

Annex K: Vietnam Country Study

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Executive summary

Vietnam's economy grew by almost 325% between 1990 and 2016, when its GHG emissions reached 320 MtCO_{2e}. The Government of Vietnam (GoVN) expects that the country's total emissions in 2030 will be about 933 MtCO_{2e} if nothing is done, but that its own mitigation efforts will reduce them by about 9% (84 MtCO_{2e}), or 27% (251 MtCO_{2e}) with international support. If all these measures are taken, the reduced total of 682 MtCO_{2e} expected in 2030 would still mean doubling Vietnam's current emissions.

The manufacturing/construction, electricity, and agriculture sectors each generated about a fifth of national emissions in 2016, the industry and transport sectors together about another fifth, and the land-use change, and forestry sector was a significant net sink as a result of investments in forest plantation development. Thus, emissions in Vietnam are sectorally diffuse, and the GoVN strategy is therefore to seek systemic change in multiple sectors through many sectoral and sub-sectoral targets. Diverse programmes of public exhortation, regulations for private and state-owned businesses, and planning requirements for provincial governments, are all set and supervised by the state.

The GoVN has defined its low carbon transition process, setting clear targets to be reached, and international partners are welcome to contribute support to help Vietnam reach higher goals. The Support Program to Respond to Climate Change (SP-RCC)

2009-2020 was set up to consolidate climate change activities across the GoVN and provinces in dialogue with a number of international partners.

There are several national programmes for transition matters, including the Vietnam National Energy Efficiency Programme (VNEEP), and again there is scope for partners to contribute. The relationships that result are locally owned and directed and are appreciated by GoVN to the extent that they accelerate and facilitate Vietnam's contribution to combat climate change.

The evaluation examined four of Denmark's interventions in support of GoVN efforts to reduce GHG emissions. They represent four models with very different shares of the Danish funding committed in 2009-2020, and with different implications for attributability and partnership.

- **The VNEEP model (65% of total Danish support)**, in which Denmark contributed part of the budget of a much larger and longer-term GoVN programme. The latter had high mitigation effectiveness, some of which can be attributed to Danish support (see Annex d).
- **The LCEE model (25%)**, in which GoVN agreed that some of Denmark's extra support to VNEEP would allow measures to promote energy efficiency in SMEs and buildings at provincial level to occur sooner, and/or with more Danish technical input, and/or with greater availability of investment finance, than otherwise would have been the case. This focusing of support on a sub-sector of special interest worked well, and with clear Danish attribution. Since LCEE grew out of VNEEP but also gave rise to DEPP II (and was therefore renamed DEPP 'I'), it can be seen as a bridge towards a more direct bilateral engagement (see Annex e).
- **The DEPP II model (9%)**, in which Denmark built on parts of LCEE to create a niche for itself in advising the Ministry of Industry and Trade (MoIT) on energy sector planning, integrating RE into the grid, and promoting energy efficiency in industry. Of these, at least the second was very likely to have had significant impact because Vietnam was developing its wind industry rapidly and in urgent need of technical advice on safe integration of wind power (see Annex f).
- **The REWS model (less than 2%)**, in which a bilateral embassy-to-provincial grant was used to make a small but innovative effort to promote solar-powered water pumping technology at communities in the Mekong Delta, in hope of influencing government procurement policy and for educational purposes. This was sound and attributable, and showed how useful an embassy small grant mechanism can be but was later eclipsed by social and technological changes in the project area (see Annex g).

Danish mitigation spending in Vietnam had the following characteristics:

- **Most Danish spending was through a GoVN-led programme**, the mitigation effectiveness of which cannot be attributed to Denmark, and without it the GoVN would probably have done the same things but rather more slowly.

- **That a small part was used to establish an advisory relationship with MoIT**, which was well-chosen for its key role in RE development where Denmark probably accelerated progress in developing offshore wind power and its integration, and in EE where results were more mixed because the sub-sector is so large and diverse.
- **That a tiny part was used in response to an identified local need** and opportunity in the Mekong Delta, which had high attributability and potential influence and replicability, but was isolated and vulnerable to contextual changes so ultimately had little impact.

The Danish mitigation interventions were aligned in a number of ways with the 2016 NDC priorities. In the 2020 NDC, Vietnam has reviewed, updated and adjusted its mitigation and adaptation contributions to be more in line with the current economic situation and latest socio-economic development forecasts for up to 2030. The NDC implementation objectives are in line with the objectives of various economic development plans, with a slightly increased ambition for emission reductions.

The three larger projects reviewed here (VNEEP, LCEE, DEPP II) made significant contributions to the goals of Vietnam's GHG emission reduction strategies. In the absence of attributable and/or quantified baselines and impact monitoring data, apart from an attempt to gather these data in the tiny REWS project, the scale of emission reductions obtained through Danish mitigation investment cannot be specified. The same applies to capacity-building effects, where institutional capacity baselines, agreed goals and progress reports would be needed to document gains. All four projects were otherwise well designed and had good or very good performance.

Specific issues that arose included several with implications for future decisions. The VNEEP model worked well, but mainly because the national programme to which it contributed was well designed and implemented by GoVN. The implication is that the quality and consistency of government policies is an important factor to assess in other cases. The LCEE model combined with other lines of approach the virtue of being within a GoVN programme, allowing for good synergy among them. It also created space for DEPP II, through which sector-wide capacity, policy and regulatory support could be offered, as GoVN accelerated its move towards RE. Although its quantitative effects are unclear, its qualitative consequences were significant and appreciated by GoVN stakeholders. This allowed DEPP III to be introduced, which continues to offer specific technical support and general encouragement to the clean energy transition in Vietnam and elsewhere.

1. National context of mitigation efforts

1.1 Overview of socioeconomic conditions

Located in mainland Southeast Asia, Vietnam has a tropical monsoonal climate, and its territory encompasses a wide range of latitudes, altitudes and terrains so is very diverse ecologically. In 2012-2016, GDP growth ranged between 5% and 7% annually, with an average of almost 6%, of which the most rapid growth rates were in the industrial,

construction and service sectors. Key social and economic indicators as they stood in 2019 are given in Table 1.

Table 1: Vietnam: Human Development Indicators, 2019

1. Human Development Index (HDI, rank of 189 countries)	118
2. Life expectancy at birth (years)	75.3
3. Expected years of schooling (years)	12.7
4. Gross national income per person (2011 PPP USD)	6,220
5. Inequality-adjusted HDI (raw HDI = 0.693)	0.580
6. Gender Development Index (GDI)	1.003
7. Employment to population ratio (% ages 15 and older)	76.0
8. Internet users, total (% of population)	70.3
9. Total population (millions)	95.5
10. Skilled labour force (% of labour force)	32.3
11. Corruption Perceptions Index (CPI, rank of 198 countries)	96

Sources: <http://hdr.undp.org/en/countries/profiles/VNM> (items 1-10);

www.transparency.org/en/cpi/2019/results/vnm (item 11).

1.2 Vietnam's GHG emissions

Vietnam's most recent formal reporting of GHG emissions to the UNFCCC (MoNRE, 2019) is based on 2014 data and largely presented in tCO₂. These are updated to 2016 and mostly given in tCO₂e in Table 2 to aid international comparisons and give a clearer appreciation of their significance for climate change. Highlights include the net negative emissions from the land-use change and forestry sector, the result of many years of forest plantation development, and the massive increase in per-person GDP and consumption emissions since 1990¹.

Table 2: GHG emissions, sinks, sources and changes in Vietnam

GHG emissions	Unit	2016 data
Total GHG emissions	MtCO ₂ e	319.9
Per-person GHG emissions	tCO ₂ e	2.07
Land-use change & forestry sources/sinks	MtCO ₂ e	minus 20.1
Electricity & heat sources	MtCO ₂ e	73.9
Agriculture sources	MtCO ₂ e	71.1
Transport sources	MtCO ₂ e	36.9

¹ See also: GoVN (2020); <https://climateactiontracker.org/countries/vietnam/>; <https://knoema.com/atlas/Vietnam/CO2-emissions>.

Waste sources	MtCO ₂ e	19.9
Manufacturing & construction sources	MtCO ₂ e	62.4
Industry sources	MtCO ₂ e	34.1
Fugitive emissions	MtCO ₂ e	20.1
Other fuel combustion	MtCO ₂ e	4.3
Buildings	MtCO ₂ e	12.3
Aviation & shipping sources	MtCO ₂ e	5.0
Energy intensity	kWh per unit GDP in 2011PPP USD	1.50
Carbon intensity	kg/kWh	0.21
GDP per person % change since 1990	Δ%	324.8
Consumption emissions per person % change since 1990	Δ%	530.1

Source: <https://ourworldindata.org/co2/country/vietnam?country=~VNM>

1.3 Vietnam's climate policies and strategies

The Government of the Socialist Republic of Vietnam (GoVN) sees responding to climate change as vital and the responsibility of the whole political system. This position is consistent with policies and laws that include:

- Resolution No. 24-NQ/TW (3 June 2013) of the Central Committee of the Communist Party of Vietnam on active response to climate change, and on strengthening natural resources management and environmental protection.
- Law on Environmental Protection No. 55/2014/QH13 (23 June 2014) was adopted by the National Assembly, with Chapter IV relevant to climate change.
- Law on Meteorology and Hydrology No. 90/2015/QH13 (23 November 2015) was adopted by the National Assembly, with content related to monitoring, impact assessment and response to climate change.
- Other mitigation-related legal documents include the Law on Energy Efficiency (2011), the Law on Water Resources (2012) and the Forestry Law (2017).

Reflecting this, there are number of mitigation-related strategies, including the 2007 National Energy Development Strategy (NEDS), the 2011 National Strategy on Climate Change (NSCC), the 2012 National Strategy for Green Growth (NSGG), the 2013 Transport Development Strategy (TDS), and the 2015 Renewable Energy Development Strategy (REDS). All these applied directly and with specific milestones for the decade or so after their publication, and also included a vision of future progress to 2030 (TDS) or 2050 (NEDS, NSCC, NSGG, REDS). Most relevant here are:

- The NSGG, which was approved in Decision No. 1393/QĐ-TTg (25 September 2012) and established that achieving a low-carbon economy, with enriched natural capital and reduced net GHG emissions would be key to ensuring rapid and sustainable economic development. It provided milestones for reducing

GHG emissions by 1.5-2.0% annually, with most reductions in the energy sector. The NSGG overlapped with the NSCC in the areas of developing RE and new energy sources, improving energy efficiency (EE), reducing energy consumption, and increasing the conservation and efficient use of resources. The two strategies agree on implementation methods, with the NSGG being more specific and detailed than the NSCC.

- The REDS was issued under Decision 2068/QĐ-TTg (25 November 2015) and aimed to increase public access to clean energy and to increase the role of RE. It provided milestones for increasing the RE share of the energy mix: for wind (3% in 2030, 5% in 2050), for solar (6% in 2030, 20% in 2050), for biomass (6% in 2030, 8% in 2050), and for biofuel (13% of transport needs in 2030, 25% in 2050), and called for increased use of household roof-top solar energy, biogas technology, and biofuels in the transport sector, and promoting the development of RE technology by public and private industry. The REDS is more specific than the NSCC in the key area of hydropower development, where it indicates a target capacity of 2,400 MW by 2030, and 8,000 MW by 2050.

1.4 Vietnam's Nationally Determined Contribution (NDC)

Vietnam has submitted an NDC (GoVN, 2016) and an updated NDC (GoVN, 2020a) to the UNFCCC Secretariat, both of them articulating Vietnam's commitment to the international climate change response. The first NDC was the basis for a Plan for Implementation of the Paris Agreement (PIPA), which specified 68 groups of tasks to be implemented by 2030 on climate change mitigation and adaptation, resource mobilisation, enhancing and improving institutional frameworks, and establishing the enhanced transparency frameworks on responses and support received for responses to climate change (MoNRE, 2016).

In its 2020 NDC update, which aligns with its Biennial Update Report (BUR; MoNRE, 2017), Vietnam's mitigation commitments have been adjusted in the following ways:

- The 'industrial processes' sector (with total emissions of 38.6 MtCO₂e in 2014) has been included in GHG inventory, BAU scenario and mitigation measures. It is not clear how this aligns with the emission categories in Table 3², but emissions from this sector were 12.0% of national emissions in 2014 and are expected to grow to 14.4% in 2030.
- The base year has been changed for UNFCCC reporting purposes from 2010, when total GHG emissions were 246.8 MtCO₂e, to 2014 when total GHG emissions were 284.0 MtCO₂e (cf Table 2: 319.9 MtCO₂e in 2016).
- Projected national emissions under the BAU scenario are adjusted upward for 2030, from 787.4 to 927.9 MtCO₂e.

² The 2020 NDC defined the 'industrial processes' sector as including construction materials, the chemical industry and HFC 'consumption', which would be equivalent to the sum of parts of the 'manufacturing & construction', 'industry', 'buildings' and possibly 'waste' and 'fugitive emissions' GHG sources in Table 3.

- With domestic resources, by 2030 Vietnam will have reduced total GHG emissions by about 9% by 2030, or about 84 million tCO_{2e}.
- This 9% mitigation contribution can be increased to 27% by 2030 (or roughly 251 million tCO_{2e}) with international support³.

The 2020 NDC also considered contextual challenges such as CoViD and setbacks in global cooperation, and listed others specifically to do with mitigation, including:

- **Energy security.** National energy security is constrained by inadequate domestic energy supply, low energy use efficiency, slow growth in energy technology, and an undeveloped competitive energy market.
- **Investment.** High costs of investment in mitigation, a limited market for energy efficiency and renewable energy technologies, financial support mechanisms that are too weak to encourage enterprises to invest in mitigation activities.
- **Monitoring and incentivising change.** There is a lack of MRV systems for GHG reduction at the national and sectoral levels, and of stringent regulations on labelling as well as standards for types of equipment and machinery. Regulations on technology standards and equipment labelling are being applied only slowly, and there is limited awareness of EE and RE and how to reduce GHG emissions in practice.
- **SME participation.** There are no specific policies and mechanisms to encourage SMEs to participate in mitigation activities, and there is limited access to preferential credit with which to finance GHG reduction measures.
- **Waste sector.** Policies on waste management are incomplete, overlapping and/or not fully implemented, and the institutional structure is inadequate, with inconsistent management structures at central and local levels and a lack of specific tailored models for each municipality. As a result, investment in waste treatment remains low and unbalanced.

The 2020 NDC update noted ways to overcome these challenges in order to deliver on its commitments. It also added text on loss and damage and its latest adaptation and mitigation efforts, and new sections on assessing the impact of mitigation measures on socio-economic development, and on synergies and co-benefits among adaptation, mitigation and sustainable development. It went on to define indicators for monitoring and evaluating NDC implementation and for climate change adaptation activities, as well as a framework for the national mitigation MRV system. Finally, it identified specific mitigation measures that had been taken in several sectors:

- **Energy.** Energy-saving and EE measures helped to reduce emissions by about 7.3 million tCO_{2e} in 2014 compared to the previous BAU scenario.
- **Transport.** Climate change responses have been mainstreamed into the process of updating, adjusting and developing sectoral strategies and planning, including

³ Meaning support received through bilateral and multilateral cooperation as well as through market and non-market mechanisms under Article 6 of the Paris Agreement, in line with the socio-economic conditions and international conventions to which Vietnam is a signatory.

detailed planning for the Vietnam dry port system, the inland waterway and railway transport systems, and the planning of Long Thanh and other airports.

- **Agriculture.** Actions have included replacing long-duration rice varieties with short-duration ones, helping reduce typhoon-related risks, increasing areas with mid-season water drainage and alternating wet and dry irrigation techniques, and increasing areas with integrated crop management.
- **LULUCF.** Active mitigation measures have been taken, especially under the REDD+ Programme. The emission reduction programme in North Central Vietnam is expected to cut 25 MtCO₂e in 2018-2025, while national forest coverage has also been increasing, reaching almost 42% by the end of 2019.

1.5 Institutional arrangements for the climate change response

The National Climate Change Committee (NCCC). This was established in 2012 and is chaired by the Prime Minister, with a Deputy Prime Minister and the Minister of MoNRE as vice-chairs. Its members are the heads or representatives of related ministries and agencies, and MoNRE acts as its permanent secretariat and hosts the NCCC Office, chaired by the Director General of the Department of Climate Change. There is also a Vietnam Panel on Climate Change (VPCC), which was established in 2014 and is currently chaired by the Minister of MoNRE, whose responsibility is to advise it on policy, science and technology issues. Members of the VPCC are representatives and scientists from the related ministries, agencies and organizations.

The Ministry of Natural Resources and Environment (MoNRE). The GoVN has designated MoNRE as the National Focal Point to implement the UNFCCC, Kyoto Protocol and Paris Agreement, including preparing BURs and National Communications to the UNFCCC Secretariat. MoNRE is tasked with formulating national climate change policy and coordinating implementation of climate actions across sectors and sub-national governments. It is also tasked with reviewing and planning climate budgets with the Ministry of Planning and Investment (MoPI) and the Ministry of Finance (MoF) but is not the leading agency in allocating funds to cope with climate change.

