EXPERIENCE NOTE

VIETNAM'S CLIMATE STRATEGY LEADING IN ADAPTATION AND MITIGATION MONITORING

TRANSFORMING DATA INTO MITIGATION ACTION: VIETNAM'S JOURNEY IN MEASURING REPORTING AND VERIFICATION

January 2025

LUXDEV
Luxembourg Development Agency

LUXEMBOURG AID & DEVELOPMENT

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EXECUTIVE SUMMARY

Vietnam, one of the world's most vulnerable nations to climate change, is pioneering climate monitoring and adaptation initiatives with significant support from Luxembourg. Starting in 2018, Luxembourg invested in two major projects in Thua Thien Hue (TT Hue) province. These initiatives focus on mitigating greenhouse gas (GHG) emissions and enhancing local resilience against climate impacts.

LuxDev, the Luxembourg Development Cooperation Agency, spearheaded these projects, emphasizing the importance of Monitoring and Evaluation (M&E) and Measurement, Reporting, and Verification (MRV) systems. These systems are critical for tracking the effectiveness of climate interventions and ensuring adherence to international commitments like the Paris Agreement.

The projects had two main components. The Climate Change Adaptation project (VIE/433) aimed to strengthen resilience through systematic monitoring and evaluation of climate impacts and adaptation interventions. It targeted vulnerable communes, building local capacity to manage and mitigate climate risks. The Climate Change Mitigation project (VIE/401) focused on reducing GHG emissions by replacing high-energy lighting with efficient light-emitting diode (LED) lights in public spaces and schools, significantly lowering CO_2 emissions and raising awareness about energy efficiency (EE).

A notable achievement of the Nationally Appropriate Mitigation Action (NAMA) pilot on energy efficient LED lighting was that the GHG emission reduction outcome of the intervention was the first ever mitigation result measured as per the United Nations Framework Convention on Climate Change (UNFCCC) guidelines, verified by and formally registered with the Government of Vietnam. This milestone set a precedent for future climate projects in Vietnam and attracted interest from national bodies, major donors, and the private sector.

Key to the success was the close collaboration with Vietnamese government agencies, both at the national level, such as the Department of Climate Change (DCC) within the Ministry of Natural Resources and Environment (MONRE), and the provincial level, including the Division of Climate Change (DiCC) at the Department of Natural Resources and Environment (DONRE), as well as the Department of Industry and Trade (DOIT), and the Department of Planning and Investment (DPI). This partnership ensured strong local ownership and alignment with national policies.

Capacity building was a cornerstone of these projects. Over four years, LuxDev conducted numerous trainings and workshops, significantly enhancing the technical skills and knowledge of provincial staff. By the end of the projects, the institutional capacity of TT Hue's DiCC had increased substantially, positioning it as a model for other provinces.

The projects also demonstrated the cost-effectiveness of LED lighting as a mitigation strategy. The installation of LEDs in schools and on streets not only reduced energy consumption and CO_2 emissions but also led to significant cost savings. By 2030, energy savings are expected to reach 10,441 MWh (equalling 55% reduction compared to conventional lighting), with a cumulative reduction in emissions estimated at 9,327.9 tCO_2.

Despite challenges such as slow government procurement processes and the absence of national guidelines for MRV, the projects successfully developed and implemented comprehensive MRV frameworks. These frameworks were aligned with UNFCCC guidelines and adapted to the local context, providing a robust model for future mitigation measurement efforts.

The experience in TT Hue offers valuable lessons for scaling up similar initiatives nationwide. The success of these projects underscores the importance of strong government commitment, effective collaboration, and the development of local expertise. As climate issues continue to escalate globally, the methodologies and results from LuxDev's pioneering work in Vietnam serve as a benchmark for future interventions.

By documenting and sharing these experiences, LuxDev aims to highlight the potential for international cooperation in addressing climate change and inspire further climate action, contributing to a global community committed to sustainable solutions.

EXPERIENCE CAPITALISATION

The process by which an experience is transformed into knowledge that can be shared with others (Zutter, 1995).

GOOD PRACTICE

A practice that has been proven and is successful in many contexts and is therefore recommended as a model.

