



NDC ASPECTS

Country Report

Transition pathways for Vietnam

September 2024

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NDC ASPECTS has received funding from the European
Union's Horizon 2020 Research and Innovation
programme under grant agreement No 101003866



Key messages

- Vietnam's per capita greenhouse gas (GHG) emissions increased from 2.3 tCO₂e (carbon dioxide equivalents) in 2005 to 4.8 tCO₂e in 2021 by a factor of four, due to a significant increase in coal combustion and increased emissions from Land Use, Land-Use Change and Forestry (LULUCF), which started to turn positive in 2001.
- The power sector was responsible for 49% of all energy related CO₂ emissions in 2021, followed by industry (about 38%), and transport (12%).
- Vietnam raises the ambition of the 2030 target and commits to reduce its emissions by 15.8% (unconditional) and by 43.5% (conditional) by 2030 compared to a 'Business-As-Usual' (BAU) scenario. To achieve the more ambitious 'conditional' targets, Vietnam is calling for external financial support for mitigation technologies. The 'unconditional' are defined as targets that Vietnam can achieve without external financial support.
- Under the BAU scenario, GHG emissions increase by 57% from 528 MtCO₂e in 2020 (excluding LULUCF) to 927.9 MtCO₂e in 2030. The 43.5% GHG reduction (conditional) freezes emissions on 2021 level.
- The 'Eight Power Development Plan' (PDP8) represents the most important policy to increase renewable power generation and reduce the dependence from (partly imported) coal for power generation.
- Vietnam's total installed capacity of the power system is planned to increase from 80 GW in 2023 to 150 GW in 2030.
- The capacity of renewable sources (including wind, solar, and biomass) is expected to double from 21 GW (accounting for around 26.9% of the system) in 2023 to 42 GW (accounting for around 28.5% of the system) in 2030.
- A new rural electrification program aims to provide electricity to 2,478 small- and medium-sized pumping stations in the Mekong Delta region, while also extending electricity access to remote islands through national grid connections or renewable energy sources.
- Around 13 GW of planned new coal power plant capacity is cancelled under PDP8, but eleven new coal power plants with a capacity of 13 GW will still complete construction

Introduction and overview

Vietnam has a population of 98.8 million with a population density of 291 persons per km². Five Vietnamese cities have populations over 1 million: the two largest are Ho Chi Minh City with a population of 8.6 million and Hanoi with 7.8 million people; the remaining three cities with over 1 million people are Hai Phong, Da Nang, and Can Tho.

Vietnam has enjoyed a remarkable economic development during the past 30 years and has transformed from one of the poorest countries in the world to a lower-middle-income country¹. GDP per capita increased 6-fold in less than 40 years, from less than \$600 per person in 1986 to almost US\$3,700 (constant 2015 US\$) in 2022 (see Table 1 in the Annex). Poverty rates (US\$3.65/day, 2017 PPP) declined from 14% in 2010 to 4.2% in 2022. Annual economic growth is projected to reach 5.5 % in 2024, up from 5% in 2023, driven by increasing global demand and restored domestic consumer confidence. Real GDP growth is expected to strengthen in the next three years, reaching the pre-pandemic average by 2026. Growing at 2.5% to 3.5% per year over the past three decades, the agriculture sector has supported economic growth and ensured food security. It contributed 13 percent of GDP and 29 percent of employment in 2021².

Vietnam's energy supply is heavily dependent on fossil fuels. In 2021, 49% of total energy supply was coal, 24% oil and 6.6% natural gas, the renewable energy share was only 20%, half of which is from biomass and the remainder mainly from hydro. Vietnam has a significant domestic production of fuels; however, the country relies on energy imports, mainly coal and oil. In 2021, Vietnam's energy imports reached 34% of total energy supply.

While the renewable share of the primary energy supply is still low, solar photovoltaics (PV) and onshore and offshore wind power began to increase significantly in 2019. Renewable energies thus reached a 44.1% share of electricity generation in 2021. Vietnam has significant renewable energy potential, in hydro, bio energy and solar, and Vietnam's offshore wind potential is among the largest in South East Asia³. The World Bank estimates a total potential of 599 GW for offshore wind alone⁴.

Total energy related GHG emissions increased significantly between 2005 and 2020 by 337% and plateaued in 2021, while the population has increased by 19% since 2005. Further information on the current emission situation can be found in Table 2 in the Annex.

Vietnam's energy policy focuses on the power sector. On May 15, 2023, the Vietnamese government released Vietnam's Eight Power Development Plan (PDP8) for the period of 2021-2030, with a vision to 2050⁵. The release was severely delayed due to disagreements in the authorities regarding the country's future power mix, particularly the pace of the phase down of coal-fired power plants and the expansion of renewable energies. The PDP8 encompasses both the planning of Vietnam's future power sources and the planning of the transmission grid infrastructure, under the assumption that Vietnam's GDP will grow by 6.5% to 7.5% annually from 2021 to 2050.