The Ministry of Planning and Investment (MoPI). This ministry coordinates the country's overall development strategies, planning and national investments, including mobilising and managing development cooperation and climate finance, and coordinating Vietnam's efforts to achieve the SDGs. It is responsible for the NSGG and in charge of formulating related policy and overseeing implementation. It is also the Designated National Authority for the Green Climate Fund, and it established a Climate Finance Task Force to guide the preparation of financing mechanisms.

Other relevant ministries. Vietnam's climate policy framework tasks all national line ministries with mainstreaming climate change issues into their strategies and plans.

- The **Ministry of Agriculture and Rural Development (MARD)** oversees climate change issues that affect rural development and is also the national focal point for disaster risk management.

- The **Ministry of Industry and Trade** (MoIT) coordinates the management and development of Vietnam's most carbon-intensive industries. The MoIT is responsible for implementing national target programmes on energy efficiency and for establishing a framework for renewable energy, among other efforts (ADB, 2013). MoIT is also the lead Ministry of the Vietnam Energy Partnership Group (VEPG).
- The **Ministry of Construction** (MoC) is in charge of planning and developing urban and regional infrastructure. The MoC also assists the MoNRE and the respective provincial ministries in preparing land use plans and coordinates the implementation of the National Programme for Urban Development (2012-2020) across ministries and provincial authorities.
- Other ministries based on their core functions are responsible for climate change activities including the **Ministry of Transport** (MoT), **Ministry of Foreign Affairs** (MoFA), **Ministry of Science and Technology** (MoST) and the **Ministry of Education and Training** (MoET).

Provincial Local Government. All 63 provinces and the cities of Hanoi and Ho Chi Minh are responsible for planning and implementing a broad range of national climate change policies. Among other things, they are required to develop climate change action plans, green growth action plans, Paris Agreement implementation plans and disaster risk reduction and management plans. Guidelines to direct provincial planning are issued by the respective line ministries. For example, guidelines developed by MoNRE for the implementation of provincial climate action plans were issued in 2009 under the National Target Programme to Respond to Climate Change (NTP-RCC), and all provinces and cities did so under the first phase of the NTP-RCC (2010-13). Those plans are now being revised and updated for 2016-2020. In addition, some provinces have established provincial cross-sectoral coordination committees and/or an Office for Climate Change under the Department of Natural Resources and Environment (DoNRE) to coordinate climate change actions following the example of the NCCC.

1.6 The Support Program to Respond to Climate Change

The Support Program to Respond to Climate Change (SP-RCC) 2009-2020 was established by the GoVN under Decision No. 2044/QĐ-TTg (27 October 2017). Its role was to provide "policy reforms for effective implementation of climate change and green growth actions prioritized in the 2016-2020 socio-economic development plan, national climate change strategy and Vietnam green growth strategy, and NDC" (World Bank, 2020). It therefore continued to implement the NSCC and NSGG, while preparing legal conditions and resources to implementing the Paris Agreement on climate and national, sectoral and local development priorities related to climate change. It also focused on supporting the implementation of policies related to climate change, developing new policies and implementing priority projects related to climate change involving ministries, branches and localities, whilst continuing to strengthen capacity and knowledge.

On this basis, it was an effective, useful and constructive arena for policy dialogue. It was implemented through three components:

- **Policy**, which included policies, laws, strategies, decrees, circulars, regulations, guidelines, economic and technical norms, and action plans (policy actions);
- **Capacity building and knowledge**, which focused on strengthening leadership capacity from central to local levels in order to improve management capacity in the context of climate change and rapid change of land country; and
- **Investment**, which included a list of urgent priority climate change investment projects to be implemented up to 2020, based on the criteria approved by the Prime Minister (Decision Decree No. 1719/QĐ-TTg dated 4 October 2011 on 'Criteria for evaluating priority projects of SP-RCC Program').

One of the objectives of the SP-RCC was to support the implementation of Vietnam's climate change policies through policy dialogue around building capacity for institutional collaboration, coping with the impacts of climate change, and promoting interdisciplinary solutions to issues concerning climate change. The main international partners of the SP-RCC have included Japan (JICA), France (AFD), Canada (CIDA), Australia (DFAT), the World Bank, and the Korea Export-Import Bank (K-Eximbank).

The SP-RCC also created the right conditions for a series of Development Policy Financing (DPF) initiatives by the World Bank, the first of which in 2016 was in direct response to the SP-RCC and "played a critical role in shaping the form and content of the policy program, and delivered results upon which the new DPF builds, whilst also strategically strengthening the foundations and providing a bridge to a new, post-2020 phase of climate action" (World Bank, 2020). The second of the series is known as the Climate Change and Green Growth (CCGG) DPF initiative and is intended to promote climate-resilient landscape management and cleaner transport and energy systems.

2. The Danish portfolio with Vietnam

2.1 Overview of the portfolio

Denmark opened its first embassy in Vietnam in 1994. The two countries signed an environmental agreement in 2002, and a general credit framework agreement in 2007. Other collaboration has covered education, food, agriculture and energy as well as culture. A broader context for the relationship was provided in 2018, when Denmark initiated the establishment of the P4G network, with Vietnam as a founder member along with México, South Korea, Chile, Ethiopia and Kenya. These founders intended P4G to become a leading forum for developing public-private partnerships at scale to deliver on the SDGs and the Paris Agreement, focusing on the five key areas of food and agriculture, water, energy, cities, and circular economy. Meanwhile, and in addition, Danish cooperation priorities are aligned with Vietnam's national priorities as expressed in the laws and policies summarised in Sections 1.3 and 1.6, including the NSCC, NSGG and the NP-RCC. A timeline for these is given in Annex b, alongside that for Danish interventions in the area of climate change mitigation (as listed in Table 3).

Table 3. Danish-funded projects and programmes evaluated in Vietnam

Title	Reference	Abbreviation	Timeframe	Budget (DKK million)
Vietnam National Energy Efficiency Program (Annex d)	5104.Vietnam.820	VNEEP	2009-2019	168.1
Low-Carbon Transition in the Energy Efficiency Sector (Annex e)	104.Vietnam.820/2015-53518	LCEE (DEPP 'T')	2013-2017	65.0
Vietnam-Denmark Energy Partnership Programme (Annex f)	Vietnam 2017-18831	DEPP II	2017-2020	22.6
Renewable Energy Water Supply in the Mekong Delta (Annex g)	104.Vietnam.30.m.137 (or .30)	REWS	2011-2014	4.4

2.2 The Vietnam National Energy Efficiency Program

a) *Design and implementation*

The Vietnam National Energy Efficiency Program (VNEEP) is a National (formerly a National Target) Programme, and is currently in phase 3, with a component related to the LCEE (see Section 2.3). The goal of the VNEEP is to raise the awareness of enterprises and people about energy saving and efficient use of appliances, and through various actions to influence behaviour in diverse target groups. It is a large programme that undertakes many activities simultaneously, and it has mobilised financial support from various international sources as well as Denmark. The attribution of results to different sources of funds is therefore difficult.

b) *Results and impacts*

Component 1 of VNEEP focused on capacity building and awareness raising. Its activities included compiling technical manuals and leaflets on energy saving and setting up and operating a network of experts to provide information on EE to journalists with dozens of media outlets reporting on energy saving activities. The Office of Energy Saving has worked with the provincial DoITs, Energy Efficiency Centres (EECs) and Industrial Promotion Centres (IPCs) to organize many seminars and training courses on EE laws and practices.

Component 2 of VNEEP focused on promoting the use of energy-efficient equipment. The energy label program has created transparency and competition in EE among brands⁴. Other activities included helping businesses to apply technical standards and norms, and to improve EE. The Office of Energy Efficiency set energy use norms for the steel, beverage, paper and pulp, cement and plastics industries, and for agricultural processing. The MoIT then developed a roadmap, action plan and draft technical

⁴ In 2014, the Ministry of Industry and Trade issued 436 certificates of EE labelling against 2,655 product codes.

regulations and standards on energy saving use for each sector⁵. It also promoted the application of energy management models in energy use facilities⁶, and developed technical and financial services to implement EE investment projects.

The VNEEP also piloted the Energy Service Company (ESCO) business model and provided financial advisory and other support services to EE investment projects, with six companies now registered to operate as ESCOs. In 2016-17, the MoIT issued a legal framework for ESCO companies to sign energy assurance contracts with energy users.

The VNEEP is largely directed at behavioural change, so its information campaigns are particularly important. These included promoting an energy labelling system, publishing 36 issues of *Energy Saving Bulletin* in 2011-2015⁷, placing over 500 items on EE topics in the media, and maintaining two websites (www.tietkiemnangluong.com.vn and www.vneec.gov.vn). Two nationwide competitions on EE in buildings were also organised⁸, while provincial DoITs, power companies and ECCs were provided with EE propaganda, and the communication activities of all ECCs and IPCs were centrally coordinated to ensure consistent EE messaging.

c) Overall mitigation performance

There were several constraints on VNEEP performance: that it had a very limited state budget; that little commercial credit was available for EE investments; that government subsidies (at 30% of total investment but no more than VND 5 billion) were too low to induce investment in new technologies⁹; and that domestic electricity prices were too low to incentivise EE investments¹⁰. It nevertheless made measurable oil-equivalent energy savings within a whole raft of multi-year government actions and donor support arrangements. It contributed significantly to raising awareness and decision-making in favour of low-carbon technologies across the whole energy sector. Danish support helped get VNEEP off to a good start and to this can be attributed a significant share of the 2011-2015 energy savings, which amounted to several million tCO₂e.

⁵ In 2014, supporting activities such as energy audit for 235 enterprises and survey and analysis of energy saving possibilities and potentials of production enterprises to optimize production process, improve energy usage, save energy.

⁶ Deploying human resource training on energy management, ISO 50001 standard for energy users. In 2014, they supported 30 enterprises to apply ISO 50001 standard; Deployed support for 40 enterprises to build energy management models as required by the Law on economical and efficient use of energy.

⁷ Surveys suggest that more than 85% of Vietnamese people know about EE as a result of exposure to various media, including radio and TV stations in 63 provinces which have community propaganda activities on energy efficiency.

⁸ The first contest attracted more than 400 buildings from 25 provinces and cities, of which MoIT recognized 106 and honoured 18. The second attracted nearly 440 entrants, synthesizing more than 1,650 energy-saving solutions that have been implemented to yield save nearly VND 1,875 billion in costs and 300,000 tons in CO₂ emissions.

⁹ In recent years, however, the cost of PV panels and other RE equipment has declined and this has improved capital recovery opportunities for RE investment projects.

¹⁰ Electricity prices in Vietnam are about half of the world average (GoVN, 2020b), and considerably lower for commercial use than in other countries with similar GDP/person (e.g. Cambodia, Laos and the Philippines, electricity costs USD 0.19, 0.09 and 0.19/kWh, respectively, compared to an average of USD 0.07/kWh in Vietnam). There is a general consensus that reform of the electricity price mechanism would be more effective than subsidies to promote investment, and a transformation to cost-reflective pricing is likely to occur eventually.

2.3 Low-Carbon Transition in the Energy Efficiency Sector

a) *Design and implementation*

The aim of the Low-Carbon Transition in the Energy Efficiency Sector (LCEE) project was to improve energy efficiency in small and medium enterprises (SMEs) and buildings, thus contributing to VNEEP energy saving targets. It had two components: Component 1, which worked with MoIT to promote EE in SMEs within the brick, ceramics, food processing, paper, textile, and rubber industries; and Component 2, which worked with MoC to promote EE in buildings through improved building codes.

b) *Results and impacts*

Efforts to improve the efficiency of village and household incinerators, kilns and furnaces were piloted by MoIT, which was also responsible for finding alternatives to coal for generating electricity at village level, and for helping households and SMEs to access credit with which to finance EE changes. After two years of implementation, the project had built up a Green Investment Fund (GIF) for the latter purpose. Many training activities and instructions had been implemented and initial results obtained, for instance at workshops in Kim Lan Pottery Village and brickworks at Vinh Long.

Improving EE in buildings was the responsibility of MoC, which it approached by developing a national technical regulation for EE in construction works, studying and developing technical standards for energy saving in civil, industrial and urban technical infrastructure, and for establishing and updating energy use databases for key and large buildings. The QCVN 09: 2013 standard was issued and requires compliance at design stage by investors in new commercial and residential buildings. The MoC organised training workshops on how to implement this standard in several cities, and subsequent surveys found that designs were often compliant, but this may slip during operation. The MoC also developed four standards for the voluntary certification for 'green' buildings¹¹.

c) *Overall mitigation performance*

These lines of approach, all of which met or exceeded their targets (see e6 in Annex e), were accompanied by detailed modelling to support estimation of direct and indirect emissions savings (see e1-3 in Annex e). Project-level emission reductions were proxied by calculations of tonnes of oil equivalent (TOE) saved, based on the number (63) of SME and other (90 or so) investment projects, and the total was thought to have been in the range of 0.1-0.2 MtCO_{2e}. These savings were related to national mitigation progress, against a 2006-2010 baseline saving of 3.4% (or 4.9 TOE, *ca* 15.6 MtCO_{2e}) and a 2011-2015 saving of 6.9% (or 11.9 TOE, *ca* 37.9 MtCO_{2e}). Thus, the LCEE made a small but strategic and highly-replicable contribution to national mitigation efforts in this period.

The evaluation concluded that, consistent with other Vietnamese strategies and partner interventions in Vietnam since the 1990s, LCEE was a model case of bringing multiple convergent lines of applied knowledge, research, financial incentives, and technical

¹¹ A sample of 259 building projects found that 156 had met the Leadership in Energy and Environmental Design (LEED) standard by June 2020, 68 had met the LOTUS standard, and 29 had met the Excellence in Design for Greater Efficiencies (EDGE) standard by 2019.

assistance to bear in a sustained way on complex sectoral circumstances in order to induce systematic directional change. Its strategic effectiveness was enhanced by being integrated within a larger (VNEEP) process, where the authority and bureaucratic activism of GoVN could synergise with the skilled innovation of TA and the motivations of local government and businesses. The challenge in this kind of approach is to sustain a balanced and focused input for long enough to make the change irreversible, which requires consistent policy support for an extended period. These favourable conditions were in place throughout the (extended) implementation period of 2013-2017.

2.4 The Vietnam-Denmark Energy Partnership Programme

a) Design and implementation

The Vietnam-Denmark Energy Partnership Program for 2017-2020 (DEPP II) was implemented by MoIT. Its overall objective was to provide technical assistance to support the widespread implementation of cost-optimized, low-carbon conversion opportunities in the Vietnamese energy system. It was designed to end in June 2020 but was extended to October due to the impact of the CoViD pandemic.

A major part of the TA was delivered by DEA technical experts in a government-to-government modality supported by LTAs and consultants. The TA was provided through three components: (a) Component 1 aimed to build capacity for energy policy development and long-term energy sector planning, with the Department of Electricity and Renewable Energy; (b) Component 2 aimed to build capacity for integrating renewable energy (RE) into the power system, with the Electricity Regulatory Authority; and (c) Component 3 aimed to build capacity for strengthening the legal framework for EE in industry, with the Department of Energy Efficiency and Sustainable Development.

b) Results and impacts

Technical support included the transfer of hardware and computational models, manuals and training for experts. Energy and power supply planning were prioritised, and the *Vietnam Energy Outlook Report 2019* provided a vision for energy development to 2050, with RE development scenarios in line with requirements of the Party and Government. Other findings included: (a) that the energy outlook periodicals were useful sources of information for stakeholders; (b) that EE database contains an up-to-date list of key energy enterprises (based on official lists approved by GoVN in 2017-2019); (c) that there was good communication based on consultations and workshops involving provincial energy users and other stakeholders; and (d) that MoIT was supported in developing and issuing instructions to the provincial DoITs on regulating key energy users and planning for EE in 2020-2025.

DEPP II also established information-sharing platforms on EE that were well appreciated by stakeholders and enabled the VEPG to access lessons from VNEEP and LCEE, while supporting Institute of Energy studies, modelling and statistical analysis. The TA that was provided supported development of the legal framework, management processes, and implementation of training. Although the CoViD pandemic interfered

with short-term TA, technical exchanges could still occur remotely. Outputs included reports describing construction methods, guidance documents, and recommendations to amend the regulations on power grids associated with transmission and distribution grids, including technical requirements for offshore wind power connection.