LESSON LEARNED

A lesson learned is a learning that a person or a group of people gain from an experience. A lesson learned is a synthesis of knowledge or understanding that results from a positive or negative experience that can be used in other contexts and/or replicated (Millenial Development Goals Achievement Fund Programme).

PIONEERING CLIMATE SOLUTIONS: THE IMPORTANCE OF MONITORING AND EVALUATION AND MEASUREMENT, REPORTING, AND VERIFICATION FOR GLOBAL IMPACT

Climate change is a pressing global challenge that requires innovative and effective solutions. As a relatively new focus area, climate M&E and the MRV of mitigation interventions are becoming increasingly crucial. With the UNFCCC mandating biennial Nationally Determined Contributions (NDC) reports from all countries, the importance of robust M&E and MRV systems has never been higher:

EMBRACE EMERGING EXPERTISE

Developing technical skills in climate M&E and MRV is essential for tracking progress and meeting global commitments. LuxDev's innovative work shows the transformative impact of building these capabilities, positioning organizations to lead in climate action. By continuously enhancing internal expertise, every project can effectively plan and monitor interventions from a climate resilience perspective.

KNOWLEDGE SHARING

Sharing successful experiences and methodologies can provide valuable support to a broader audience. LuxDev's experience underscores the importance of expanding knowledge beyond internal use. By offering expert guidance to public and private sector clients, organizations can amplify their impact, fostering a global community committed to sustainable solutions.

MEASUREMENT, REPORTING, AND VERIFICATION (MRV)

- 1,546 LED luminaires: Replaced sodium luminaires on 26 streets;
- 18,692 LED tubes: Installed in 54 schools, replacing 13,676 fluorescent tubes;
- 586.4 MWh: Power savings from LED replacements on streets over 23 months;
- 982.3 MWh: Power savings from LED replacements in schools over 13.5 months;
- 55%: Reduction in electric energy consumption from project LED lighting systems as compared to conventional lighting;
- 1,401.6 tCO_2: Total GHG emission reduction from LED installations;
- 9,327.9 tCO_2: Projected GHG reduction by 2030;
- 2.9 billion Vietnamese dong (EUR 116,000): Total cost savings from LED installations;
- 49,734 students and 2,805 staff: Benefited from improved lighting quality in classrooms;
- First NAMA registration: The first formal registration of a NAMA project in Vietnam, including LED interventions, officially verified and registered.

CAPACITY BUILDING ACTIVITIES

- battery of trainings and workshops: For provincial staff on topics such as the Paris Agreement, NDCs, NAMA, GHG impact, and more;
- 58.8%: Trainees applying new skills effectively in daily work;
- 100%: Trainees improved knowledge and skills in planning, M&E, and MRV.

BUILDING INSTITUTIONAL CAPACITY

- 4 years: Duration of LuxDev's extensive collaboration with TT Hue's newly established DiCC;
- 510 indicators: Vulnerability selected in line with the Vulnerability Assessment Framework recommended by the Intergovernmental Panel on Climate Change;
- 200 indicators: Climate impact and risk indicators;
- 345 indicators: Adaptation actions and financial resources indicators;
- 27: Different data collection tools developed;
- 24 months: Time taken to complete the baseline for the Climate Change Adaptation (CCA) Database Management System;
- 4,069 households: Sample survey conducted across 145 communes and wards.

To access the ANNEX please click on the link[1]

1 (EN) - ANNEX - M&E-MRV Experience sheet - [EN].pdf

NATURE AND OBJECTIVES OF THE DOCUMENT

This experience capitalisation note aims to draw attention to the increasing importance of climate change M&E and MRV. The primary objectives are to document what was done, how it was done, and the results achieved in two pioneering climate projects funded by Luxembourg in TT Hue province, Vietnam. Additionally, the note seeks to consider the key conditions and challenges for a national rollout in Vietnam or similar work elsewhere and explore Luxembourg's potential role in such efforts.

The motivation behind this note is to highlight the innovative methodologies and best practices developed during these projects, emphasizing their significance as best practices for other regions. By documenting and sharing these experiences, the note aims to benefit LuxDev as an agency, providing valuable insights and frameworks for future climate-related interventions.