¹ According to the World Bank definition, countries with a per capita GDP of around US\$ 2,200 are classified as "Lower middle income" countries.

² Worldbank 2024, Viet Nam, economic overview, online, assessed September 2024; <https://www.worldbank.org/en/country/vietnam/overview>

³ Teske, S., Morris, T., Nagrath, K (2019) 100% Renewable Energy for Viet Nam – A proposal for an economically and environmentally sustainable 8th Power Development Plan of the government of Viet Nam. Report prepared by ISF for the European Climate Foundation, The Netherlands, July 2019.

⁴ Offshore Wind – Technical Potential in Viet Nam, World Bank Group, 2019, <https://documents1.worldbank.org/curated/en/340451572465613444/pdf/Technical-Potential-for-Offshore-Wind-in-Vietnam-Map.pdf>

⁵ Vietnam's Eight National Power Development Plan (PDP8), Green Finance & Development Center, June 2023, <https://greenfdc.org/vietnams-eight-national-power-development-plan-pdp8/>

Key topics in the climate debate

Renewable energies are expanding rapidly due to their favourable economics and in 2021 12% of Vietnam's electricity supply is generated mainly in utility scale solar PV plant's while barely any roof-top PV have been installed on residential buildings due to unfavourable policies. However, in June 2024, a new policy was implemented that introduces new incentives for roof-top PV⁶.

While onshore wind generation slowly starts to gain ground in Vietnam's power market, the projects are still small and generate just over 1% of the electricity in the country. Offshore wind dominates the debate due to its large potential and the country's long coastline. The PDP8⁷ sets a target for onshore, nearshore, and offshore wind power.

The coal debate in Vietnam clearly dominates the energy debate. The significant delay of the PDP8 of over 2 years, was due to a debate around the future of coal. While the PDP cancels around 13 GW of planned coal power plant capacity, eleven new coal power plants with a capacity of 13 GW will still complete construction. Vietnam has increased its coal imports by 5500% between 2005 and 2021⁸ leaving the country dependent on 38.5% coal imports (primary energy supply).

In the transport sector, the fuel efficiency standards for vehicles currently under discussion are controversial due to the popularity of large pick-up trucks.

The transport sector contributed around 18% of Vietnam's total GHG emissions in 2021. Transport-related emissions will play an increasingly important role in the future and will have more than doubled to an estimated 89 million tons of CO₂e by 2030⁹. In 2022, the energy share of road transport for passenger and freight traffic was about 67.3% and 40.2% respectively¹⁰. Road motor vehicles in Vietnam are still growing rapidly to meet the growing demand in freight and passenger transport. From 2014 to 2018, the annual average growth rates of cars and motorcycles were 13.7% and 9% respectively¹¹.

Around 35% of Vietnam's GHG emissions are from non-energy-related GHG emitters, 15% of which are from industrial processes and 15% from agriculture. Both emissions are discussed in the Vietnam's NDC (2022 version¹²).

⁶ Vietnam's new rooftop PV policy 100% excess power capacity can be purchased, <https://www.energytrend.com/news/20240805-48105.html>

⁷ Power Development Plan 8, English translation available at <https://thuvienphapluat.vn/van-ban/EN/Thuong-mai/Decision-500-QD-TTg-2023-National-Electricity-Development-Planning-of-2021-2030/566836/tieng-anh.aspx>

⁸ International Energy Agency, IEA online data, accessed September 2024, <https://www.iea.org/countries/viet-nam/coal>

⁹ Jung Eun Oh, et al. (2019), Addressing Climate Change in Transport: Volume 1: Pathway to Low-Carbon Transport 2019: The World Bank and Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH.

¹⁰ GSO General Statistics Office of Vietnam (2023). <https://www.gso.gov.vn/en/statistical-data/>.

¹¹ Achieving a green energy transition in Vietnam's transport sector through electric mobility, Nov. 2023, SLOCAT Partnership, https://slocat.net/achieving-a-green-energy-transition-in-vietnams-transport-sector-through-electric-mobility/#_ftn2

¹² NATIONALLY DETERMINED CONTRIBUTION, (NDC), (UPDATED IN 2022), SOCIALIST REPUBLIC OF VIET NAM, https://unfccc.int/sites/default/files/NDC/2022-11/Viet%20Nam_NDC_2022_Eng.pdf, Ha Noi, October 2022

Key decarbonization pathways & related transformations

After several years of elaboration and consultation, Vietnam seems to have reached a politically feasible vision for its power sector that serves as a compromise between the coal-oriented national utility and decarbonisation-focused international partners. Nevertheless, it falls short of expectations in terms of environmental targets and harbours the risk of stranded assets. The future of coal in Vietnam is still controversial.