On the specific issue of capacity building, the main weakness identified was that the DEPP II design included no institutional capacity assessments or staff development plans, so improvements in capacity could not be documented. On the other hand, interviewees described technical training and internships as very practical and useful in the areas of RE modelling and managing the Vietnamese power system in the context of rapid growth in RE resources. Another key observation was that the placement of LTAs worked well both at the technical level and as an effective methodology for support. More generally, interviewees acknowledged that DEPP had helped Vietnam in the early stage of its RE development, especially by modelling RE for power plants and power system regulators. Recommendations on methods, development of data sets, calculation tools and procedures, and a roadmap to amend the grid regulations were all much appreciated. Since implementation at the provincial and local level has a key role in a National Program, help with developing building regulations and raising DoIT capacity to manage reporting of key energy units, the control the quality of energy audit reports, and to report on energy consumption norms were all seen as very useful.

c) *Overall mitigation performance*

The programme offered high potential for positive impact, since it was "addressing the challenges that Vietnam is facing with regards to a forecasted increase of GHG emissions, which again is coupled with the challenges of integrating new and variable renewable energy technologies into the national power grid." (MFA, 2019b: 7). It was designed to address weaknesses in policy, regulation, local implementation, capacity to integrate RE and incentives to promote RE and EE, using a flexible mix of policy dialogue, TA, and supervised on-the-job and other training.

Since DEPP II was a capacity-building programme, mitigation effects were expected to be indirect and slow to mature, but significant because of economy-wide effects from well-crafted regulations and enhanced willingness and capacity to comply with and enforce them. Alterations in planning and regulatory capacity and direction are in principle cumulative, directional and hard to reverse, so should be sustainable as well as powerful. The programme could have been improved by using a capacity needs assessment baseline and a focused monitoring programme to demonstrate increasing institutional capacity and performance. The evidence nevertheless suggests that DEPP II made a useful start on addressing key mitigation challenges, and that this contribution was well-appreciated by stakeholders.

d) *Implications for DEPP III*

The DEPP III design for Vietnam includes a detailed review of lessons from DEPP II and is informed and rationalised by energy systems modelling and other analyses in the Energy Outlook Vietnam 2019 (EREA & DEA, 2019). It seems well aligned with past experiences and national priorities, for example on capacity building, where activities will

be formulated "in direct collaboration with partners [and pay] particular attention to documenting the needs of the partner, clearly setting out the scope and objectives of the capacity development activities and reaffirming that indicators ... capture the capacity development aspect." (MFA & MCEU, 2020: 15). It also responds to new developments, both positive (e.g. sustained and ambitious GoVN policy to reduce GHG emissions) and negative (e.g. the recognition that Hanoi is now the most air-polluted city in the world).

The design is justified mainly by statements of intent, such as that "DEPP III will lead to increasing shares of renewable energy, with more reliable and stable electricity supply from the grid" (*Ibid.*: 12). From a mitigation point of view, signs that the design has a more specific and potentially quantifiable approach to capacity building than in DEPP II include its aim of deepening "Vietnamese planners' understanding of climate change drivers and concepts of externalities so that they can more effectively address climate change as part of the quantitative energy system modelling." (*Ibid.*: 12).

It requires no special calculation, however, to validate efforts to overcome challenges "raised when developing large amounts of wind and solar power sources, including the ability to integrate and balance wind and solar power into the energy system, the ability to reinforce and expand the transmission grid and land use requirements, especially for large solar parks. These challenges will be addressed in DEPP III focusing on assisting the Vietnamese authorities responsible for regulating the electricity sector and access to the grid by developing the necessary regulatory framework to ensure a cost efficient integration of renewable energy." (MFA & MCEU, 2020, Annex 1: 3).

2.5 Renewable Energy Water Supply in the Mekong Delta

a) Design and implementation

The Renewable Energy Water Supply (REWS) project aimed to demonstrate the use of small-scale solar and wind RE technology for pumping community water in the Mekong Delta. Previous aid projects had installed many small rural water systems in the area, but few pumps were still operating, partly because of burn-out due to irregular grid power, and power cuts were common even where villages were connected to the grid. Solutions were being sought by communities and local government explicitly to replace fossil (diesel generator and grid) power on reliability, cost and environmental grounds. The RDE saw the opportunity to meet these needs, while offering a demonstration aimed at changing public opinion and government procurement in favour of RE.

Through the People's Committee of Can Tho all 13 provinces therefore agreed to enter into a Danish embassy Local Grant Authority (LGA) project to promote RE solutions for bringing water to villages. This was mainly to be done through information and training delivered through the provincial water centres (pCERWASS), using newly-built RE community water supplies and a mobile education unit, the monitoring and reporting of GHG emission reductions and cost savings, and a knowledge centre established at the pCERWASS office in Can Tho. The Inception Report of the present evaluation had identified REWS as a noteworthy project from 2011-2014, so the national consultants were asked to visit the area and document its legacy effects.

b) *Results and impacts*

Interviews confirmed that all installations of the selected (Danish-made) solar pump systems with automatic solar-grid change-over devices were done successfully and on schedule, with support from the pCERWASS, consultants and Grundfos Vietnam. All operated as expected and gained immediate public support as water was delivered with less effort and cost than before. The demonstration and education effects seem to have been welcomed by villagers and the planned number (99) of community workshops were delivered. Interviews confirmed that all systems were still working in 2020, indicating that operation and maintenance training had been sufficient. But key changes in context had occurred. GoVN had stopped the use of ground water, possibly on health grounds because of arsenic and/or fluoride contamination (see f1 in Annex f), so the pumps were being used only for surface water. There had also been systematic privatisation of public water supplies, and dispersed pumping stations were less attractive to investors than large water treatment plants. Some provinces had combined their water networks and/or pCERWASS into provincial public water supply companies. And the technologies had also changed, with cheaper and more powerful solar panels (450 W rather than 100 W) and the installation of larger roof-top solar systems (up to 1 MW) in response to GoVN policy.

c) *Overall mitigation performance*

To the small effect of the REWS project on local GHG emissions should be added the educational effect and the induced demand for replication, which could have been met by other public and private actors. In the context of massive RE inputs to the national grid, however, and the aggregation of service delivery arrangements through corporate investment, the role of household- and community-level solar power is bound to be limited in future. Thus, the REWS project offered a significant localised mitigation model at the time, but it has less value as such now. It nevertheless stands as an example of how embassy LGA funds can be used creatively and efficiently to meet local needs in ways that are environmentally benign.

2.6 Danish Interventions in relation to NDC commitments

The 2016 NDC and its 2020 update are closely aligned with GoVN policies and priorities throughout the 2013-2020 period, including the 2011 NSCC and 2012 NSGG and the 2009-2020 SP-RCC framework. Points of alignment between Danish interventions and the NDCs are indicated in Table 4.

Table 4: NDC mitigation commitments and Danish interventions in Vietnam

Commitments in the NDC (GoVN, 2016, 2020)	Response in the form of Danish interventions
<p>NDC strategic goal:</p> <ul style="list-style-type: none"> 2016 NDC: GHG emissions in 2030 (787.4 MtCO_{2e} in BAU scenario) reduced by 8%. 2020 NDC: GHG emissions in 2030 (927.9 MtCO_{2e} in BAU scenario) reduced by 9%. 	<p>VNEEP, LCEE, DEPP II were all aligned with the NDC goals and together made a significant contribution to the goals of Vietnam's GHG emission reduction strategies in the energy sector.</p>

<p>NDC coverage 1 - Economy.</p> <p>2016/2020 NDC: both cover the entire economy.</p>	<p>Contributions to reducing GHG emissions in the energy sector have economy-wide significance.</p>
<p>NDC coverage 2:</p> <ul style="list-style-type: none"> • 2016 NDC: CO₂, CH₄, N₂O, HFCs, perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). • 2020 NDC: CO₂, CH₄, N₂O and HFCs. <p>The definition of HFC varies between the NDCs.</p>	<p>Following Danish Climate Envelope guidelines, impact indicators should include 'tCO₂e emissions reduced', and there is much attention to various measures of carbon dioxide emissions and their oil equivalents at economy-wide scale (see Annex e cell e3). Of the Danish interventions (as opposed to GoVN programmes supported by Denmark), only REWS included at design stage plans to measure GHG emissions. None targeted CH₄ or N₂O or the HFCs however defined.</p>
<p>NDC strategic measure 1 - Investment Promotion:</p> <ul style="list-style-type: none"> • 2016 NDC: develop policies that create favourable conditions for investments in mitigation activities. • 2020 NDC: a diverse raft of measures is specified to encourage and enable domestic and foreign enterprises and investments in EE, RE, green growth, etc., and to use public-private partnerships and instruments such as green bonds, green investment funds, while ensuring cooperation with development partners, and inter-regional and inter-provincial coordination in mobilising and using resources. 	<p>VNEEP piloted the ESCO business model and provided financial advisory and other support services to investment projects in energy saving and efficiency. LCEE aimed to help SMEs and village households access investment finance for innovations and built up a Green Investment Fund to help borrowers to save energy by changing their production systems (e.g. in pottery and brick enterprises). DEPP II aimed to build capacity for energy policy development, long-term energy sector planning, integrating RE into the grid, and for strengthening the legal framework for EE in industry, all of which would have improved the investment environment for mitigation activities in the energy sector.</p>
<p>NDC strategic measure 2 - the State.</p> <ul style="list-style-type: none"> • 2016 NDC: strengthen the leading role of the State in responding to climate change. • 2020 NDC: strengthen the capacity of the state to undertake necessary mitigation tasks and to support others in doing so. 	<p>The Danish contribution to VNEEP was essentially sector budget support to a GoVN programme. LCEE was implemented through ministries (MoIT and MoC), and DEPP II was implemented through MoIT and the Electricity Regulatory Authority. REWS was oriented to provincial governments in the Mekong Delta.</p>
<p>NDC strategic measure 3 - Renewable Energy.</p> <ul style="list-style-type: none"> • 2016 NDC: change the fuel structure in industry and transportation. • 2020 NDC: promote efficient exploitation of renewable energy sources and increasing their proportion in energy production and consumption. 	<p>Contributions to the development of RE by all Danish interventions were in line with this strategic measure.</p>
<p>NDC sectoral target 1 - Agriculture</p> <p>2016/2020 NDC: reduce GHG emissions through sustainable agricultural development and improve the effectiveness and competitiveness of agricultural production.</p>	<p>None of the Danish interventions aimed to reduce AFOLU/LULUCF sector GHG emissions.</p>
<p>NDC sectoral target 2 - Forestry.</p>	<p>None of the Danish interventions aimed to reduce</p>

2016/2020 NDC: manage and develop sustainable forests, enhance carbon sequestration and environmental services; conserve biodiversity associated with economic development and increase incomes for forest-dependent communities and people.	AFOLU/LULUCF sector GHG emissions.
NDC sectoral target 3 - Energy Efficiency. 2016/2020 NDC: improve effectiveness and efficiency of energy use; reducing energy consumption.	The three larger Danish interventions projects (VNEEP, LCEE, DEPP II) were strongly aligned with the EE targets in the energy sector and made a significant contribution to EE awareness, investment and uptake, including through LCEE in SMEs and buildings at provincial level.
NDC sectoral target 4 - Waste Management. 2016/2020 NDC: Improve waste management by building solid waste treatment plants using new technologies combined with compost production, to reduce landfill and limit environmental impacts.	None of the Danish interventions aimed to reduce waste sector GHG emissions.
NDC sectoral target 5 - Construction. 2020 NDC: reduce GHG emissions by replacing construction materials and improving the cement and chemical production processes together with reducing the consumption of HFCs.	None of the Danish interventions were aligned with these sectoral mitigation activities.
NDC sectoral target 6 - Transport. 2020 NDC: shifting passenger and cargo transportation models.	None of the Danish interventions were aligned with transport sector mitigation.
Other NDC priority: implement NDC 2016, 2020.	Vietnam joined the Danish-funded NDGP in 2016, with MoNRE, NCCC and MoPI as focal points (NCCC leads on NDC implementation and stakeholder coordination). The NDGP database for Vietnam records 12 initiatives on mitigation and adaptation (https://ndcpartnership.org/good-practice-database#navi).

3. Conclusions

The three larger projects reviewed here (VNEEP, LCEE, DEPP II) made significant contributions to the goals of Vietnam's GHG emission reduction strategies, and their design and results are important factors in implementing Vietnam's strategies to reduce GHG emissions in the energy sector. For purposes of comparison with Danish-funded interventions elsewhere, it should be noted that VNEEP was wholly and LCEE partly designed and implemented by the Vietnamese institutions concerned. Among the Danish interventions in Vietnam, only the tiny REWS project sought to document emission reductions. The absence of attributable and/or quantified baselines and monitoring data in the other cases means that the scale of emission reductions obtained through Danish mitigation investment cannot be specified. The same applies to capacity-building effects, where institutional capacity baselines, agreed goals and progress reports would be needed

to document gains. All four projects were otherwise well designed and had good or very good performance (Table 5).

Table 5: Design and performance scores for mitigation interventions in Vietnam

Project	Design	Impact	Effectiveness	Efficiency
VNEEP	6	5	6	4
LCEE/DEPP 'I'	5	6	6	6
DEPP II	4	5	6	5
REWS	6	6	5	6
Mean	5.3	5.5	5.8	5.3
Description	good	good/very good	very good	good

Specific issues that arose included several with implications for future decisions. The VNEEP ('sector budget support') model worked well because the national programme to which it contributed was well designed and implemented by GoVN. The implication is that the quality and consistency of government policies is an important factor to assess in other cases. The LCEE (or DEPP 'I') model combined with other lines of approach the virtue of being within a GoVN programme, allowing for good synergy among them. It also created space for DEPP II, through which sector-wide capacity, policy and regulatory support could be offered, as GoVN accelerated its move towards RE. Although its specific effects are unquantified, at a qualitative level its consequences were significant and much appreciated by GoVN stakeholders. This allowed DEPP III to be introduced, which continues to offer specific technical support and general encouragement to the clean energy transition in Vietnam and elsewhere.

Annex a: Information sources for the Vietnam country study

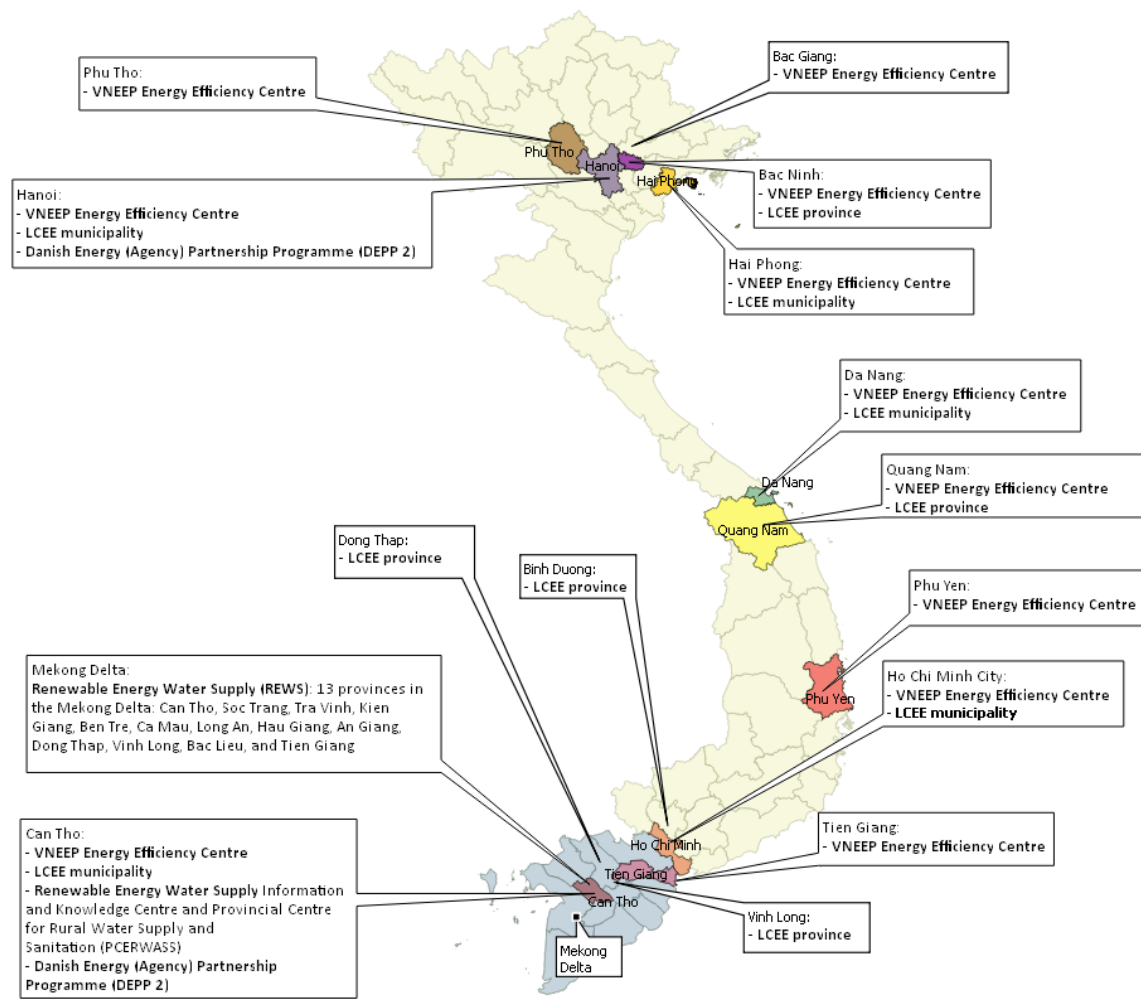
Process of country study development		
All country studies were developed according to the note in Annex a of Annex H.		
Persons and institutions consulted in the Vietnam country study		
Institution	Relevance	Interviewee
Climate Sense (NDC Partnership)	Annex d: VNEEP, Annex e: LCEE and Annex f: DEPP II	Koos Neefjes (Director & Climate Change Expert).
Danish Embassy in Vietnam	Annex d: VNEEP, Annex e: LCEE and Annex f: DEPP II	Tran Hong Viet (Program Officer).
Danish Energy Agency	Annex d: VNEEP, Annex e: LCEE and Annex f: DEPP II	Nadeem Niwaz (Country Manager).
GIZ	Annex d: VNEEP, Annex e: LCEE and Annex f: DEPP II	Le Thi Thoa (Programme Officer, Renewable Energy and Energy Efficiency project in Vietnam).
GIZ	Annex d: VNEEP, Annex e: LCEE and Annex f: DEPP II	Nguyen Do Thuyen (Programme Officer, renewable energy and Energy Efficiency project in Vietnam).
Electric Power University	Annex e: LCEE and Annex f: DEPP II	Nguyen Duc Quang (Lecturer).
Institute of Energy	Annex d: VNEEP, Annex e: LCEE and Annex f: DEPP II	Nguyen Thu Huyen (Researcher).
Department of Environmental Protection, Can Tho City	Annex g: REWS	Nguyen Van Tai (DEP Official).
Department of Agriculture and Rural Development, An Giang province	Annex g: REWS	Truong Kien Tho (DARD Deputy Director General).
Farmers Association of Soc Trang province	Annex g: REWS	Mr Nghi (FA representative).
Consultant	Annex g: REWS	John Rockhold (consultant to REWS project).