The objectives are threefold:

- **highlight the importance:** Draw attention to the increasing importance of M&E and MRV in climate change projects;
- **detail the implementation:** Provide a detailed account of what was done, how it was implemented, and the outcomes achieved;
- **explore scalability:** Consider the key conditions and challenges for a national rollout in Vietnam and potential replication in other contexts, emphasizing Luxembourg's possible role in these efforts.

CONTEXT AND RATIONALE OF THE INTERVENTION

CLIMATE VULNERABILITY AND LUXEMBOURG'S COMMITMENT TO CLIMATE ACTION IN VIETNAM

Vietnam is one of the world's most vulnerable countries to climate change, facing rising sea levels, severe storms, floods, droughts, salinization of soil and water, shifting ecosystems, and food insecurity. These climate impacts pose significant threats to the nation's economy and livelihood, with the World Bank ranking Vietnam among the top ten countries expected to be most affected by climate change by 2050, projecting a potential GDP decline of 3.5%.

In response to these pressing challenges, the Luxembourg government, starting in 2018, chose to channel its first International Climate Finance (ICF) into TT Hue province. This region, home to Southeast Asia's largest lagoon, epitomizes the climate vulnerabilities that the nation faces. Luxembourg's intervention focused on two key projects with dual objectives:

Mitigation: Implement a pilot NAMA aimed at reducing GHG emissions, primarily from coal-fired power plants, which are a major contributor to global warming.

Adaptation: Support local authorities and communities in preparing for and adapting to the increasing climate risks, thereby safeguarding personal safety and livelihoods.

Despite having various policies and plans for disaster risk reduction, climate adaptation, and mitigation, the Government of Vietnam (GoV) lacked the systems, tools, and skills to monitor and measure the wide array of climate-related events and interventions effectively. Reliable data on adaptation and mitigation impacts were urgently needed to fulfil international commitments, such as the Paris Agreement and the net-zero emissions target by 2050. This gap highlighted the necessity for robust M&E and MRV systems.

VIETNAM'S ENERGY TRANSITION: A SHIFT FROM FOSSIL FUELS TO RENEWABLES

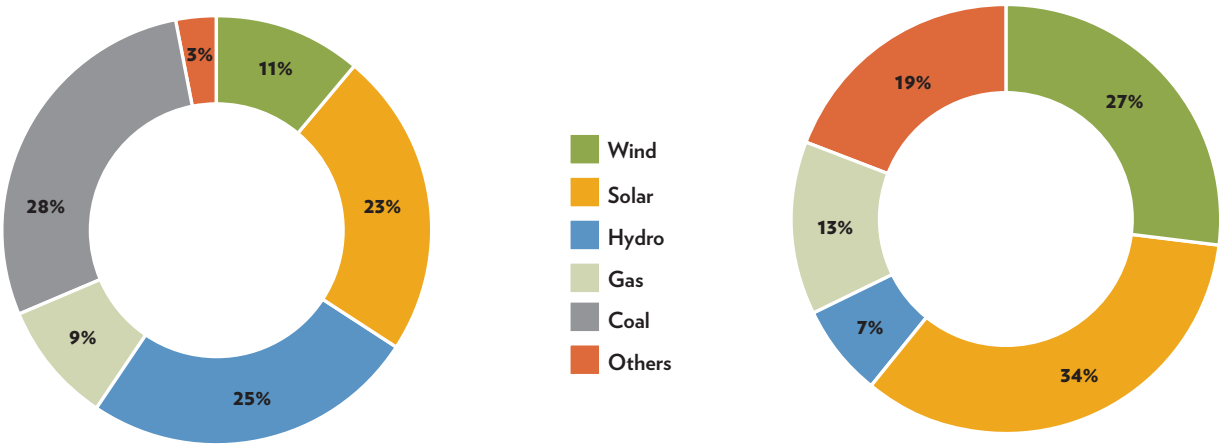
DRIVING SUSTAINABILITY THROUGH ENERGY EFFICIENCY AND CAPACITY BUILDING (2022-2050)

After years of drafting and revising, Vietnam's latest Power Development Plan (PDP VIII) was finalised in May 2023. Compared to all previous PDPs, as well as first drafts of PDP VIII, the final approved Plan takes quite a radical shift in direction for the country's energy mix. Whereas initial drafts of PDP VIII were still planning to build a substantial number of additional coal-fired power plants, on top of some 25 such plants in operation already, the final PDP VIII aims to bring the use of coal for electricity generation back to zero by 2050.