However, the PDP8 released in 2023, is a historical opportunity to chart the way towards a low-carbon power system for Vietnam, and avoid locking it in a high-carbon social structure. This section documents a technical and economic analysis of long-term energy and power development plans for Vietnam, carried out by the Institute for Sustainable Futures at the University of Technology Sydney (ISF-UTS) in cooperation with the Vietnam Initiative for Energy Transition (VIET).

The report *'RENEWABLE ENERGY FOR VIET NAM: A proposal for an economically and environmentally sustainable 8th Power Development Plan for the Viet Nam Government'*¹³ was published in 2019 as a direct contribution to the discussion for the PDP8. To undertake a sensitivity analysis of different energy system scenarios; all scenarios consider the same estimated growth in Vietnam's population and economy for the period up to 2050. The research consisted of a GIS-based mapping tool to assess Vietnam's potential for utility-scale solar PV, onshore and offshore wind; a long-term energy scenario model to develop mid- and long-term energy pathways and an analysis of Vietnam's power sector.

Scenario assumptions

The backbone of the analysis is a set of three original narratives for coal scenarios: the "OLD PLAN", "NEW NORMAL", and "FACTOR THREE". The first corresponds to the PDP7 revised (PDP7rev) plan. The second represents a possible development under current market forces with regard to the economics of renewable power generation. The third pathway describes what could happen if the government of Vietnam continues to steer the electricity system into an energy transition, decisively and without imposing high costs upon stakeholders.

- The **OLD PLAN** vision describes PDP7rev, updated to account for actual situational changes that have occurred since it was formulated. Other than coal, all projections for other energy supplies and demand parameters are also based on PDP7. This scenario is called the REFERENCE scenario.
- The **NEW NORMAL** vision is directed towards the power sector policy goal to provide an affordable and secure electricity supply within the next 10 years, under market forces that already prioritize investments in solar and wind generation rather than in fossil fuels.
- The **FACTOR THREE** vision is based on a broader policy goal: to decarbonize Vietnamese society within one generation, while meeting its economic development goals and reducing the energy sector's emissions by a factor of three by the middle of the century.

These three coal pathways were complemented with assumptions about the possible development of renewable electricity and energy efficiency, to define one reference and two alternative energy-system scenarios:

- REFERENCE combines the coal pathway "OLD PLAN" with the existing plans.

¹³ Teske, S., Morris, T., Nagrath, K (2019) 100% Renewable Energy for Viet Nam – A proposal for an economically and environmentally sustainable 8th Power Development Plan of the government of Viet Nam. Report prepared by ISF for the European Climate Foundation, The Netherlands, July 2019, <https://www.uts.edu.au/sites/default/files/article/downloads/Teske-Morris-Nagrath-2019-Renewable-Energy-for-Viet-Nam-report.pdf>

- RENEWABLES 1 (RE1) combines the coal pathway “NEW NORMAL” with a higher level of renewables and energy efficiency.
- RENEWABLES 2 (RE2) has an earlier coal-phase-out horizon, “FACTOR THREE”, and therefore increases the introduction of renewable power generation faster than RE1. It assumes the same energy efficiency projections as RE1. A higher electrification rate, especially for the transport sector, is also assumed.

Summary – overall energy system and GHG emission pathway

Figure A shows the final energy demand per sector, gross power demand, and primary energy supply for the three calculated scenarios REFERENCE (VN-REF), RENEWABLES 1 (VN-RE1) and RENEWABLES 2 (VN-RE2). The VN-RE2 leads to a share of 88% renewable final energy by 2050, 95% of the electricity would be supplied by renewable-based power generation. Solar PV and offshore wind dominate the power generation by 2050.

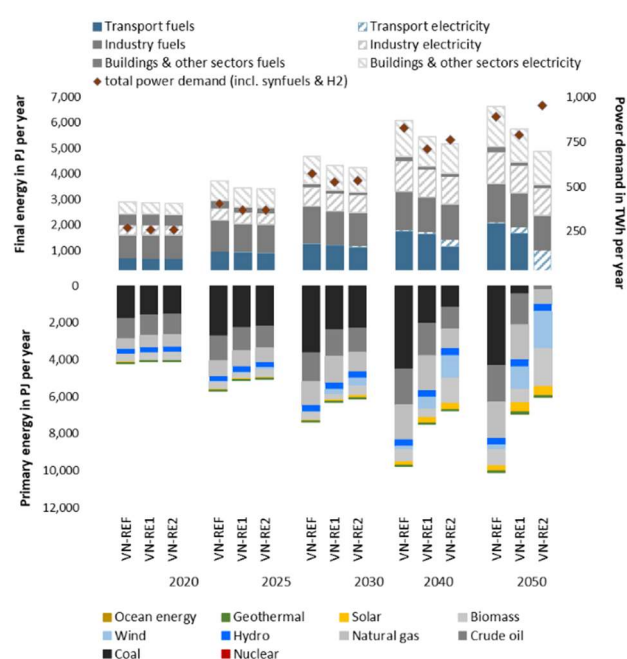


Figure A: Final energy demand per sector, gross power demand (upper panel), and primary energy supply, incl. non-energy use (bottom panel) in three scenarios