Annex b: Timeline of Danish projects and programmes in Vietnam

Year	Vietnam	VNEEP	LCEE (DEPP 'I')	DEPP II	REWS
2006	Decision 79/2006/QĐ-TTg on National Target Programme on Efficient Use and Saving Energy.	GoVN initiates Phase 1 of VNEEP (2006-2010).			
2007	National Forestry Development Strategy 2006-2020. Decision No. 1855/QĐ-TTg on National Energy Development Strategy (NEDS).				
2008	Decision No. 158/2008/QĐ-TTg on the National Target Programme to Respond to Climate Change.				
2008					
2009		Danish support for VNEEP begins (2009-2013)			
2010					
2011	Law on Economical and Efficient Use of Energy No: 50/2010/QH12. Decision No: 2139/QĐ-TTg on the National Strategy for Climate Change (NSCC). Decision No. 37/2011/QĐ-TTg on supporting the development of wind power projects in Vietnam. Decision No. 543/QĐ-BNN-KHCN on Climate Change Response of Agriculture and Rural Development Sector in the Period 2011-2015.	GoVN maintains EE activities under various national initiatives and with various donors (2011-2012).			Danish embassy support for REWS initiated (Dec 2011 to Dec 2014).
2012	Law on Water Resources. Decision No.799/QĐ-TTg on the national REDD+ action programme. Decision No. 1393/QĐ-TTg on the National Strategy for Green Growth (NSGG)	GoVN initiates Phase 2 of VNEEP (2012-2015).			
2013	Resolution No. 24-NQ/TW on active response to climate change. Law on Natural Disaster Prevention and Control No: 33/2013/QH13. Transport Development Strategy (TDS).		Danish support for LCEE initiated (Jan 2013-Dec 2015).		

2014	Law on Environmental Protection No. 55/2014/QH13.			Danish embassy support for REWS ends (Dec 2014).
2015	Law on Meteorology and Hydrology No. 90/2015/QH13. Decision 2068/QĐ-TTg on Renewable Energy Development Strategy (REDS).			
2016	NDC 1 submitted to UNFCCC Secretariat.	GoVN maintains EE activities under various national initiatives and with various donors (2016-2018).	Danish support for LCEE extended.	
2017	Forestry Law. Decision No. 2044/QĐ-TTg on the SP-RCC Program Document 2016-2020.		Danish support for LCEE ends Jun 2017	Danish support for DEPP II initiated (July 2017 – June 2020).
2018	P4G network initiated in Copenhagen, with Vietnam as a founder member along with Denmark, México, South Korea, Chile, Ethiopia and Kenya.			
2019		VNEEP 3 (2019-2030) approved by GoVN.		
2020	NDC 2 submitted to UNFCCC Secretariat.			Danish support for DEPP II ends (June 2020). DEPP III approved (November 2020).

Sources: Text, and www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/VIETNAM.pdf.



Annex c: Map of Vietnam with key project locations.

Annex d: The Vietnam National Energy Efficiency Programme (VNEEP)

Part A: Basic data
A1. Project number & name. 5104.Vietnam.820: Climate Change Adaptation and Mitigation (CCAM). The mitigation component is the Vietnam National Energy Efficiency Program (VNEEP).
A2. Interviews. See Annex a, persons and institutions consulted relevant to Annex d.
A3. Dates & financial data. 1 January 2009 for 5 years (2009-2013). Total budget DKK 833.6 million, of which DKK 657.5 million was for adaptation, DKK 168.1 million was for mitigation. The VNEEP was originally a 10 year GoVN program, which was approved in April 2006, so Danish support was sector budget support for part of it. An extension for 2019-2030 was designed by MoIT (2018) and approved by the Prime Minister in March 2019.
A4. Location(s). Vietnam: Hanoi and Ho Chi Minh City, with Energy Efficiency Centres located at Ho Chi Minh City, Hanoi, Tien Giang, Phu Yen, Hai Phong, Can Tho, Quang Nam, Bac Ninh, Bac Giang, Da Nang, and Phu Tho.
A5. Partners. Ministry of Industry and Trade, MoIT (for mitigation); Ministry of Natural Resources and Environment, MoNRE (for adaptation, along with Peoples Provincial Committee, of Quang Nam and Ben Tre provinces).
Part B: Purpose and relevance
B1. Purpose. The CCAM programme aimed to increase sustainability in economic and social development and poverty alleviation, through increased national capacity to adapt to climate change and increase mitigation efforts. The two components focus on: (a) adaptation (NTP-RCC), part-focused on two climate vulnerable provinces (Ben Tre in the Mekong Delta, and Quang Nam in the central coastal zone), building on existing cooperation between Danida and the provinces; and (b) mitigation (VNEEP), the aim of which is to increase the efficiency with which energy is used, both within enterprises and in large buildings, thus supporting the national effort to move toward a low carbon economy. Targets include savings of 3-5% in 2006-2010 and of 5-8% in 2011-2015 in total energy consumption, compared with the base case of the 2006 forecast on energy development. The VNEEP specifies 6 components and totally 11 projects to achieve these savings.

B2. Relevance to partners.

For **Vietnam**, the legal and policy bases for NDC implementation include: (a) Law on Environment (6/2014); (b) Law on 'Economical and Efficient use of Energy' (6/2010); (c) Resolution No. 24-NQ/TW on 'Proactively responding to climate change, enhancing natural resource management and environmental protection' (6/2013); (d) National Climate Change Strategy (12/2011); (e) National Green Growth Strategy (9/2012); (f) Decision 1775/QĐ - TTg on 'Management of GHG emissions; management of carbon trading activities to the world market' (11/2012). "Vietnam will continue to develop policies that create favourable conditions for investments in mitigation activities." (GoVN, 2016: 5). See also MFA (2011a): The National Target Programme to Respond to Climate Change (NTP RCC) and the Vietnam Energy Efficiency Programme (VNEEP) are among key policy frameworks for combating the negative impacts of the global warming in Vietnam. Hence, the CCAM programme, which is fully aligned with and contributes to these two national programmes, is highly relevant for the country's climate change priorities.

For **Denmark**, the approach was in line with the then-current policy, for example: "Denmark will emphasise supporting the transfer of green technology that can contribute to greater sustainability through, for example, more efficient utilisation of energy" (MFA, 2011b: 20). Similar intentions have frequently been expressed in Danish policies since, and EE as a dimension of mitigation remains an important part of the international climate response to which Denmark subscribes through the Paris Agreement and EU (as well as unilateral) initiatives, albeit that the assumed relationship between EE and net GHG emission reductions has proved to be more complex and indirect than at first thought.

B3. Relevance to MDGs/SDGs.

SDG 7: Affordable and Clean Energy, since it is assumed that greater energy efficiency will in effect increase total supply (or the reliability of supply) relative to demand.

SDG 13: Climate Action, since it is assumed that greater energy efficiency will lead (one way or another) to fewer fossil fuels being burned.

B4. Relevance to NDC mitigation commitments.

The VNEEP pre-dated the NDC (GoVN, 2016), but that document makes repeated references to the priority of increasing energy efficiency alongside the promotion of renewable

energy and clean fuels, and removing subsidies on fossil fuels (pages 2, 5-7), framed in the context of improving energy security or responding to climate change, or both.

B5. Relevance to mitigation. Mitigation technology (MT). Incentives & regulations (IR).

Part C: Narrative overview

Despite finance sector difficulties after the 2008 crash and reduced macroeconomic performance in 2011-2015, growth in GDP of about 7.0% annually (as prevailed in 2001-2010 and after 2016) is regarded as normal and desirable in Vietnam (MoIT, 2018). This rapid growth is accompanied by high energy intensity of Vietnamese enterprises - twice that of their peers in Malaysia and Thailand (MFA, 2008; MoIT, 2018) - so there is room for significant improvement. The VNEEP therefore set targets for energy savings and indicated a number of interventions needed for achieving the targets. It focused on improving the likelihood of achieving measurable and verifiable energy savings in Vietnamese enterprises by reducing some of the barriers which delay or block decisions on implementing energy efficiency measures. Training schemes for consultants, energy managers and staff of the departments of industry and construction were to be established, supported by focused information activities. Thus, the main outputs of the VNEEP were to include: a complete legal framework on energy efficiency and conservation; legal obligations and technical and managerial guidance encourage and enable businesses to develop better energy efficiency models and to improve, upgrade and optimise the technology they use for energy saving and efficiency; and enhanced public awareness on energy efficiency and its integration into the national education system.

Part D: Design quality

D1. Theory of change. The Danish expectation was that by building on and enhancing or completing GoVN arrangements to incentivise energy savings, the performance of VNEEP would be improved. About 35% of the component budget was to be used for a funding mechanism, which was to be established on a matching grant basis to promote the implementation of energy efficiency measures in enterprises and commercial buildings. These measures would, acting through agreed protocols in the context of a government programme, result in economy-wide improvements in energy efficiency.

D2. Assumptions underlying the theory of change.

Assumption 1. Planned legislation will be passed and come into effect, including a new Energy Savings Law (by 2010) and new regulation on prices and economic incentives (by

2011), and that these rules will be enforced and complied with.

Assumption 2. GoVN will allocate state funds to the new Energy Savings Fund (or other suitable financial mechanism) from the budget year 2010 and onwards, and that this will provide adequate incentives for change.

Assumption 3. Enterprises will be aware of and understand the potential and benefits of energy savings and express a demand for energy audits as a way to comply with the new laws and take advantage of new opportunities.

Assumption 4. The political costs of reducing energy subsidies and imposing a new regulatory and incentive regime will continue to be seen as acceptable to GoVN and all sectoral actors, so all will cooperate in implementing energy efficiency measures.

D3. Plausibility of assumptions and links. All the assumptions were plausible, since in a one-party state the likelihood that a GoVN-designed and GoVN-implemented programme based on settled GoVN policy would not adhere to form and schedule was considered small.

D4. General quality of the project design. The design of VNEEP was by GoVN with scope for coordinated support by diverse development partners according to procedures and principles laid out in the Programme Document (MoNRE, MoIT & MFA, 2008). The design was appropriate to national conditions and in line with the country strategy, while complying with national priorities for capacity building, underpinning national objectives for sustainable development, and likely to generate employment in the energy services and technology sector, while its financial management and procurement were to be undertaken according to GoVN law, and with budgeting, work planning and reporting done in accordance with GoVN rules and regulations (MFA, 2011a). **Score:** 6.

Part E: Evidence for mitigation performance

E1. Direct effectiveness. MFA (2011a) noted that VNEEP achieved 3.4% saving of total national energy consumption during 2006-2010 (the target was 3%-5%). Another major achievement was the approval of Energy Efficiency and Conservation Law which came into force on 1 January 2011. A network for promoting energy efficiency was established including eight Energy Efficiency Centres, ten Industrial Promotion Centres, consultancy centres under universities and research institutes all over the country. Most cities and provinces have completed its energy efficiency plans. mechanisms and conditions for enterprises to access the investment fund are not yet clear. MoIT (2018) reported an Institute of Energy calculation that the overall rate of energy conservation in 2011-2015 was almost six per cent, equivalent to

nearly 12 million tonnes of oil equivalent. **Score:** 6.

E2. Indirect effectiveness. The following highlights from Anon (undated); see also MoIT (2018) 'Achievements in the 2011-2015 period', and G1. **Component 1:** The 'Energy conservation households 2011' campaign was launched in Hanoi and Ho Chi Minh City (mobilizing the participation of 300,000 households). The campaign was successfully organized with the coordination among the Program Steering Committee, the Cities' People's Committee leaders, and different levels and sectors, and with efforts of the women, fulfilling their roles in the families and society; with over 1 million households in Ho Chi Minh City and Hanoi participating in the campaign. **Component 2:** (a) It is expected that around 450 significant energy users would receive training programs on energy management in 2012 (as of September 2012, 300 significant energy users have been trained and provided with certifications). (b) Coordinating with consulting firms/organizations to provide energy audits for over 200 enterprises nationwide (for over 100 enterprises within framework of the Program).

Component 3: (a) Developing, compiling standards, technical guidance of and organizing training on energy efficiency and conservation in construction works. (b) Researching, surveying and developing database of buildings - significant energy users in the North and the South as stipulated in the Law on Energy Efficiency and Conservation. (c) Mainstreaming activities related to energy efficiency and conservation in buildings such as organizing energy efficiency architectural solution contest 2011, conferences on green buildings, developing design guidelines for green buildings. **Component 4:** Deployment of a road map for application of emission standards for road motor vehicles following the Decision No. 249/2005/QĐ-TT approved by the Prime Minister; submitting to the Prime Minister to issue the road map for application of Euro 3, Euro 4, and Euro 5 emission standards for manufactured, assembled and imported new vehicles, in order to reducing fuel consumption in transportation and contributing to environment protection. **Score:** 6.

E3. Net GHG emission reductions

See Part E1, where direct effectiveness is estimated at almost 12 million tonnes of oil equivalent. The scale of the Danish contributions to this achievement is unclear, considering the multiple other development partners involved and the GoVN's own actions, but a claim of some share is permissible, especially in the period of Danish sector financing.

E4. Impact effects. See E1 and E2. Attributable impact is hard to judge without greater clarity on Danish influence. **Score:** 5.

E5. Sustainability effects. MFA (2011a) emphasises that the whole programme is a

government operation, with financial management and procurement according to GoVN law, funds channelled through the State Treasury and managed by the GoVN, and budgeting, work planning and reporting are done in accordance with GoVN rules and regulations. Since the programme to which Danida contributed has been extended by GoVN to 2030, sustainability must be considered to be high. On the other hand, MFA (2011a: 5) also notes that "High-level dialogue with government partners in the programme remains weak." Tensions that may have arisen during implementation are invisible at this level of analysis. Interviews also show that absence of finance led to stop for new EE investments. **Score:** 5.

E6. Efficiency issues. MoIT (2018): "Annual expenditures from the State's budget for the Program regularly arrived late, affecting execution progress of the objectives; in addition, total annual expenditures were relatively low, ... despite the fact that the Program's intended population was broad and diverse, from Central to local level." In addition, MFA (2011a) noted that "The Progress of mitigation component is on track, but stronger effort is needed in order to achieve the immediate objective." (page 6). The evidence is consistent with moderate efficiency. Meanwhile, the energy labelling roadmap encountered difficulties such as limited testing infrastructure, limited human resources and implementation funding, inconsistent standards, and a lack of equipment for EE testing. Financial resources, technical experts, especially in the field of Civil Construction, Transport and in localities were limited, so the implementation of energy audits for enterprises in those fields was weak. Finally, low domestic energy prices constrained implementation of energy saving measures. **Score:** 4.