The GoV has been very open and constructive in their planning of the energy sector, and years ago established the Vietnam Energy Partnership Group, which brings the GoV (Ministry of Industry and Trade) and donors together for regular exchanges of ideas. Under that Vietnam Energy Partnership Group four GoV-Donor working groups were set up, LuxDev being a member of a working group on EE.

With its economy continuing to do very well, Vietnam's energy need is projected to keep growing fast in coming decades, but the way that that power will be generated will be radically different in 25 years from now. As recently as 2020, coal alone made up 52% in the energy mix, and oil 24.4% and gas 8.2%, making a total of 84.6% of all energy generated by fossil fuels. Today the share of coal has dropped below 30%, and by 2050 should be eliminated, when clean renewables and hydropower together will make up some 70% in the energy mix (Vietnam National Energy Efficiency Programme, Energy Statistics 2020).

Share of installed capacity shifting from 2022 - 2050



LUXEMBOURG'S CLIMATE PROJECTS IN TT HUE

The Climate Change Adaptation and Climate Change Mitigation projects, were designed to address these critical needs. These projects were pioneering for Vietnam, establishing TT Hue as a pilot province for climate monitoring and capacity building. The work centered on:

- M&E of Climate Change Impacts and Adaptation Interventions: Aiming to increase resilience through systematic monitoring and evaluation;
- MRV of GHG Emission Reductions: Ensuring accurate measurement, reporting, and verification of mitigation actions.

Executed in close collaboration with Vietnamese government agencies, these projects ensured alignment with national policies and strong local ownership. Key partnerships included:

- National level: Collaborations with the DCC within the MONRE and the Ministry of Industry and Trade;
- Provincial level: Day-to-day operations with the DiCC at the DONRE and the DOIT.

The pioneering nature and success of these interventions resonated at the national level, drawing significant interest from government bodies, major donors like the Asian Development Bank and United Nations Development Programme, and the private sector. The methodologies and results developed through these projects are now viewed as benchmarks for future climate initiatives in Vietnam and beyond.

The Climate Change Adaptation project aimed to strengthen resilience by enhancing awareness and understanding of climate change issues, constructing small-scale infrastructure to protect livelihoods, and promoting resilient ecosystems. It targeted 29 vulnerable communes in TT Hue, collaborating with various government departments, civil society organizations, and the private sector.

The Climate Change Mitigation project focused on testing and demonstrating energy efficiency interventions. By replacing high-energy lighting with low-energy LED lights in public locations and schools, it aimed to reduce CO_2 emissions and raise awareness about energy efficiency. The project also implemented MRV to provide reliable evidence of GHG impact, setting the stage for accessing further international climate funding. This project was executed in Hue city, with significant involvement from local schools and public works companies.

The final evaluation of these projects underscored their effectiveness and innovation, highlighting several firsts for Vietnam. The documentation and dissemination of these methodologies and results are expected to have a lasting impact, providing valuable insights for future projects and broader climate action efforts globally.

By presenting this context and rationale, we aim to offer a comprehensive introduction to the reader, emphasizing the urgency, significance, and impact of LuxDev's climate interventions in Vietnam. This section sets the stage for understanding the detailed implementation and outcomes discussed in the subsequent parts of the document.

The work carried out in TT Hue is pioneering for Vietnam, particularly in the context of climate monitoring. The projects introduced advanced M&E and MRV systems, which have been recognised as best practices.

SUMMARY OF INTERVIEW WITH THE DEPUTY HEAD OF ENERGY MANAGEMENT DIVISION, TT HUE DEPARTMENT OF INDUSTRY AND TRADE

In 2019, Vietnam's Prime Minister approved the Vietnam Energy Efficiency Programme for 2019-2030. The TT Hue DOIT is responsible for implementing the provincial EE action plan, which began in 2020. The support from Luxembourg through project VIE/401 was timely, significantly aiding in both hardware and software components that align with national and provincial EE targets.