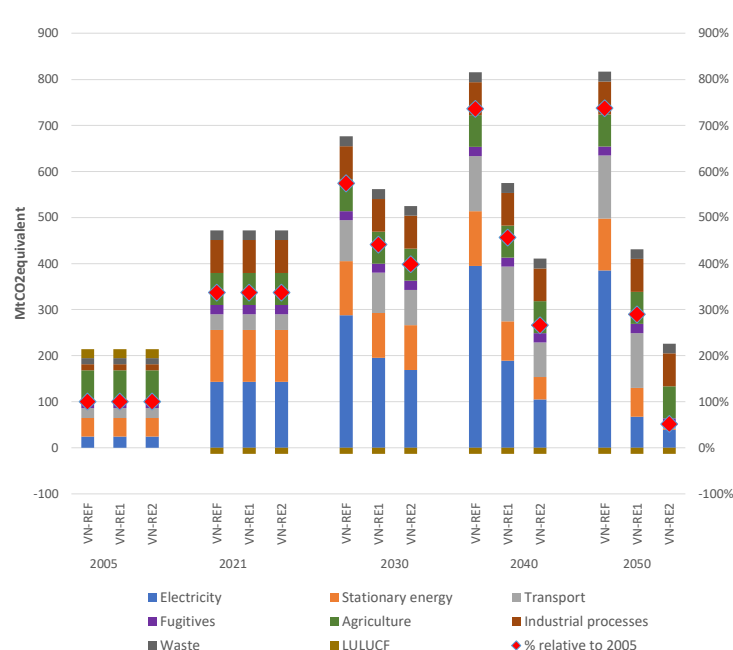


Figure B: Emission profile per sector and scenario: absolute GHG emissions (bars, left axis) and relative CO₂ reduction in percent compared to 2005 (red dots, right axis)

Figure B shows the development of GHG emissions by sector and the relative CO₂ reduction in percent (right axis) to 2005. The energy-related emissions are projected to decrease under both RE-pathways in comparison to 2021, while the REF scenario will increase energy related CO₂ emissions further. Vietnam’s energy-related CO₂ emissions would increase to over 511 million tons by 2030 under the REF scenario, and 396 million tons under the RE1 scenario, while the population increases from 94 to 106 million people in the same period. The pathways of the RE2 scenario will almost decarbonize the industry and transport sectors, whereas the energy sector will remain responsible for 49 million tons of CO₂ by 2050, mainly due to gas-based process heat and power generation. The emissions in 2030 are already 30% lower in RE2 than in the REF scenario. The PDP8 – as agreed in 2023 – will lead to emissions slightly higher than calculated in VN-RE1. Figure B also shows that non-energy GHG especially from agriculture and LULUCF decrease, however, the detailed analysis was not part of the research. This estimation is based on Vietnam’s commitment to achieve net-zero in 2050 (see NDC 2022).

Sectoral system transformations – demand side

In addition to the data for the sectoral system transformations provided in the annex, this section summarizes the key measures required to implement the 1.5°C decarbonization pathway for the demand side of the key industry sectors in Vietnam.

Vietnam National Energy Efficiency Program (VNEEP)

The Vietnam National Energy Efficiency Program started in 2006¹⁴. The last program, VNEEP III, started in March 2019 (VNEEP III 2019)¹⁵ and has a target of 10% total energy savings, equivalent to 2,512 PJ, between 2019 and 2030. The specific objectives for VNEEP III are to:

1. Achieve energy savings of 8%–10% compared with the total national energy consumption for the 2019–2030 period;
2. Reduce power losses in transmission to < 6.0%;
3. Increase energy efficiency in various industrial sectors, with the following energy demand reduction targets:
 - a. steel industry: 5.00%–16.50% (depending on the product type and production technology);
 - b. chemical industry: minimum 10.00%;
 - c. plastics production industry: 21.55%–24.81%;
 - d. cement industry: minimum 10.89%;
 - e. textile industry: minimum 6.80%;
 - f. beverage industry: 4.6%–8.44% (depending on the product type and production scale);
 - g. paper industry: 9.90%–18.48% (depending on the product type and production scale);
4. Reduce gasoline and oil consumption in transportation by 5% compared with the sector's fuel consumption demand forecast until 2030; develop fuel standards for new and imported two-wheel motorbikes and minibuses (nine-seater);
5. Ensure that 90% of industrial parks and 70% of industrial clusters access and apply energy-efficiency measures;
6. Implement energy labelling for 50% of all thermal insulation building material products;
7. Develop and approve local energy efficiency plans for 100% of all cities and provinces under the central government.