E7. Capacity building issues. See E1. The nationwide EE network described by MFA (2011a: 6) implies a major capacity building need, and since the same source observes that "Both components also comply with the priority of capacity building of Vietnamese human resources" (p. 5), it can perhaps be assumed that capacity building was adequate to meet GoVN expectations and requirements, even though the same source also remarks (p. 8) that weak capacity among GoVN bodies is still a widespread problem. Interviews provided no information to change these statements. **Score:** 4.

E8. Baseline and monitoring arrangements. See G2 and MoIT (2018). Measurement and monitoring of national GHG emissions is well developed in Vietnam, although disaggregating the trends and attributing parts to specific actions, donors, partnerships, policies, etc. would require innovative analysis. There are also factors in the national monitoring system for GHG emissions that could benefit from different viewpoints - for example, the net GHG emission reductions in the LULUCF sector are attributable to forest plantation developments that may

have sacrificed biodiversity.

E9. Overall conclusion on mitigation performance. VNEEP started in 2006 and is now in Phase III. It aimed to improve EE from the start, even without clear links to GHG emission reduction, and the Danish contribution arrived when the program was already underway. It made measurable oil-equivalent energy savings within a whole raft of multi-year government actions and donor support arrangements. It contributed significantly to raising awareness and decision-making in favour of low-carbon technologies across the whole energy sector. Assessing the effectiveness of Danida's own contribution is a challenge as no separate or specific indicators were established or monitored, but the Danida input is argued to have helped get VNEEP off to a good start and might be able to claim a significant share of the 2011-2015 energy savings (several million tCO₂e), and some on-going impact and sustainability. **Score:** 6.

Part F: Other issues

F1. Unintended consequences. None noted.

F2. Other performance issues. None noted.

Part G: Notes on other relevant topics.

G1. Other mitigation/performance-related factors in Vietnam

Vietnam is a country where synergies are known among effective institutions (e.g. National Cleaner Production Centre), financial mechanisms (e.g. the Green Credit Trust Fund) and programmes (e.g. the IFC's Environmental and Social Risk Management) (Caldecott, 2017). With this background and reputation comes confidence that Vietnam would be able to meet the targets specified in the VNEEP Programme Component Document: 50 certified energy consultants and 225 energy managers certified per year; energy audits and efficiency and Clean Development Mechanism possibilities presented in at least 300 large scale energy-intensive enterprises, 200 large enterprises, 12 power plants and 300 SME/large buildings; and an energy efficiency co-financing mechanism is established, functional and being used. On the other hand, MFA (2011a): "The business environment in Vietnam is still difficult, in that there is a preference for state owned enterprises over private sector entities. Private sector has difficulties accessing technology, know-how and finance. This continues to prevent the sector from fulfilling its potential." And MoIT (2018) also mentions for 2012-2015 that "Many businesses have no fund or were not able to access soft credit loans for energy conservation

projects. Besides, due to financial difficulty, many companies halted or were not able to implement energy conservation projects, especially steel and cement ones."

G2. VNEEP Continuation decision for 2019-2030

This decision was made by the Prime Minister on 13 March 2019, citing: (a) Law on Organization of the Government dated June 19, 2015; (b) Law on Economical and Efficient Use of Energy dated June 17, 2010; (c) Decree No. 21/2011/ND-CP dated March 29, 2011 of the Government stipulating details and measures to implement the Law on Economical and Efficient Use of Energy; (d) Decision No. 428/QĐ-TTg dated March 18, 2016 of the Prime Minister on approval of the revised National Power Development Master Plan for the period of 2011-2020 with a vision to 2030; and (e) Decision No. 2053/QĐ-TTg dated October 28, 2016 of the Prime Minister on promulgating the Implementation Plan of the Paris Agreement on climate change (http://gizenergy.org.vn/media/app/media/the-signed-version-of-VNEEP-3_ENG_GIZ.pdf).

G3. Legislative foundation for VNEEP (MoIT, 2018):

- Energy Efficiency and Conservation Law;
 - Decree No. 21/2011/ND-CP dated Mar. 29, 2011 issued by the Government detailing the Energy Efficiency and Conservation Law and measures for its implementation;
 - Decree No. 134/2013/ND-CP dated Oct. 17, 2013 issued by the Government setting forth administrative fine in electricity, hydroelectric dam safety, and efficiency and conservation;
 - Intended Nationally Determined Contribution (INDC) – Vietnam's commitment towards the international community to combat global climate change, [of which, Vietnam committed to reducing 8% greenhouse gas emission against typical development scenario and may further reduce to 25% with international aid] [*including an 8% reduction in GHG emission against the BAU scenario and may further reduce to 25% with international aid*]; Updated Nationally Determined Contribution (NDC 2), Vietnam's commitment towards the international community to combat global climate change, [of which, Vietnam committed to reducing 9% greenhouse gas emission against typical development scenario and may further reduce to 27% with international aid]
 - Decision No. 04/2017/QĐ-TTg dated Mar. 09, 2017 issued by the Prime Minister setting forth the List of equipment and appliances to which mandatory energy labelling
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and minimum energy efficiency standards are applied, and the roadmap to their implementation;

- Decision No. 403/QĐ-TTg dated Mar. 20, 2014 issued by the Prime Minister approving the National Action Plan on Green Growth for 2014-2020;
- Decision No. 78/2013/QĐ-TTg dated Dec. 25, 2013 by the Prime Minister setting forth List of energy consumption vehicles and equipment for disposal, and ban on construction of new low-efficiency power plants;
- Decision No. 1393/QĐ-CP dated Sep. 25, 2012 issued by the Prime Minister approving the National Strategy on Green Growth, in which there was an explicit statement on reducing greenhouse gas emission intensity and promoting clean energy and renewable energy use, with the following key indicators: (a) 2011 - 2020: Reduce greenhouse gas emission intensity by 8 - 10% against 2010 index, reduce per-GDP energy expenditure by 1 - 1,5%/year. Reduce greenhouse gas emission in energy-related activities by 10% to 20% against business-as-usual development plan. Of which, around 10% is from voluntary effort, the other 10% is with international aid; (b) Guidance for 2030: Reduce annual greenhouse gas emission by at least 1.5 - 2%, reduce greenhouse gas emission in energy-related activities by 20% to 30% against business-as-usual development plan. Of which, around 20% is from voluntary effort, the other 10% is with international aid; (c) Guidance for 2050: Reduce annual greenhouse gas emission by 1.5 - 2%.
- Directive No. 34/CT-TTg dated Aug. 07, 2017 by the Prime Minister on promoting power conservation.

Annex e: Low-Carbon Transition in the Energy Efficiency Sector (LCEE)

Part A: Basic data

A1. Project number & name: 104.Vietnam.820/2015-53518: Low carbon transition in the energy efficiency sector (LCEE), Vietnam.

A2. Interviews. See Annex a, persons and institutions consulted relevant to Annex g.

A3. Dates & financial data. Planned: Jan 2013-Dec 2015 originally, but extended to Jun 2017. Total budget DKK 65 million, from the Climate Envelope (MoIT *et al.*, 2012).

A4. Location(s). Vietnam: five centrally-governed municipalities (Ha Noi, Hai Phong, Da

Nang, Ho Chi Minh City, Can Tho) and five provinces (Bac Ninh, Binh Duong, Dong Thap, Quang Nam and Vinh Long).

A5. Partners. (a) Ministry of Industry and Trade (MoIT): responsible for SME issues. (b) Ministry of Construction (MoC): implements building codes for energy efficiency. (c) RDE, Hanoi:

Part B: Purpose and relevance

B1. Purpose. The aim was to improve energy efficiency in small and medium enterprises (SMEs) and buildings, thereby contributing to sustainable development and a transition to a

low-carbon economy. The project was expected to contribute to the VNEEP energy saving targets of 5-8% by 2015 and had two components: **Component 1 - Energy efficiency in SMEs**: supports MoIT in promoting energy efficiency in the SME sector with focus on the brick, ceramics, food processing, paper, textile, and rubber industries; **Component 2 – Energy Efficiency in buildings**: supports MoC to improve capacity for implementing building codes for energy efficiency.

B2. Relevance to partners.

For **Vietnam**, support to the SME sector is a priority, and the aim of promoting energy efficiency is mandated by the Law on 'Economical and Efficient use of Energy' (6/2010), and is embedded, alongside renewable energy, within the National Climate Change Strategy, the National Green Growth Strategy and the National Target Programme to Respond to Climate Change as well as the GoVN's Vietnam Energy Efficiency Programme (VNEEP).

For **Denmark**, the approach was in line with policy of "supporting the transfer of green technology that can contribute to greater sustainability through, for example, more efficient utilisation of energy" (MFA, 2011b: 20). The Final Results Report also notes that "the programme was a successful showcase of technology transformation and Danish experience in some sub-sectors. Outcomes from programme activities were an input to the identification of emission reduction commitment of Vietnam to the Paris Agreement. It is important to note that the LCEE helped strengthen the Danish – Vietnamese partnership in energy sector and led to a new cooperation phase for the period 2017-2020." (MFA, 2017: 2).

B3. Relevance to MDGs/SDGs.

SDG 7: Affordable and Clean Energy, since it is assumed that greater energy efficiency will increase total supply (or the reliability of supply) relative to demand.

SDG 8: Decent Work and Economic Growth, since energy efficiency and the leverage of investment in the SME sector (where most people are employed in most countries) is likely to have a particularly strong effect on employment.

SDG 12: Responsible Consumption and Production, since energy efficiency in the SME manufacturing sector is a key factor in this area.

SDG 13: Climate Action (mitigation), since it is assumed that greater energy efficiency will lead (one way or another) to fewer fossil fuels being burned.

B4. Relevance to NDC mitigation commitments. VNEEP (from 2010) and LCEE (from 2013) pre-dated the 2016 NDC, but the latter stresses promoting EE, RE and clean fuels, and

removing subsidies on fossil fuels (pages 2, 5-7), framed in the context of improving energy security or responding to climate change, or both.

B5. Relevance to mitigation. Mitigation verification criteria met: Mitigation technology (MT), Capacity Building (CB), Incentives & regulations (IR), as although both VNEEP and LCEE were built around capacity building LCEE also concerned the transfer of specific technical knowledge and technologies for EE (and potential mitigation), and the development and enforcement of specific regulations (i.e. building codes and preferred practices).

Part C: Narrative overview

Tailored to promoting EE in SMEs and buildings, LCEE was a supplement to the 2009-2013 VNEEP. Unlike VNEEP however, LCEE did not only use sector budget support (SBS) although it included an SBS component to top up the VNEEP grant. The usual difficulties with SBS were experienced: "lengthy and complicated procedure for approval of annual budget and work plan by Vietnamese authorities" leading to implementation delays (MFA, 2017: 3). The other two modalities used in LCEE were: (a) TA support from DEA and elsewhere; and (b) investment support in the form of TA and financing via the Green Investment Fund (GIF) to promote investment in EE by SMEs. It was extended up to the start of DEPP II in Vietnam, a programme that focussed on enhancing Vietnam's capacity on energy sector planning in 2017-2020.

The LCEE project was clearly designed, and its implementation seems consistent with other Vietnamese strategies and partner interventions in Vietnam since the 1990s. The project appears to be model case of bringing multiple convergent lines of applied knowledge, research, financial incentives, and technical assistance to bear in a sustained way on complex sectoral circumstances in order to induce systematic directional change. The challenge in such an approach is to sustain a balanced and focused input for long enough to make the change irreversible, which requires consistent policy support by all concerned for an extended period. These favourable conditions seemed to have been in place throughout the (extended) implementation period (2013-2017). **Score:** 6.

Part D: Design quality

D1. Theory of change.

MoIT *et al.* (2012) offers useful diagrams of the rationale for Component 1 for SME engagement, and Component 2 for building codes and demonstration buildings (see G1, G2 respectively). At an overview level, SMEs account for 45% of the industrial energy use in

Vietnam and offer good prospects for EE savings and GHG emission reductions. SMEs play an important social and economic role and have the potential to contribute to the green growth and promotion of green jobs. SMEs are relatively unsupported by other donors and, because of their small scale they offer a cost-effective opportunity for physical improvements to be achieved relatively quickly. Earlier experience had shown that the brick and ceramic sectors show the greatest potential for scaling up energy efficiency of SMEs, but other sectors were also to be identified for support as appropriate. Further, that building codes could be formulated, adopted, applied and enforced to shape the design and operation of Vietnam's rapidly-growing stock of buildings in the direction of greatly increased energy efficiency.

D2. Assumptions underlying the theory of change.

Assumption 1: that SMEs would be responsive to investment opportunities where company debt would be paid for by EE savings (with or preferably without project-related subsidies).

Assumption 2: that it would be feasible to roll-out communications, incentives, technical advice and loan guarantees to large numbers of SMEs quickly and efficiently;

Assumption 3: that building codes for greater EE, and the investment needed to put them into effect, would be acceptable to the construction sector and enforceable by the authorities.

D3. Plausibility of assumptions and links.

Assumption 1 is plausible in light of the well-developed Vietnamese NCPC, GCTF, ESRM system (see Part G1 VNEEP review), but questions remain about the attractiveness and hence sustainability of private EE investment without special outreach, advice, facilitation and other subsidies.

Assumption 2 is plausible (or at least has proved to be feasible), but questions remain on the most efficient balance between the motivation of SMEs to actively seek help and the incentives on offer.

Assumption 3 is plausible but may depend upon the willingness and capacity of regulatory authorities to require compliance with the building code, and therefore upon idiosyncratic Vietnamese factors.

D4. General quality of the project design. The appraisal (MFA, 2012: 4) found that "the draft project description is of high quality", although some practical points needed to be clarified which was largely done during implementation, so while noting some uncertainties above this review takes a similarly positive view of the design overall. **Score:** 5.

Part E: Evidence for mitigation performance

E1. Direct effectiveness. See E3 (b). Significant direct (estimated or inferred) mitigation effects were shown as a result of an approach that combined incentivising, learning, doing and measuring in the SME sector. Replication potential is high. **Score:** 5.

E2. Indirect effectiveness. See E3 (a). "The main purpose of LCEE is to contribute to the completion of VNEEP's targets with focus on enhancing energy efficiency (EE) in SMEs and building sector. To this end, the programme achieved its objective. Specifically, the programme addressed EE improvements in buildings and industrial sectors with remarkable results such as tangible GHG-emission reduction with associated lower level of pollutants due to displacement of coal, establishment of an innovative support scheme for SMEs (the GIF)." (MFA, 2017: 2). Effectiveness was enhanced by LCEE being a sub-set of the VNEEP process. **Score:** 5.

E3. Net GHG emission reductions

(a) National level:

Baseline (2011): Energy saving during period 2006-2010 is 3.4%, equivalent to 4.9 million tonnes of oil equivalent (TOE) [or about 15.6 million tCO_{2e} - see below].

Result (2015): Energy saving during period 2011-2015 is 6.0%, equivalent to 11.9 million TOE [or about 37.9 million tCO_{2e} - see below].

(b) Project level:

A total of 63 EE investment projects received loan guarantees or awards in the brick, ceramics, food processing, paper, textile, and rubber industries, which is claimed to result in an estimated annual energy saving of 416,316 MWh, equivalent to 64,238 TOE saved or avoided emissions of over **230,000 tCO₂**.

- The latter number is approximately correct based on the number of TOE [1 TOE = 7.4 barrels of oil equivalent (BOE); 1 BOE = 0.43 tCO_{2e}; so 64,238 TOE = 64,238 x 7.4 x 0.43 = **204,405 tCO_{2e}** (www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references)].
- But based on the MWh saved, the result is rather different [416,319 MWh divided by 11.63 MWh/TOE = 35,767 TOE; so 416,319 MWh = 35,767 TOE x 7.4 x 0.43 = **113,810 tCO_{2e}**].
- There are multiple units, equivalencies and approximations in use, plus rounding errors

and uncertainties, so any calculation of this kind will yield a range of outcomes and should be treated with caution. In this case, all that can be said with confidence is that the **project-based savings exceeded 100,000 tCO₂e and may have been in the range of 0.1-0.2 MtCO₂e.**

Another 90 or so EE investment projects were indirectly attributable to LCEE, with each USD invested by GIF estimated to have saved about 0.17 tonnes (170 kg) of CO₂ emissions.

- The calculation of tCO₂e conserved per unit investment is a critical metric for comparing the mitigation effectiveness of different interventions, so should by now be well established. It is however surrounded by uncertainties, notably the assumptions used to generate tCO₂e saving estimates, and the utility in mitigation terms of tCO₂e saved at different times relative to the Paris Agreement temperature goal as a proxy for the onset of irreversible/runaway climate breakdown (see Annex e).

E4. Impact effects.

The achievements are listed by MFA (2017), with possible impacts [*in italics*] that might have come from them; these would require some assessment of legacy effects to be confirmed.

