has the risk of causing environmental pollution with large scale and capacity but has environmentally sensitive elements. c) Projects using land, water surface, and sea areas on a large scale or on a medium scale but with environmental sensitive elements. d) Projects to exploit water resources with large scale and capacity or with medium scale and capacity but with environmentally sensitive elements. e) Projects that require changing the purpose of land use on a medium scale or larger but have environmentally sensitive elements. f) Projects requiring large-scale immigration and resettlement. 2. Time to implement PEIA: PEIA is carried out during the stage of pre-feasibility study of construction investment, proposal of investment policy, request for approval of investment		pollution with average scale and capacity but have environmentally sensitive elements; The project does not belong to the type of production, business or service that has the risk of causing environmental pollution with the large scale and capacity but has environmentally sensitive elements. - Projects using land, water surface, and sea areas on a large scale or on a medium scale but with environmentally sensitive elements. - Projects exploiting water resources with large scale and capacity or with medium scale and capacity but with environmentally sensitive factors. - Projects that require changing the purpose of land use on a medium scale or larger but have environmentally sensitive factors. - The project requires large-scale immigration and resettlement.

agency is responsible for reviewing the SEA results during the approval process. e) The Ministry of Natural Resources and Environment shall give written opinions on the contents of the Strategic Plan for the strategy and planning.f) The Ministry of Natural Resources and Environment has written opinions on the content of SEA for strategy and plan. 3. Content of SEA report (stipulated in Article 27 of the LEP and Form No. 01, Appendix II, Circular No. 02/2022/TT-BTNMT).		policy for investment projects subject to request for decision or approval of investment policy according to the provisions of law on investment, public investment, investment in the form of public-private partnership, and construction. 3. The content of PEIA report includes: a) Evaluate the compatibility of the location of the investment project with the National Environmental Protection Strategy, National Environmental Protection Planning, environmental protection content in regional planning, provincial planning and other relevant planning. b) Identify and forecast the main environmental impacts of investment projects on the environment based on scale, production technology and project implementation location. c) Identify environmentally sensitive factors of the area where the investment project will be implemented according to location options. d) Analyze, evaluate and select options for scale, production technology, waste treatment technology,		b) Group II investment projects specified in Points c, d, đ and e, Clause 4, Article 28, the LEP: - Projects using land, land with water surface, and sea areas on a medium scale or on a small scale but with environmentally sensitive elements. - Projects exploiting water resources with medium scale and capacity or with small scale and capacity but with environmentally sensitive elements. - The project requires changing land use purposes on a small scale but has environmentally sensitive elements. - The project requires migration and resettlement on a medium scale. c) The above objects belonging to urgent public investment projects according to the provisions of Law on Public Investment are not required to carry out EIA. 2. Implementing EIA (Article 31, the LEP):

		investment project location and measures to minimize environmental impacts. e) Identify main environmental issues and scope of impact on the environment that need attention during the EIA implementation process. 4. Agencies must implement PEIA: Agencies, organizations and individuals that propose investment projects given under the provisions mentioned above must implement PEIA. The PEIA content is reviewed by the competent state agency at the same time as the application for decision or approval of the investment policy.		a) EIA is carried out by the investment project owner himself or through a qualified consulting unit. EIA is performed concurrently with the process of preparing a feasibility study report or a document equivalent to the project's feasibility study report. b) EIA results are expressed in a EIA report. c) Each investment project prepares an EIA report. 3. EIA report content (stipulated in Article 32, LEP and Form No. 04, Appendix II, Circular No. 02/2020/TT-BTNMT).

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