¹⁴ VNEEP-I: 2006-2015 - Energy saving target 3.4%—with a total target of 4.9 mega tons of oil equivalent (Mtoe) (205 PJ/a)

VNEEP-II: 2006-2015 - Energy saving target 5.65%—with a total target of 11.2 mega tons of oil equivalent (Mtoe) (469 PJ/a)

¹⁵ VNEEP III(2019), DECISION, On approval of the National Energy Efficiency Programme (VNEEP) for the period of 2019 – 2030, Hanoi, March 13 2019, No.: 280/QĐ-TTg; http://vepg.vn/wp-content/uploads/2019/03/the-signed-version-of-VNEEP-3_ENG_Final.pdf

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- Refine, scale and incentivise uptake of agricultural feed additives and viable delivery models to address: Rumen digestion; Organic fertilizer management; Rice cultivation
- End native tropical forest logging and address deforestation
- Implementation of measures to manage and reduce solid waste generation, e.g., development and application of solid waste recycling technologies; optimization of treatment conditions of domestic and industrial wastewater; application of biotechnology to remove methane from domestic wastewater treatment process; recovery of methane from industrial wastewater treatment

Power Development Plan 8

One of the key targets of the Eight National Power Development Plan (PDP8)¹⁶ is to diversify its energy mix significantly by 2030. According to the in May 2023, approved roadmap, the country plans to bolster its capacities in thermal, LNG thermal, and coal-fired thermal power plants to 14,930 MW, 22,400 MW, and 30,127 MW, respectively. On the 1st of April 2024, the implementation plan for the PDP8 was approved by the prime minister.

Under the PDP8, the total installed capacity of the power system is planned to increase from 80 GW in 2023 to 150 GW in 2030. The capacity of renewable sources (including wind, solar, and biomass) is expected to double from 21 GW (accounting for around 26.9% of the system) in 2023 to 42 GW (accounting for around 28.5% of the system) in 2030.

Wind power, the capacity connected to the national grid in 2030 is planned to be 28 GW;

- 22 GW onshore and nearshore wind power and 6 GW offshore wind power
- PDP8 anticipates that grid-connected offshore wind power will further reach 15 GW by 2035 and 70 to 91.5 GW by 2050
- In addition, PDP8 provides for the development of offshore wind power not connected to the national grid. This includes for projects to export to other countries or from new energy sources such as hydrogen or ammonia, without imposing any limit on total capacity¹⁷

The target for biomass power capacity is 1 GW, and for waste to energy 1.2 GW by 2030. Additional roof-top solar PV capacity is set at 2.6 GW complimented with battery storage capacity of 0.3 GW. Moreover, Vietnam plans to import around 5 GW hydroelectric power from Laos, with a possible increase to 8 GW.

Furthermore, the PDP8 includes a rural electrification program, aiming to provide electricity to 2,478 small- and medium-sized pumping stations in the Mekong Delta region, while also extending electricity access to remote islands in Quang Tri, Kien Giang, and Ba Ria – Vung Tau provinces through national grid connections or renewable energy sources.

¹⁶ Power Development Plan 8, English translation available at <https://thuvienphapluat.vn/van-ban/EN/Thuong-mai/Decision-500-QD-TTg-2023-National-Electricity-Development-Planning-of-2021-2030/566836/tieng-anh.aspx>

¹⁷ Vietnamese Offshore Wind – Status and recent developments 12 August 2024, Watson Farley & Williams, <https://www.wfw.com/articles/vietnam-offshore-wind-status-and-recent-developments/>

Key messages for next NDCs

Vietnam submitted its Intended Nationally Determined Contribution (INDC) in 2015; signed and approved the Paris Agreement, and developed a National Plan for the implementation of the Paris Agreement in 2016. For COP 21, Vietnam completed the review and update of the NDC in 2020 (NDC 2020) and last updated its NDC in 2022. The NDC 2022 states that the *'contribution to GHG emission reduction in NDC 2022 has significantly increased compared to that in NDC 2020, towards long-term goals identified in Vietnam's National Climate Change Strategy to 2050'*.