Component 1:

- Action plans to promote EE in industries were developed and enforced in ten provinces [*EE investments and outcomes increase as a result of planning and enforcement*].
 - Pilot projects for incinerators/furnaces are implemented in the craft village area, applicable to small furnaces owned by households; replacing raw materials used from coal to electricity, improving local environmental conditions of the village;
 - Investment cost is also an issue for other households to multiply;
 - After about 2 years of implementation, the project has built up a Green Investment Fund (GIF) to support borrowers to convert their production and save energy. Within the framework of the project, many training activities and instructions have been implemented and initial results have been obtained. For example, the workshop program for pottery enterprises in Kim Lan Pottery Village, Hanoi and the workshop for brick enterprises in Vinh Long were successfully organized. The model to support borrowers to convert energy-saving production activities suitable to the Vietnamese context.
 - More than 1,000 SMEs in six sectors across 30 provinces were provided with information about EE solutions, energy management and financial sources for EE investment [*uptake and use of the information reflected in changed practices*].
-

- Staff from 60 EE service providers were trained by Danish experts on the latest technologies and EE measures [*certification of new competencies and employment using those skills to induce or improve EE investments*].
- 63 EE investment projects directly supported and about 90 induced [*see E3; calculations to be ratified independently*].
- Demonstration projects were established in the brick tunnel and food processing sectors, showing huge energy savings, and with their results disseminated to other enterprises [*see Component 2 demonstration effects; change of behaviour in observers*].
- A commercial partnership venture was established between a Danish and a Vietnamese company [*consequences of the venture for mitigation; uptake of similar opportunities by other*].
- The Energy Outlook Report 2017 for Vietnam was published in September 2017 [*utility of the report according to potential users*].
- The Energy Outlook Report 2019 for Vietnam was published in November 2019.

Component 2:

- With inputs from Danish consultants and feedback from various LCEE activities, the new EE Building Code (QCVN 09:2017/BXD) was approved in December 2017 and came into effect from 1 June 2018 [*enabling measure*].
 - "Green building construction became a trend in large cities of Vietnam including Hanoi and Ho Chi Minh city as an outcome of LCEE's communication and capacity building activities" and building owners and investors had begun to compete with one another over the 'green credentials' of their buildings and their level of compliance with the EE building code (MFA, 2017: 7) [*this is already an impact*].
 - MoC has developed the national technical regulation "Construction works using economical and efficient energy"; Studies and develop technical standards for energy saving in civil, industrial and urban technical infrastructure programs; established and updated energy use databases of key buildings and large-scale buildings.
 - Specifically, the QCVN 09: 2013 standard has been issued and requires investors of new commercial and residential buildings to comply with the design stage. Organized capacity building training workshops, introduced the contents, instructions and tools for implementing QCVN 09: 2013 in cities: Hanoi, Da Nang, Ho Chi Minh City, Quang Ninh, Can Tho, Khanh Hoa with the participation of nearly 700 people;
 - Two demonstration building projects (the Royal Tower in Ho Chi Minh city and the Thai Duong Building in Hanoi) were implemented to demonstrate the application of EE
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Building Code in practice [*change of behaviour in observers*].

- An MoU was signed to establish government-to-government cooperation in the building sector in Vietnam [*enabling measure*].

Score: 6.

E5. Sustainability effects.

- The project benefited from its integration with VNEEP as a GoVN programme, since "With regards to budget support modality [of LCEE], the Vietnamese government continued to finance EE activities in 2016 and 2017 despite the fact that VNEEP had ended in 2015." (MFA, 2017: 3).
- "The sustainability is ensured through emphasis on capacity development and support to the implementation of legislation at MoIT and 10 [cities and] provinces. The LCEE confirmed there were huge potentials for cost-effective adoption of EE technology and solutions in the SME sector. Technology transformation process has been undergoing beyond LCEE's period in ceramic, brick production and food processing with private sectors' capital. In the building sector, a shifted focus to compliance with green and EE building standards were seen as tangible impacts of LCEE's awareness raising and capacity building efforts." (MFA, 2017: 3).
- "Ten provincial [and city] EE action plans are funded from provincial budget and implemented during 2016-2020. This ensures the sustainability of LCEE support." (MFA, 2017: 4).

Green building certification: the green building standards that are being implemented in Vietnam are LEED, LOTUS, Green Mark, and Edge. This is a voluntary certificate: investors self-register and apply for certification. An MoC survey found large commercial 'Green Buildings' certified according to the following standards: (a) LEED: 156 projects (to June 2020); (b) LOTUS: 68 works; (c) EDGE: 29 (figures 2019); and (d) Other: 06 works. **Score: 6.**

E6. Efficiency issues. Quantified targets were defined for 2017 relative to 2012-2015 baselines for the two components in each case.

- **Component 1 (Energy efficiency in SMEs):** provincial EE action plans to be prepared (exceeded); SME awareness of EE potential, technical solutions, sources of technical support and financial sources to be raised (exceeded); competent EE consultancy service providers to be available (exceeded); access to finance to be available for EE investment among SMEs (achieved); EE demonstration projects to be established in several sectors
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(achieved); Danish-Vietnamese commercial partnerships in the EE area to be established (not achieved); and a *Vietnam Energy Outlook* (based on the use of a Balmorel model at MoIT and the Institute of Energy) to be published (achieved).

- **Component 2 (Energy efficiency in buildings):** reduced energy consumption as a result of the (new) building code (exceeded); partnership mechanisms in place between Danish (MCEU) and Vietnamese (MoC) government institutions (achieved); and, untargeted, two demonstration buildings constructed with Danish expert advice and operating with their energy consumption monitored.

The 2015 MTR found that the project was delayed, and an extension had been approved, that work was still underway to complete the M&E framework, and that there was a focus on activities rather than results (*cf* the above focus on results rather than impacts). These issues seem to have been effectively addressed in the following two years, and overall efficiency appears to have been high. **Score: 6.**

E7. Capacity building issues. Component 1 included Output 3 on 'capacity building for EE service providers and Energy Conservation Centers' (MFA, 2015), based on a capacity mapping exercise, and Component 2 included Output 2 on 'Capacity development for implementing the building code'. The latter involved developing a capacity development strategy "including assessment of performance gaps, attainment capacity outputs, design of training and other interventions of an institutional nature (e.g. incentive environment)" followed by implementation of the strategy in various ways, and regularly evaluating "the outcome of capacity development interventions and adjust the approach and strategy accordingly." (MoIT *et al.*, 2012:15). Other highlights include:

- "The regulation frameworks and policy development capacity in 10 [provincial and city] Departments of Industry and Trade (DOIT) was improved by capacitating DOIT to implement and enforce policy on controlling investment projects with high energy consumption causing environment pollution. This was done through two training modules with 24 DOITs participated. Besides, on-the-job training were provided to 3 selected DOITs." (MFA, 2017: 4).
 - "Study tour to Denmark for policy makers of related ministries and provinces was a good opportunity for learning and sharing experience for both Danish and Vietnamese sides. Danish experience in policy design and implementation such as setting up incentive scheme, combination of EE and RE policies, voluntary agreement was greatly appreciated by the participants." (MFA, 2017: 4).
 - In the training of EE service providers, "the combination of classroom and on-site
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training methods was highly appreciated by participants from EESPs and SMEs. Training courses conducted at the demonstration sites where know-how and technologies were showcased played a great deal in improving capacity of local EESPs in conducting energy audit and identifying suitable solutions for energy saving." (MFA, 2017: 5).

- "A training programme was conducted in 2017 for 10 experts from the Institute of Energy and MoIT who were involved in the development of power sector plan." (MFA, 2017: 6).
- "Two study tours were conducted, one to Denmark and the other to Thailand and Malaysia. From these study tours, key Vietnamese stakeholders had first-hand experience with showcase of successful EE buildings, including feedback and advice from people who involved in the construction of these buildings. Participants were introduced to latest design techniques and solutions that could be relevant for Vietnam." (MFA, 2017: 8).

Thus, the capacity building process seems well conceived and delivered, but its value in terms of impact would depend upon an assessment of legacy effects, and without baselines, targets and monitoring of capacity change it is hard to justify excellence. **Score:** 4.

E8. Baseline and monitoring arrangements. The attitude of the project designers and implementers appears to have been to baseline and monitor as much as possible, using appropriate indicators.

E9. Overall conclusion on mitigation performance. Consistent with other Vietnamese strategies and partner interventions in Vietnam since the 1990s, the project appears to be model case of bringing multiple convergent lines of applied knowledge, research, financial incentives, and technical assistance to bear in a sustained way on complex sectoral circumstances in order to induce systematic directional change. The challenge in this approach is to sustain a balanced and focused input for long enough to make the change irreversible, which requires consistent policy support by all concerned for an extended period. These favourable conditions seemed to have been in place throughout the (extended) implementation period (2013-2017). **Score:** 6.

Part F: Other issues

F1. Unintended consequences. None noted.

F2. Other performance issues.

Coherence. See MFA (2015: 15).

- **World Bank.** Danida supports multilateral initiatives such as the World Bank's ESMAP that is also active in Vietnam. There is also strong synergy between the LCEE and IFC's support to MoC in promoting EE in buildings and SMEs in industrial parks. There are two other projects (funded by IFC and USAID) that also comprise demonstration buildings.
- **UNEP.** Danida supports the UNEP DTU Partnership that is home to the Energy Efficiency Hub, which has been set up in the UN City in Copenhagen to support to UN Secretary General's Sustainable Energy for All initiative (to which Vietnam is an opt-in country).
- **UNDP.** The LCEE benefited strongly from the experience of the UNDP-implemented, GEF-funded PECSME programme, and UNDP is involved in several other EE initiatives including a new GEF-funded one on promoting production and use on non-fired bricks and EE in buildings.
- **EU.** The EU made a grant allocation of EUR 346 million to support sustainable energy in Vietnam for 2014-2020 (see <http://energyfacility.vn/eu-budget-support-on-energy-access-to-vietnam/>), and there was also a German-EU Renewable Energy and Energy Efficiency programme.
- **Switzerland (SECO)** was involved in the sector through its role in the GCTF in the design of the GIF.
- **Donor coordination.** The World Bank and French AFD take turns to organise half-yearly coordination meetings for development partners in the energy sector. "There would be a lot to be gained from an effort to develop a common approach to capacity building and technical assistance. Such a common approach could lead to the development of a coherent capacity development strategy for the sector as recommended by the Danida review mission of June 2011." (MoIT *et al.*, 2012: 17).

Poverty. The MTR noted that the VNEEP and therefore the LCEE would mainly contribute to poverty reduction by enhancing economic development through improving the EE of industrial enterprises and through new job opportunities related to the EE improvements. It also noted that "Poor people living in the vicinity of the enterprises will benefit from reduced pollution and workers will have improved working environments." (MFA (2015: 14).

Gender. The MTR found little attention to gender issues in the LCEE project's reporting and or M&E frameworks, despite the entry into force of the National Strategy on Gender Equality for 2011-2020. The MTR endorsed "further systematic efforts to mainstream gender in the

operations of LCEE as well as VNEEP and its successor national EE programme (through the M&E systems, through documentation on pilot projects and lessons learned)." It also noted "several examples of how EE innovations benefit women, for example how in bricks and ceramics SMEs new kiln types reduce heavy and dirty work by female labourers." (MFA, 2015: 14).

Human rights. "LCEE's work on documenting and disseminating EE issues in SMEs in collaboration with many local stakeholders and local associations contributes to the human rights principles of non-discrimination, participation & inclusion, transparency, and accountability." (MFA, 2015: 14).

Environment. As well as reducing GHG emissions, "LCEE also contributes considerably to improvement in the both the ambient and indoor environment, for example by reduced air pollution from traditional kilns. LCEE is fully in line with the Danida Strategic Framework (Sep 2013) on Natural Resources, Energy and Climate Change." (MFA, 2015: 14).

Part G: Notes on other relevant topics.

G1. Rationale for expected outcomes - SMEs (Figure 4.1 in MoIT *et al.*, 2012: 5)

Rationale	Outcome
Provincial Governments/DoITs have the mandate as well as considerable resources and influence to promote EE in their areas. They are much closer and can more effectively promote EE than can be done from Hanoi or Ho Chi Minh City alone.	Provinces adopt EE policies, programs
Awareness of the potential of EE by SMEs to save money and improve quality of their products is a key driver for adopting EE practices.	SMEs are aware of EE potential
Service providers are potentially a driver of EE (especially if they adopt a private energy service provider model). SMEs are dependent on the technical expertise of the service providers.	EE service providers become capable
According to research access to finance is one of the major barriers for SMEs adopting EE practices	SMEs can better access finance for EE
EE for the brick and ceramic industry is well demonstrated, the challenge now is to bring these sectors to a new threshold where	EE projects replicated

EE becomes replicated and routine. In other sectors, demonstration is still needed.

and demonstrated

Sustainable and continuous adaptation and improvement of EE practice and technology diffusion can best be promoted in the long term through commercial partnerships.

Commercial partnerships Vietnam /Denmark

G2. Rationale for expected outcomes - buildings (Figure 4.2 in MoIT *et al.*, 2012: 14)

Rationale	Outcome
The main goal of the VNEEP is to reduce energy use – this is backed up by the law on EE and conservation that puts energy monitoring requirements on large buildings. The building code aims to ensure that all new buildings adopt minimum standards. As Vietnam is in a phase of rapid urbanization and expansion of large buildings, efforts at ensuring that new buildings are energy efficient will have a large future impact.	Capacity to implement leading to energy saving. Energy use in buildings reduced as a result of implementation of the building code.
Demonstration buildings have been proven in many countries as an effective means of technology dissemination and diffusion for adoption of energy efficiency and low carbon technologies. Vietnam has a range of climate conditions that will demand different solutions. A rapidly increasing tourism sector and the development of larger scale office and shopping complexes are increasing the need for forward looking niche demonstrations.	Demonstration. Pilot demonstration projects(s) are identified and made ready for implementation.
A longer term government to government cooperation will bring benefits that go beyond those that could be achieved within a limited 3 year project horizon. The policy and regulatory issues involved in increasing energy efficiency in buildings are different in many respects there also many that are similar e.g. using technology such as geographic information systems to increase productivity of monitoring, inspection and control.	Partnership. Government to government cooperation initiated between MCEB and MoC.

Annex f: The Vietnam-Denmark Energy Partnership Programme (DEPP II)

Part A: Basic data
A1. Project number & name. Vietnam 2017-18831 DEA Partnership Programme.
A2. Interviews. See Annex a, persons and institutions consulted relevant to Annex f.
A3. Dates & financial data. <u>Dates:</u> Jul 2017 – Jun 2020. <u>Financial Data:</u> Overall budget DKK 22.6 million (DKK 21.6 million + DKK 1 million added in 2019 for Engagement 4 - see B1), from the Climate Envelope: (a) Engagement 1 (long-range energy sector planning by the MoIT Department of Electricity and Renewable Energy), DKK 8.4 million; (b) Engagement 2 (RE energy integration into the power system by the MoIT Electricity Regulatory Authority), DKK 5.9 million; (c) Engagement 3 (low carbon development in industrial sector by the MoIT Department of Energy Saving and Sustainable Development), DKK 7.3 million, done; (d) Engagement 4 (offshore wind power), DKK 1.0 million; (e) mid-term review, seminars, operational manual, administration, DKK 8 million; (f) unallocated funds (for use in China, Vietnam, South Africa or Mexico), DKK 7.0 million; and (h) a further DKK 3.24 million from DEPP unallocated funds for specific results of Engagements 1-4 (see B1) in 2019 and 20201.
A4. Location(s). Vietnam, including unspecified (supra-national) regional and sub-national coverage as appropriate. Ha Noi, Bac Giang province and Dong Nai province.
A5. Partners. Vietnam: (a) MoIT: (a) Department of Science, Technology and Energy Efficiency; (b) Planning Department, General Directorate of Energy; Electricity Regulatory Authority. Denmark: (a) DEA: energy planning; (b) EnergiNet: energy integration into the power system.
Part B: Purpose and relevance
B1. Purpose. The overall objective of DEPP II was to provide TA in the widespread implementation of cost-optimised, low-carbon conversion opportunities in the Vietnamese energy system. This goal is in line with those of the National Strategy on Green Growth in Vietnam and the implementation of Vietnam's Paris Agreement commitments and is in line with the Danish Climate Envelope goals. DEPP II was designed to end on 30 Jun 2020, but

due to the impact of the CoViD-19 pandemic, it was extended to 31 Oct 2020.

The thematic objective was to ensure that the most cost-effective opportunities for low carbon transition in the energy system are more widely adopted throughout Vietnam (MFA, 2017a), through the following Development Engagements.