According to Climate Watch¹⁸, the 2022 NDC compared to the NDC 2020 as follows:

Increased ambition/enhancement:

1. Strengthened mitigation: reduced total GHG emissions in 2030
2. New policies and actions
3. Strengthened adaptation

No increased ambition:

1. No new sectoral targets
2. No additional information for clarity, transparency, and understanding

Summary NDC 2022

Vietnam raises the ambition of the 2030 target and commits to reduce its emissions by 15.8% (unconditional) and by 43.5% (conditional) by 2030 compared to a 'Business-As-Usual' (BAU) scenario. To achieve the more ambitious 'Conditional' targets, Vietnam's requests external financial support for mitigation technologies. While 'Unconditional' are defined as targets Vietnam can achieve without external financial support. Under the BAU scenario, GHG emissions increase by 57% from 528 MtCO₂e in 2020 (excluding LULUCF) to 927.9 MtCO₂e. The 43.5% GHG reduction (conditional) freezes emission on 2021 level. However, Vietnam committed to the long-term target to achieve net-zero emissions by 2050, a specific implementation plan has not been published yet.

Climate Action Tracker, an independent scientific project that tracks government climate action and measures it against the globally agreed Paris Agreement¹⁹, rates Vietnam's new NDC 2022 as 'Critically insufficient' as no concrete policies and/or finance for mitigation or adaptation has been identified in the NDC. The NDC describes the modelling of the conditional and unconditional GHG pathways and explains in depth the effects of climate change in Vietnam including required adaptations measures. But the NDC does not identify any legally binding policies to address those topics in the 45-page document.

Lessons learned

With the new PDP8, the decarbonization of the electricity sector is – also due to its economic advantages over coal power generation - on a positive trajectory. However, the fossil fuel phase-out – especially the orderly winding up of the coal and gas industry – is highly controversial. The Vietnam government is not prepared to agree on any legally binding emission targets. To implement the NDC, Vietnam identifies rather vague measures e.g. to *'develop action plan to implement the Glasgow Leaders' Declaration on Forest and Land Use, clean energy transition roadmap; plan for implementation of the Global Coal to Clean Power Transition Statement'*. However, the ongoing

¹⁸ Online database, assessed in September 2024, https://www.climatewatchdata.org/countries/VNM?end_year=2021&start_year=1990#climate-enhancements

¹⁹ Online database, assessed in September 2024; <https://climateactiontracker.org/countries/vietnam/targets/>

support for offshore wind with new policies will reduce energy-related emissions. Finally, new natural gas and coal projects remain in Vietnam's energy industry and those policies are not in line with a 1.5°C target.

Annex

Key socio-economic figures

Table 1 shows the population growth and the long-term GDP development of an average of 5.2% per year until 2050 – the outlook is based on the Vietnam Government projection of the Development Strategy Institute Ministry of Planning and Investment.

Table 1: Vietnam—population and economic development 2019–2050

	Unit	2019	2020	2025	2030	2035	2040	2045	2050
Population	[million]	95.8	96.6	103	106	109	111	113	115
GDP USD	[billion]	315	324	492	697	928	1,162	1,367	1,510
GDP growth	[%/yr]	7.36%	2.87%	8.20%	7.20%	5.90%	4.60%	3.30%	2.00%

Source: World Bank, open data, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=VN>

Current emission situation

Vietnam's greenhouse gas (GHG) emissions without Land Use, Land-Use Change and Forestry (LULUCF) rose significantly by 588% in total between 2005 and 2019, and the emissions continue to rise rapidly.

Table 2: Vietnam—overview current GHG emissions

	2005			2022		
	Annual total [Mt CO ₂ e]	GHG shares [%]	Annual per capita [tCO ₂ e]	Annual total [Mt CO ₂ e]	GHG shares [%]	Annual per capita [tCO ₂ e]
Electricity	24	13%	0.3	143	30%	1.5
Stationary energy	40.25	21%	0.5	112.25	24%	1.2
Transport	21.47	11%	0.3	34.79	7%	0.4
Total energy-related CO₂ emissions	86.08	45%	1.0	290.17	62%	3.0
<i>relative to 2005</i>	-	-	-	588%	-	288%
Fugitives	16.75	9%	0.2	19.62	4%	0.2
Agriculture	65.55	34%	0.8	69.61	15%	0.7
Industrial processes	12.98	7%	0.2	71.47	15%	0.7
Waste	13.5	7%	0.2	21.06	4%	0.2
LULUCF	18.77	10%	0.2	-13.02	-3%	-0.1
Total GHG emissions	193.21	100%	2.3	470.07	100%	4.8
<i>relative to 2005</i>	-	-	-	243%	-	208%
Population	83.14 million			97.46 million		