- **Engagement 1.** Recurrent planning processes and associated inputs are informed by more consolidated data, forecasts, peer reviewed assumptions and additional long-range policy and policy implementation scenarios for a less carbon-intensive energy sector, including through the expansion of renewable energy generation capacity.
- **Engagement 2.** Enhanced power system ability to integrate the renewable energy generated in a cost-effective way.
- **Engagement 3.** A strengthened implementation framework for provincial level to target the most cost-beneficial opportunities for low carbon development in industry and a more coherent and consistent national level regulatory framework contributing to industrial low carbon policy.
- **Engagement 4** (added in 2019). Ascertain potential for off-shore wind power.

B2. Relevance to partners.

For **Vietnam**, the legal and policy bases for DEPP include: (a) Law on Environment (6/2014); (b) Law on 'Economical and Efficient use of Energy' (6/2010); (c) Resolution No. 24-NQ/TW on 'Proactively responding to climate change, enhancing natural resource management and environmental protection' (6/2013); (d) National Climate Change Strategy (12/2011); (e) National Green Growth Strategy (9/2012); (f) Decision 1775/QĐ-TTg on 'Management of GHG emissions; management of carbon trading activities to the world market' (11/2012). "Vietnam will continue to develop policies that create favourable conditions for investments in mitigation activities." (GoVN, 2016: 5); g) Decision No. 2053/QĐ-TTg dated October 28, 2016 of the Prime Minister on promulgating the Implementation Plan of the Paris Agreement on climate change.

For **Denmark**, the focus on inclusive and sustainable growth is in line with *The World 2030* (MFA, 2017b), with an emphasis on increasing the share of renewable (wind) energy.

B3. Relevance to MDGs/SDGs. SDG 7: Affordable and Clean Energy. SDG 8: Decent Work and Economic Growth. SDG 11: Sustainable Cities and Communities. SDG 13: Climate Action. SDG 17: Partnerships.

B4. Relevance to NDC mitigation commitments. Vietnam's 2016 NDC aims at an 8% GHG emission reduction by 2030 using only domestic resources (25% with international support). To meet these goals, an acceleration in progress towards low-carbon energy supply is essential. In addition, plans for a high volume of coal-fired power plants are meeting resistance among a public that is increasingly concerned about environmental and climate issues (MFA, 2019a: 5). Vietnam's 2020 NDC update aims at 9% GHG emission reduction by 2030 using only domestic resources (27% with international support).

B5. Relevance to mitigation. The project was relevant under the 'practical actions' criterion of Capacity Building (CB), by promoting knowledge-based planning, policy development and power system management, and under the 'enabling framework' criterion of Incentives & regulations (IR), by contributing to a more coherent and consistent national level regulatory framework for industrial low carbon investment.

Part C: Narrative overview

DEPP II 2017-2020 covered China, México, South Africa and Vietnam, sharing with the Climate Envelope the overall mitigation objective of assisting developing countries with their transition to a low carbon economy, in the context of achieving their mitigation commitments under the UNFCCC. All DEPP countries are large energy consuming countries and significant GHG emitters (DEA, 2016: 3). This also applies to Vietnam, where GHG emissions almost tripled and its carbon intensity increased by 48 percent from 2000 to 2010, resulting in the second highest carbon intensity in the region after China (MFA, 2019b).

In Vietnam, DEPP II had components targeting capacity building for: (a) long-term energy sector planning; (b) integrating RE into the power system; and (c) strengthening the legal framework for EE in industry. TA was provided by DEA, long-term advisors, international and national consultants. The core task was to support Vietnam is using the Balmorel model to optimise its power system. A small budget was added in 2019 to allow for assessment of the potential of off-shore wind (see DEA, 2020).

Part D: Design quality

D1. Theory of change. Vietnam has significant and rapidly-growing GHG emissions, but is

committed to reduce these emissions in absolute and/or per unit GDP terms relative to the BAU scenario, which will require sustained growth in the RE mix of the energy sector and in EE across the economy. Denmark is able to offer technical guidance based on experience and commercial capacity in many fields relevant to the decarbonisation of national energy sectors, especially: (a) improved policies, regulations and plans to encourage and enable growth in RE and EE; (b) enhanced incentives for compliance with RE and EE priorities; and (c) cost-efficient integration of variable energy into the national power systems. A partnership based on TA and peer learning between institutions in the energy sectors of Vietnam and Denmark offers a way for the necessary know-how to flow accompanied by measures to build capacity within Vietnam to apply this knowledge effectively.

D2. Assumptions underlying the theory of change.

Assumption 1. That 'Danish knowledge' on RE and EE is at least equal in quality to any other available to Vietnam, and superior to any available on the same terms.

Assumption 2. That the GoVN commitment to reducing Vietnam's GHG emissions at least in line with its 2016 NDC will remain in place and broadly unaffected by macroeconomic phenomena or efficiency issues like staff turnover and corruption.

Assumption 3. That TA and peer learning can be defined and implemented in such a way as to form an adequate basis for a capacity-building partnership between institutions, one that encompasses effective policy and regulatory development, energy sector planning and technical arrangements for managing RE inputs to the national grid.

D3. Plausibility of assumptions and links.

Assumption 1 is plausible, considering that Denmark has a strong record on RE and EE, and that the CE is being used to subsidise the provision of Danish expertise and equipment to Vietnam through DEPP.

Assumption 2 is plausible, since GoVN has embedded its emission reduction policies in law and institutional goals, has considerable experience in promoting various aspects of Sustainable Consumption and Production across its economy, and is aware of the climate-vulnerability of the country and hence of the importance that all countries comply with and strengthen the Paris Agreement. In these circumstances it is considered unlikely that either cheapening of fossil fuels relative to RE and EE cost savings, or a downturn in Vietnam's economy, will affect government policy. This is not necessarily the same as saying that sufficient staff will be in place, with time to work on DEPP as planned; and nor does a GoVN policy necessarily mean that private industry will cooperate. Vietnam in general has a good

track record, however, for implementing plans more-or-less as envisaged.

Assumption 3 is questionable, since a partnership implies a long-term relationship based on mutual aid between institutions, and hence an emphasis on equality. Partnership building describes the process by which such a relationship is cultivated, through mutual consent and recognition of mutual benefit. This in turn requires that the needs, roles, rights and responsibilities of each partner are well understood by the other. Since in this case the objective is not only to provide Danish TA with sight and influence on Vietnamese policies and laws, which requires trust, but also to build the capacity of Vietnamese institutions, one would expect it to start off with a joint study of capacity relative to the new expectations created by RE and EE policies, and an explicitly agreed plan to correct weaknesses in these specific capacities. The partnership would then develop over time with shared experience, mutual understanding, and increased abilities on each side matched to each other's strengths and weaknesses. But there is no indication in the programme documents, either for DEPP in general or for DEPP Vietnam in particular, that any of this is appreciated and forms the basis for operational planning, and the documents include no mention of what the Danish partner will learn or gain from the partnership with Vietnam. There is also the sense that the DEPP documents are rather generic in their proposals, risks and assumptions, and not adapted to the specific context of Vietnam as called for in *The World 2030* (MFA, 2017b). DEPP II was designed for four very different countries (China, Vietnam, South Africa and México), and a similar generic text is used to justify all of the partnerships, for example claiming relevance and impact without reference to any specific measures, baselines, or targets. This seems to conflict with the partnership approach, and the path to emission reductions is also unclear in the absence of capacity assessments or plans to do them, or of the ability to monitor capacity development over time. These issues, if real, may indicate a flawed process. **Score: 4.**

D4. General quality of the project design. In conclusion, on the face of it the general quality of the design is plausible but with one questionable assumption. **Score: 4.**

Part E: Evidence for mitigation performance

E1. Direct effectiveness. None, as this is a capacity-building partnership.

E2. Indirect effectiveness. No evidence to date. A number of new or amended regulations have been developed with DEPP support, including MoIT Circular 25/2020/TT-BCT (replacing Circular 09) on EE, with DEPP workshops in Hanoi and Ho Chi Minh City and the involvement of provincial Departments of Industry and Trade (DoITs), and Official Letter

5866/BCT- TKNL 11/8/2020 on provincial EE planning in 2020-2025.

Interviewees expressed particular satisfaction with DEPP II information-sharing platforms on EE, and optimism that DEPP II would contribute to GHG emission reduction, although the lack of measurable goals was noted. **Score: 4** (potential only).

E3. Net GHG emission reductions: No estimate or evidence.

E4. Impact effects. Component 1 TA included the transfer of hardware, computational models, manuals and training for experts, and the 2019 Vietnam Energy Outlook Report which provided a vision for energy sector development to 2050 with renewable energy development scenarios in line with Party and GoVN plans. The energy outlook periodicals are a useful used as a source of information, but have not been regularly maintained (2017, 2019). The EE database has a list of key energy enterprises, as approved by GoVN. Results include reports describing construction tools, guidance documents, and recommendations to amend the regulations on power grids associated with transmission and distribution grids for Vietnam, as well as specifying the technical requirements for offshore wind power integration.

"There is high potential for a positive impact from the DEPP II in Vietnam. The programme is addressing the challenges that Vietnam is facing with regards to a forecasted increase of GHG emissions, which again is coupled with the challenges of integrating new and variable renewable energy technologies into the national power grid. On energy efficiency, DEPP II is addressing the industrial sector which is the biggest GHG emitter in Vietnam. Simplifications of EE laws and procedures is the focus of this engagement. The overall concern of the engagements is the perceptiveness of the counterparts and how well they are able to adapt and implement the learnings they gain from the TA that DEA provides." (MFA, 2019b: 7).

Interviewees confirmed the view that DEPP has helped Vietnam in its early stage of RE development, including forecasting RE sources for power plants and power system regulators. Recommendations on methodology, development of data sets, calculation tools and procedures, and a roadmap to amend the grid regulations to be implemented in the following years were all appreciated, as were TA inputs on the legal framework, management processes and tools, and training. **Score: 5.**

E5. Sustainability effects. See Impact. Alterations in planning and regulatory capacity and direction are in principle cumulative, directional and hard to reverse, so should be sustainable, while they are likely to have medium- to long-term effects. In EE, the implementation at the provincial/local level plays a key role in determining the success or failure of implementing the National Program on economical and efficient use of energy, as well as compliance with legal

regulations on Energy efficiency. Interviewees noted that building regulations included a useful series of management processes to help DoIT's manage reporting of key energy units, control quality of energy audit reports, and report on energy consumption norms. DEPP II TA was seen as practical because directly applicable by MoIT to sector planning, management and operation of power systems and efficient use of energy. **Score:** 6 (potential only).

E6. Efficiency issues. The MTR found that NLDC staff were being assigned to multiple tasks at the same time, making it hard for them to learn how to do each one well. Although extra NLDC staff were being recruited, EnergiNet personnel were meanwhile still being used to fill gaps. **Score:** 5.

E7. Capacity building issues. Capacity building depends on the direction of travel of on-the-job training and the build-up of qualified staff, and weaknesses in design and practice were noted: (a) The design includes no institutional capacity assessment, capacity gap analysis or capacity goals, and nor does it include staff development plans and gaps. It is hard to judge improvement in capacity without very clear and shared understanding between partners of the start gaps and the envisaged and achieved end situation without upfront baselines. (b) Short-term TA was generally perceived as competent and relevant by the partners, but it was not always clear what their input was to institutional capacity strengthening processes. For most tasks, capacity strengthening requires that counterpart staff are fully available and engage in the process, which in some cases has not been sufficient.

On the other hand, interviews described TA training and internships as very practical and useful in the areas of wind and solar power modelling and managing the Vietnamese power system in the context of sky-rocketing growth in RE resources. Efforts were made to ensure that short-term missions were requested by the partner institution and that staff were available to work with the Danish partners, for example by elaborating specific ToR for each assignment. This was not done for EnergiNet's tasks, however, or for work undertaken by DEA in the home office.

Commenting on capacity development, the MTR observes that: "Although the programme works well within the mandate of the partner institutions, ownership and capacity strengthening could be furthered by inserting DEPP activities in the framework of the partner institution's own work plan, thereby ensuring how the task contributes to the overall process in the partner institution." (MFA, 2019a: 14). Alternatively, the DEPP work plan could be adjusted and aligned to the Vietnamese work plans. It is good practice always to ensure that any capacity development activity is firmly originated in the institutions work plans, strategies and

targets. Attention to capacity strategies could also address issues of sustainability.

From project implementation experience, it shows that in addition to improving professional capacity in the formulation of sector planning strategies, improving capacity in synthesis, scenario analysis for decision making, building policy enforcement for state management staff is very important and needs to be continued through technical assistance projects. Another issue is to ensure legacy effects in the face of personnel changes at all levels over time, which relates to the organisation and assignment of tasks in the units, groups, and staff involved in project implementation. **Score:** 6.

E8. Baseline and monitoring arrangements. The Programme Document lists as an impact indicator the number of tCO₂e reduced, but no background measurements or baseline are provided, and no arrangements for detailed monitoring of progress are described.

E9. Overall conclusion on mitigation performance. The programme is designed to address weaknesses in policy, regulation, local implementation, capacity to integrate RE and incentives to promote RE and EE, using a flexible mix of policy dialogue, short-term TA, and supervised on-the-job and other training. There is imperfect integration with national work plans, and some lack of clarity over management responsibilities, but the MTR found that it has generally been working well. There are however no progress reports to provide detail. A capacity building programme cannot yield measurable emission reductions over a three-year period, but will therefore need adequate proxy measures to demonstrate increasing institutional capacity and performance, which are missing in the absence of a capacity needs assessment baseline and a focused monitoring programme. The theory of change is mainly plausible even though flawed, but the congruence of Vietnam's policy intentions with the supply of Danish expertise is likely to be moving the system in the right direction. **Score:** 6.

Part F: Other aspects of design and performance

F1. Unintended consequences. None noted.

F2. Other performance issues.

Coherence. The MTR noted an absence of links "with other Danish supported initiatives in Vietnam including Strategic Sector Cooperation and research collaboration", but that information was exchanged regularly with the RDE's Commercial Section (MFA, 2019b: 3). It also found few examples of engagement with the private sector or civil society (MFA, 2019b: 4). On donor coordination, the MTR found that "Vietnam has the attention of several international Development Partners. The energy sector and other related businesses are

supported by among others GIZ, EC, UNDP, WB, USAID, ADB and the Government of New Zealand. With such a high level of international support the risk of overlapping interventions and support is considered high. To avoid such overlap and ensure coordination of the interventions MoIT took the initiative of setting up the Vietnam Energy Partnership Group (VEPG) for which the EU then agreed to provide funding. VEPG has formed five working groups that address each their area and that are constituted by members from various stakeholders. The DEPP LTA is co-chairing the Working Group on 'Energy Data and Statistics'. It was confirmed that the VEPG has been successful in coordination of the work carried out by various development partners." (MFA, 2019b: 3-4).

CoViD. The pandemic made it impossible to carry out missions by DEA and the Danish power system dispatching agency, as well as internships for Vietnamese counterparts to Denmark. Online meetings allowed technical content to be exchanged, however.

Annex g: Renewable Energy Water Supply in the Mekong Delta (REWS)

Part A: Basic data

A2. Project number & name. Renewable Energy Water Supply in the Mekong Delta in Vietnam (104.Vietnam.30.m.137 or 104.Vietnam.30), the REWS Mekong project.

A3. Interviews. See Annex a, persons and institutions consulted relevant to Annex g.

A4. Dates & financial data. Duration: Dec 2011 to Dec 2014. Budget: DKK 4.346 million budgeted. DKK 4.0 million was requested and DKK 3.7 million spent; the balance of DKK 0.346 was contributed by partner pCERWASS.

A5. Location(s). Vietnam: 13 provinces in the Mekong Delta: Can Tho, Soc Trang, Tra Vinh, Kien Giang, Ben Tre, Ca Mau, Long An, Hau Giang, An Giang, Dong Thap, Vinh Long, Bac Lieu, and Tien Giang.

A6. Partners. The project was a bilateral arrangement between the RDE Hanoi, and the People's Committee of Can Tho on behalf of 13 Mekong Delta provinces. The partners are specified by PCCT & RDE (2011) as: Provincial Centres for Rural Water Supply and Sanitation (pCERWASS) in 13 Mekong Delta provinces, centred at pCERWASS Can Tho.

Part B: Purpose and relevance

B1. Purpose. "To increase the knowledge and use of renewable energy solar and wind

powered high efficiency, low maintenance water pump systems within the 13 provinces of the Mekong Delta region of Vietnam for the benefit of the Vietnamese rural people, the environment, and the economics of the region." (PCCT & RDE, 2011: 2).

B2. Relevance to partners.

For **Vietnam**, the project was in line with the GoVN's Comprehensive Poverty Reduction and Growth Strategy, Social Economic Development Plan, and National Rural Clean Water Supply and Sanitation Strategy (2000-2020), while complying with the Law on Economical and Efficient use of Energy (6/2010), the Law on Environment (6/2014), Resolution No. 24-NQ/TW on the national climate change response (6/2013), the National Climate Change Strategy (12/2011), and the National Green Growth Strategy (9/2012).

For **Denmark**, the project provided the opportunity to showcase Danish RE technology in an expanding market, to influence government procurement policies, and to reduce GHG emissions, in line with the aims of its development cooperation actions.

B3. Relevance to MDGs/SDGs. In addition to the replacement of fossil energy with solar and wind power (SDG 13: Climate Action), other benefits of the project and its education and replication consequences are stated to include new water supplies to some of the 16% of Mekong Delta communities lacking access to clean water (AusAID *et al.*, 2011) and 52% lacking adequate sanitation (SDG 6: Clean Water and Sanitation), thus relieving women and

children of water-collection tasks (SDG 5: Gender Equality), reduced costs for SMEs based on aquaculture and irrigation-based agriculture (SDG 8: Decent Work and Economic Growth), and health benefits from reduced air and noise pollution from generators (SDG 3: Good Health and Well-Being).

B4. Relevance to NDC mitigation commitments. "The Government has prioritized policies, such as renewable energy development, consistent with Vietnam's mitigation potential and conditions, in order to contribute to energy security and environmental protection." (GoVN, 2016: 2).

B5. Relevance to mitigation. The project was relevant under the 'practical actions' criterion of Mitigation Technology (MT), by installing solar water pumps, and under the 'enabling framework' criterion of Training & Education (IR), by raising public awareness and changing government procurement policy in favour of solar technology.

Part C: Narrative overview

Vietnam sees itself as dangerously vulnerable to the early effects of climate change (GoVN, 2016: 7), some of which are already visible: "In some areas of the country the programme faces challenges from a changing climate and sea level rise. The challenges include: i) water resources being increasingly affected by salinity and pollution; and ii) water and sanitation infrastructure being affected by extreme weather events and flooding." (Jensen *et al.*, 2012: 2). The REWS project was designed at a time where about 20 million people living in the Mekong Delta were very poor. Previous aid projects (by Denmark, AUSAID, ADB, WB, Care and others) had installed thousands of small rural water systems in the area, but few pumps were still operating. Most areas in the Delta have access to grid power, but supply is very irregular, with power cuts and surges that burn out motors which cannot be repaired. The project aimed to demonstrate the use of small-scale solar and wind RE technology for pumping community water in the Mekong Delta, which was being sought explicitly to replace fossil (diesel generator and grid) power on cost and environmental grounds, and to be used as a demonstration aimed at changing public opinion and government procurement in favour of RE. Other benefits were expected to include new water supplies to some communities, reduced costs for SMEs based on aquaculture and irrigation-based agriculture, and reduced air and noise pollution from generators. The project design relied upon the availability of provincial water centres (pCERWASS) in 13 Mekong Delta provinces with surplus capacity that could be harnessed at little incremental cost and high efficiency to the aims of the project. The latter included installing and using RE at demonstration sites in the provinces and at a centre in Can Tho, the

monitoring and reporting of GHG emission reductions and cost savings, and the use of this information and the technology itself to advise and inform the population of all 13 provinces through 99 village workshops and a mobile presentation of the availability, utility and multiple advantages of using RE for water pumping.

Part D: Design quality

D1. Theory of change.

By 2015, 69% of Vietnamese saw climate change as a very serious threat (PCT, 2015), and the project document explains why the 13 Mekong Delta pCERWASS were interested in using on-site RE systems for pumping water: security of electricity supply and water delivery, low installation and maintenance costs, price stability, equipment durability, environmental friendliness and messaging, lack of public knowledge on renewable energy alternatives, the opportunity to change government procurement guidelines by proving the technology, and that over 90% of the pCERWASS' recurrent budget was being spent on fossil fuels. Through the People's Committee of Can Tho all 13 provinces agreed to enter into a Danish Embassy LGA project to promote RE solutions for bringing water to villages. This was mainly to be done through information and training using newly-built RE community water supplies, aimed at decision makers at all levels (villages, communes, districts, provinces), and at a central pCERWASS office in Can Tho where a knowledge centre would be established. Demonstration sites (33) in all provinces and a mobile unit would be used, plus up to 100 community workshops (PCCT *et al.*, 2013; PCCT & RDE, 2011).

D2. Assumptions underlying the theory of change.

Assumption 1. That solar and wind electricity generation technology would substitute satisfactorily for rural grid and generator sources in powering water pumping systems in the Mekong Delta context.

Assumption 2. That RE would provide other anticipated environmental and socioeconomic benefits to participating communities.

Assumption 3. That the necessary skills for installation and maintenance would be effectively transferrable in the Vietnamese rural context.

Assumption 4. That other communities would be interested in, learn from, and act on knowledge generated by the project and offered by its outreach activities.

D3. Plausibility of assumptions and links. All assumptions were plausible (and justified by events), as was the underlying assumption that the Vietnamese partners would deliver

everything that they agreed to do.

D4. General quality of the project design. This project was exemplary in its problem analysis, in its grounding in the clearly-articulated and well-justified needs and wishes of its provincial proponent-beneficiaries, and in the description of its aims and implementation arrangements. **Score: 6.**

Part E: Evidence for mitigation performance

E1. Direct effectiveness. Unquantified but presumably small. Based on real conditions, the system design requirements included: (a) that it must meet the demands normally placed on a pumping system in rural areas of Vietnam (50-100 m³/day); and (b) that it should use solar and grid power as available by day and night (rather than an expensive and environmentally-harmful battery), with an automatic change-over device. The Grundfos SQ Flex was selected as it operates on AC or DC (with range 30-300 VDC or 1 x 90-240 VAC, 50/60 Hz), and a Solar-Grid Automatic Change Over Device was available. **Score: 6.**

E2. Indirect effectiveness. Marked education effects and high potential replicability.

E3. Net GHG emission reductions: Insignificant.

E4. Impact effects. "All the schemes ... have been used as demonstration sites for visit and exchange of knowledge and experience with the local water staff and local communities. An Information and Knowledge Centre was also established in Can Tho to present renewable energy equipment for water supply, e.g. solar pumps, solar panels, leaflets and materials for distribution and to serve as training centre on renewable energy for water supply. Thousands of people have been to the Centre [and a mobile van installed with a solar energy pump model in operation supported by audio/visual facilities has travelled to 99 communes in 13 Mekong Delta provinces to raise awareness on renewable energy for the local community. These training and awareness raising [activities] will continue after completion of the project. The model to use solar/wind energy for rural water piped schemes was highly appreciated by the provincial authorities, water staff and local communities. There is a generally high demand from the provinces to replicate this model." (RDE, 2015: 1-2). **Score: 5.**

E5. Sustainability effects. The five years since the project have seen important changes in context. The pumping stations are still working but for surface water only, as GoVN stopped the use of ground water. There has been systematic privatisation of public water supplies, and investors much prefer fewer large surface water treatment plants to many small dispersed

pumping stations. Some provinces have combined the networks and/or pCERWASS into provincial public water supply companies (e.g. Tien Giang and Ho Chi Minh City). The technologies have also changed: 100 W solar panels have been replaced by those up to 450 W per panel, and with GoVN policy on roof-top solar, many water treatment plants have installed large (up to 1 MW) solar systems on treatment tanks (e.g. Hau Giang, An Giang, Long An, Vinh Long, Nha Trang and Thu Duc). **Score: 6.**

E6. Efficiency issues. Interviews confirmed that all installations at 72 sites in 32 provinces were done successfully and on schedule, using standard pre-fabricated steel frame, control panels, thin film solar panel, and solar pump, with support from the pCERWASS, consultants and Grundfos Vietnam. All 32 schemes operated to expectation, and the people were very happy with the result of high-quality product, good design and planning. "It is expected that Provincial Authorities and Communities will cover their costs of the installation of Renewable Energy Demonstration sites, with Technical Assistance and installation training from international and Vietnamese TA" (PCCT & RDE, 2011:). A project management unit staffed by named Vietnamese pCERWASS officials was to be set up, and all the pCERWASS (the directors being named with mobile telephone numbers in the proposal) "will be responsible for providing their technical staff in working with the International Renewable Energy Equipment Supplier and Technical Assistance Provider" for a long list of tasks and roles (PCCT & RDE, 2011:6-7). Since the budget was not fully spent, it appears that all these expectations were met. It is hard to see how efficiency could have been any greater. **Score: 6.**

E7. Capacity building issues. Uptake by staff at pCERWASS seems to have been an efficient use of surplus Vietnamese staff capacity, and the demonstration and education effects seem to have been warmly responded to by villagers at 99 communes in 13 provinces. Even the planned number (99) of village workshops were delivered. Interviews confirmed that all systems are still working indicating that operation and maintenance training has been sufficient to secure sustainability. To excel the capacity building could have been linked with National Trainings and integrated into a national curriculum thus ensuring a long-term capacity in country to further develop maintenance of the pumps. Grundfos does however, run international training schemes and a next step could be to establish a link between the Grundfos training academy and relevant technical training in Vietnam. **Score: 5**

E8. Baseline and monitoring arrangements. "The project will set-up monitoring equipment to show the energy saved and reduction of CO₂ by the renewable energy system. This will be a strong communication from a population which will be highly affected by global

warming to Vietnam and the world." PCCT & RDE (2011: 11). Interestingly, the intent here is not only to document real-life emission reductions, but to use those reductions specifically as an educational resource both locally and globally.

E9. Overall conclusion on mitigation performance. To a presumably small (but locally significant) effect on GHG emissions should be added the educational effect and the induced demand for replication (which could have been met by other public and private actors). The cost-effectiveness in EUR/tCO_{2e} cannot be calculated without additional information, but the indications are that the GHG emission savings are insignificant as the current alternative was no-water or no-clean water (as opposed to clean water generated through fossil fuel). Going forward (as the average income rises and this success is replicated) this demonstration project could lead to significant sustained avoided emissions. However, as the technologies have changed and there is a shift from use of ground water to surface water, the project was significant at the time but may not be in the future. **Score:** 5.

Part F: Other aspects of design and performance

F1. Unintended consequences. Solar power can be used to pump groundwater from deep aquifers and there is no mention in the project documents of potential risks from natural arsenic and fluoride contamination, which had been known for at least a decade at the time of project design (e.g. Berg *et al.*, 2001; Caldecott, 2020: 150-51). This concern is also omitted by AusAid *et al.*, (2011: vi & 26): "The environmental risks are judged as manageable and relate to: over exploitation of water resources; poorly monitored water quality leading to people drinking unhealthy water e.g. containing pesticides; latrines concentrating waste and polluting the nearby groundwater being used for drinking water e.g. through dug wells; damage to fragile ecosystems caused by increased water availability leading to greater use of livestock."

F2. Other performance issues.

Coherence. (a) The multi-donor sector support programme *Support to National Target Programme for Rural Water Supply and Sanitation Phase III (NTP-RWSS, 2011-2015)* was active in Vietnam at the same time as the REWS Mekong project, with national partners Ministry of Agriculture and Rural Development, Ministry of Health, Ministry of Natural Resources and Environment, Ministry of Education and Training, Vietnam Bank for Social Policies, and donor partners Netherlands, AusAID, Danida and DfID (AusAID *et al.*, 2011). (b) There is little sign of integration between REWS Mekong and NTP-RWSS. The Joint Annual Review of the latter says only: "A number of initiatives using renewable energy in water supply schemes are being implemented or planned in different parts of Vietnam. The JAR is aware of both solar and wind powered water supply demonstration projects being planned, some with Danida support. The JAR suggests that NCERWASS and the SO follow these demonstration projects closely to assess the possibility of increasing the use of renewable energy in water supply schemes." (Jensen *et al.*, 2012: 4).

Replicability. (a) "According to the 13 pCERWASS's, there are several 100 existing systems in trouble due to the lack of power to the rural grid and fluctuations and there is still a need for complete new system to communities without water. The rising kW cost of the electric grid power is also becoming un-sustainable as a power source. This means that the replicating potential is very high. In addition, there is also a large potential for lifting/distributing water, e.g. in the Mekong rural aquaculture businesses." (PCCT & RDE, 2011: 10)." (b) Replication "requires investment and resources. The Embassy has been trying to connect these demands with the Danida Business Finance [DBF, now DSIF] which prioritizes concessional loans for green growth and renewable energy but it is a big challenge already, due to reasons, such as the competence of the local staff in preparing F/S [feasibility studies?] for such a project, the difference in the size of the project (which is small, maximum 5 million US dollars) and the size of the DBF loan (which should be around 10 million US dollars), etc. (RDE, 2015: 2).

Acronyms and abbreviations (Vietnam)

ADB	Asian Development Bank.		
AFD	L'Agence Française de Développement.	IFC	International Finance Corporation (World Bank Group).
BAU	Business as usual.	IPPU	Industrial Processes and Product Use.
BUR	Biennial Update Report.	JICA	Japan International Cooperation Agency.
CCAM	Climate Change Adaptation and Mitigation.	LCEE	Low-Carbon Transition in the Energy Efficiency Sector.
CE	Climate Envelope	LEAP	Long Range Energy Alternative Planning (model).
CIDA	Canadian International Development Agency.	LGA	Local Grant Authority (of Danish embassies)
DBF	Danida Business Finance.	LT	Long Term (adviser).
DEA	Danish Energy Agency.	LULUCF	Land use, land-use change and forestry (sector).
DEPP	Danish Energy Partnership Programme.	MARD	Ministry of Agriculture and Rural Development.
DFAT	Department of Foreign Affairs and Trade (Australia).	MCEB	Ministry of Climate, Energy and Buildings (<i>Klima-, Energi og Bygningsministeriet</i> , usually translated as 'Ministry of Climate, Energy and Utilities', MCEU, even though <i>bygning</i> means 'building' in Danish).
DKK	Danish kronor.	MFA	Ministry of Foreign Affairs of Denmark.
DoIT	Department of Industry and Trade.	MKL	Department for Multilateral Cooperation & Climate Change (MFA Denmark).
DoNRE	Department of Natural Resources and Environment.	MoC	Ministry of Construction.
EE	Energy efficiency.	MoFA	Ministry of Foreign Affairs
EEC	Energy Efficiency Centre.	MoET	Ministry of Education and Training.
EPC	Engineering, procurement and construction.	MoIT	Ministry of Industry and Trade.
ESCO	Energy Service Company.	MoNRE	Ministry of Environment and Natural Resources.
ESMAP	Energy Sector Management Assistance Program.	MoST	Ministry of Science and Technology.
ESRM	Environmental and social risk management.	MoT	Ministry of Transport.
EVN	Vietnam Electricity (state-owned company).	MoPI	Ministry of Planning and Investment.
GCF	Green Climate Fund.	MTR	Mid-Term Review.
GCTF	Green Credit Trust Fund.	NC	National Communication
GG	Green Growth.	NCCC	National Climate Change Committee.
GHG	Greenhouse gas.	NCPC	National Cleaner Production Centre.
GIF	Green Investment Fund.	NEDS	National Energy Development Strategy.
GoVN	Government of Vietnam.	NLDC	National Load Dispatch Centre.
HFC	Hydrofluorocarbons in the 2016 NDC: organic (carbon-containing) compounds of carbon with fluorine and hydrogen, the most common type of organofluorines are widely used as refrigerants. Halocarbons in the 2020 NDC: compounds of carbon atoms with one or more halogen atoms (fluorine, chlorine, bromine or iodine), of which organochlorides are the most common and widely used as pesticides,	NSCC	National Strategy on Climate Change.
		NSGG	National Strategy for Green Growth.
		NTP	National Target Program.
			solvents, insulators and plastics.

NTP-RCC	National Target Programme to Respond to Climate Change.
NDC	Nationally Determined Contribution (to Paris Agreement goals).
pCERWASS	Provincial Centre for Rural Water Supply and Sanitation (Vietnam).
PCCT	People's Committee of Can Tho province (Vietnam).
PECSME	Promoting Energy Conservation in Small and Medium (sized) Enterprises (see: www.thegef.org/project/promoting-energy-conservation-small-and-medium-scale-enterprises-pecsme).
PIPA	Plan for Implementation of the Paris Agreement.
PDP	Power Development Plan.
PV	Photovoltaic.
QCVN	Vietnam Technical Regulation.
RDE	Royal Danish Embassy (Vietnam, Hanoi).
RE	Renewable energy.
REDS	Renewable Energy Development Strategy.
REWS	Renewable Energy Water Supply.
SME	Small and medium-sized enterprise.
SP-RCC	Support Program to Respond to Climate Change.
TA	Technical assistance.
TDS	Transport Development Strategy.
ToR	Terms of Reference.
UNFCCC	United Nations Framework Convention on Climate Change (and 2015 Paris Agreement).
VEEP	Vietnam Efficiency Energy Program.
VEPG	Vietnam Energy Partnership Group.
VND	Vietnam Dong (VND 1 million = EUR 36.82, EUR 39.23 and EUR 36.71 on 3 Oct 2010, 2015 and 2020 respectively).
VNEEP	Vietnam National Energy Efficiency Program.
VPCC	Vietnam Panel on Climate Change.

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