Source: DCCEEW, Statistics 2023

The electricity related CO₂ emissions are soaring due to significant increase of fossil fuel-based power generation – especially hard coal and natural gas. Vietnam's power sector is dominated by hard coal supplying over 50% of the electricity, followed by natural gas with a share of around 20% in 2020. By 2019, the fossil fuel generation share plateaued for the first time just under 70% in 2019 and 2020 with the remaining generation coming largely from hydro power. However, in 2019, the installation of utility scale solar PV picked up significantly and in 2021, PV

generation was on the same level as natural gas with an annual production of 28 TWh²⁰. Solar and wind power generation increased from zero to 12.3% between 2000 and 2022, with solar PV clearly dominating (11%). The Vietnam government has significant plans to increase onshore and offshore wind. By May 2024, the installed capacity was 5,714 MW of onshore and nearshore projects²¹. While the trend in power generation goes in the right direction, emissions from electricity and heat – in Vietnam both sectors are lumped together – and industry have increased by a factor of approximately 5²². Furthermore, the transport emissions have increased significantly, due to the transition from 2-wheelers to inefficient cars and SUVs which are being used more and more frequently across the country. In 2001, LULUCF emissions turned positive for the first time, since 2011 LULUCF emissions alternate between positive and negative in one-digit percentages, the sector is planned to becoming a carbon sink again.

Table 3: Electricity generation structure in Vietnam in the scenario ‘Renewable Energy 2’ pathway (VN-RE2)

Electricity generation [TWh/yr]	2020	2025	2030	2035	2040	2045	2050
Total generation	259	370	532	687	760	837	952
- Fossil	170	236	262	253	191	109	112
- Hard coal (& non-renewable waste)	117	173	178	157	87	0	0
- Lignite	0	0	0	0	0	0	0
- Gas	52	62	83	96	103	108	111
- Oil	1	1	1	1	1	1	1
- Hydrogen	0	0	0	0	0	0	0
- Renewables (w/o renewable hydrogen)	89	134	269	434	569	728	839
- Hydro	78	87	96	106	108	110	110
- Wind	2	23	121	237	345	465	558
- PV	6	11	32	65	83	111	123
- Biomass (& renewable waste)	3	14	20	26	33	42	48
- Geothermal	0	0	0	0	0	0	0
- Solar thermal power plants	0	0	0	0	0	0	0
- Ocean energy	0	0	0	0	0	0	0
Distribution losses	24	34	49	64	71	78	88
Own consumption electricity	4	3	3	3	2	2	2
Electricity for hydrogen production	0	0	0	0	0	0	0
Electricity for synfuel production	0	0	0	0	0	0	0
Final energy consumption (electricity)	232	334	481	634	696	768	870
Variable RES (PV, wind, ocean)	8	34	153	302	428	576	681
RES share (domestic generation)	34%	36%	51%	63%	75%	87%	88%

²⁰ IEA, country analysis Viet Nam (2024), <https://www.iea.org/countries/viet-nam/electricity>

²¹ National Load Dispatch Center, ‘Information on operation of renewable power plants’, 7 May 2024, <https://www.nldc.evn.vn/NangLuongTaiTao>

²² NATIONALLY DETERMINED CONTRIBUTION, (NDC), (UPDATED IN 2022), SOCIALIST REPUBLIC OF VIET NAM, https://unfccc.int/sites/default/files/NDC/2022-11/Viet%20Nam_NDC_2022_Eng.pdf, Ha Noi, October 2022

Table 4: Final energy demand in Vietnam by sector in the scenario ‘Renewable Energy 2’ pathway (VN-RE2)

Final energy demand [PJ/yr]	2020	2025	2030	2035	2040	2045	2050
Total (incl. non-energy use)	2,973	3,515	4,356	4,997	5,271	5,298	4,958
Total energy use (excl. non-energy use)	2,854	3,407	4,252	4,896	5,172	5,201	4,864
Transport	694	927	1,180	1,323	1,436	1,363	1,011
- Oil products	592	776	908	905	887	669	3
- Natural gas	96	122	159	167	155	113	61
- Biofuels	0	6	51	89	121	145	170
- Synfuels	0	0	0	0	0	0	0
- Electricity	7	24	62	162	274	437	778
RES electricity	2	9	31	102	205	380	686
- Hydrogen	0	0	0	0	0	0	0
RES share Transport	0%	2%	7%	14%	23%	39%	85%
Industry	1,295	1,541	2,003	2,431	2,468	2,474	2,443
- Electricity	390	456	703	1,097	1,080	1,081	1,073
RES electricity	134	166	356	692	809	940	947
- Public district heat	110	160	177	205	236	273	315
- Hard coal & lignite	428	556	658	487	314	7	5
- Oil products	143	117	109	109	47	19	0
- Gas	92	113	196	198	85	44	0
- Solar	0	0	0	0	3	0	0
- Biomass	121	121	133	300	659	994	980
- Geothermal	10	18	27	36	45	56	70
- Hydrogen	0	0	0	0	0	0	0
RES share Industry	22%	21%	27%	43%	64%	85%	90%
Other sectors (residential, commercial...)	865	939	1,069	1,142	1,268	1,364	1,410
- Electricity	437	723	968	1,024	1,150	1,245	1,282
RES electricity	150	263	490	646	862	1,083	1,130
- Public district heat	0	12	7	11	15	20	27
- Hard coal & lignite	1	0	0	0	0	0	0
- Oil products	48	26	15	13	11	9	9
- Gas	93	32	14	18	8	7	0
- Solar	6	10	8	15	22	34	50
- Biomass	278	134	55	55	54	33	25
- Geothermal	2	2	2	6	8	16	17
- Hydrogen	0	0	0	0	0	0	0
RES share Other Sectors	50%	44%	52%	64%	76%	87%	89%
Total RES	721	759	1,181	1,976	2,854	3,818	4,303
RES share	25%	22%	28%	40%	55%	73%	88%
Non-energy use	120	108	104	101	99	97	95
- Oil	120	108	104	101	99	97	95
- Gas	0	0	0	0	0	0	0
- Coal	0	0	0	0	0	0	0

Table 5: Primary energy demand in Vietnam in the scenario 'Renewable Energy 2' pathway (VN-RE2)

Primary energy demand [PJ/yr]	2020	2025	2030	2035	2040	2045	2050
Total (incl. non-energy-use)	3,958	4,921	5,991	6,642	6,655	6,246	5,931
- Fossil (excluding on-energy use)	3,196	4,032	4,546	4,283	3,284	1,822	911
- Hard coal	1,540	2,156	2,289	1,925	1,135	74	6
- Lignite	1	0	0	0	0	0	0
- Natural gas	683	774	1,041	1,163	1,053	915	797
- Crude oil	973	1,103	1,215	1,195	1,095	833	107
- Nuclear	0	0	0	0	0	0	0
- Renewables	761	889	1,444	2,359	3,372	4,425	5,020
- Hydro	280	312	345	381	390	396	396
- Wind	8	84	435	854	1,242	1,674	2,010
- Solar	27	48	124	250	324	434	492
- Biomass	434	425	511	833	1,363	1,849	2,035
- Geothermal	12	20	29	42	53	72	87
- Ocean energy	0	0	0	0	0	0	0
RES share	19%	18%	24%	35%	50%	70%	84%

Table 6: Energy-related CO₂ emissions in Vietnam in the scenario 'Renewable Energy 2' pathway (VN-RE2)

Energy-related CO ₂ emissions [million tons/yr]	2020	2025	2030	2035	2040	2045	2050
Power plants (incl. cogeneration in Industry and Other sectors)	111	158	170	157	105	40	40
- Hard coal (& non-renewable waste)	91	135	139	122	67	0	0
- Lignite	0	0	0	0	0	0	0
- Gas	19	23	30	35	37	39	39
- Oil + Diesel	1	0	0	0	1	1	1
CO₂ emissions by sector	247	320	357	328	241	118	49
- Industry	62	75	88	71	43	8	1
- Other sectors	15	12	10	9	7	5	1
- Transport	50	65	77	77	75	56	4
- Power generation (public plants only)	110	157	169	156	104	39	39
- Other conversion	9	11	13	14	12	10	5

Table 7: Installed power generation capacities in Vietnam in the scenario 'Renewable Energy 2' pathway (VN-RE2)

Installed capacity [GW]	2020	2025	2030	2035	2040	2045	2050
Total generation capacities	56.0	78.6	133.7	201.2	241.2	287.5	318.3
- Fossil	28.6	36.1	37.4	34.9	26.2	15.4	15.9
- Hard coal (& non-renewable waste)	19.7	25.0	23.8	20.9	11.5	0.0	0.0
- Lignite	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Gas (w/o hydrogen)	8.5	10.6	13.1	13.5	14.1	14.9	15.4
- Oil & Diesel	0.5	0.5	0.5	0.5	0.5	0.5	0.5
- Hydrogen (fuel cells, gas power plants incl. cogeneration)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Renewables	27.4	42.5	96.3	166.3	215.0	272.2	302.4
- Hydro	20.6	22.9	25.3	27.9	28.6	29.1	29.1
- Wind	1.0	9.0	42.5	83.7	116.6	155.6	176.2
of which wind offshore	0.0	2.0	20.9	40.3	54.3	76.2	90.2
- PV	5.3	8.2	24.9	50.1	64.0	79.5	87.7
- Biomass (& renewable waste)	0.6	2.4	3.6	4.6	5.9	8.1	9.3
- Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Solar thermal power plants	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Ocean energy	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RES share generation capacities	49%	54%	72%	83%	89%	95%	95%



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COUNTRY REPORT

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NDC ASPECTS has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 101003866