The VIE/401 project has been pivotal in enhancing TT Hue's capacity in critical areas, particularly through investments in LED hardware and raising awareness about energy efficiency. It has also played a crucial role in building the province's capacity for MRV, aiming to make TT Hue the first province in Vietnam with this capability.

As a member of the Project Task Force, the Deputy Head of the Energy Management Division emphasized the importance of this project in meeting ambitious government objectives. Involvement included selecting public locations for LED installation, participating in baseline data measurements, and engaging in various technical trainings. The collaboration with the Department of Natural Resources and Environment has been vital, especially in advancing MRV work.

The Deputy Head expressed optimism about Luxembourg's continued support, highlighting MRV as a challenging yet essential field that every province will need to develop. There is potential for TT Hue to eventually support other provinces in building their MRV expertise.

DEFINITIONS – CLIMATE CHANGE ADAPTATION MONITORING AND EVALUATION AND MITIGATION MEASUREMENT, REPORTING, AND VERIFICATION

Climate change interventions can be categorized into two main types: adaptation and mitigation.

Mitigation Interventions: These address the primary cause of global warming and climate change, which is GHG emissions. Mitigation efforts focus on reducing or preventing the emission of GHGs into the atmosphere.

Adaptation Interventions

These tackle the numerous consequences of global warming and climate change, such as impacts on people's lives, livelihoods, and health. Adaptation involves adjusting processes, practices, and structures to minimize damage from climate impacts and take advantage of potential opportunities.

In climate change monitoring, the term MRV is sometimes used to encompass both adaptation and mitigation efforts. However, M&E and MRV serve different purposes and are distinct in nature.

M&E

This involves the traditional monitoring of events, processes, inputs, activities, and immediate outputs of interventions, and evaluating their longer-term outcomes and impacts. M&E employs a variety of approaches and methodologies, both quantitative and qualitative, to assess the effectiveness of adaptation interventions.

MRV

MRV is focused solely on the process of quantifying the impact of GHG emission reduction interventions. It involves three key steps:

- measurement: Quantifying the impact of any GHG emission reduction intervention.
- reporting: Communicating these measurements to relevant authorities.
- verification: Ensuring that reported results are accurate through independent verification by an authorized third party. This is a strictly quantitative exercise.

LuxDev aligns with leading agencies in using 'M&E' for adaptation interventions and 'MRV' for mitigation interventions, ensuring clarity and precision in our climate action efforts.

WHAT WAS DONE IN MONITORING AND EVALUATION AND MEASUREMENT, REPORTING, AND VERIFICATION AND HOW

Vietnam's national climate change (CC) plan and EE programme, quite ambitiously require that all provinces in the country have the capacity and capability to monitor and measure impact of CC events and adaptation as well as mitigation interventions. Over a four-year period, LuxDev were the first to link up and work extensively with a provincial, newly established DiCC to build those capacities and capabilities at the sub-national level.

> "The installation of LED lighting in schools has significant importance for the environment, and for awareness raising about energy use. Only two-three months after installation, some schools reported their power consumption and electricity bills to have decreased by 10-20% already."
>
> **Deputy Head Secondary Education Division of Hue Department of Education and Training (DOET)**

During those years, national guidelines were being drafted by the ministry's DCC, which was a slow process that only got finalised by the end of Luxembourg's interventions. Therefore, projects could not rely on formally issued national guidelines and instead directly followed the guidelines of the UNFCCC, which Vietnam's guidelines were also to comply with. At the same time, however, a direct link was established with the national DCC and a collaboration developed, with regular discussions between LuxDev and the DCC on concepts, approaches, methods, tools and practices. It was an experience of joint learning and sharing, whereby LuxDev provided the national level with input and feedback on the capacity building process and practical implementation of M&E and MRV on the ground, while working with one of their provincial DiCC's. That feedback, then, helped the DCC shape and finalise national guidelines.

M&E and MRV capacity building interventions in two projects were implemented at two levels:

- institutional capacity building primarily with and within the provincial DiCC;
- collaborative effort with various partners to actually Measure, Report and Verify the NAMA pilot intervention in energy efficiency.

IMPLEMENTED AT TWO LEVELS

Institutional capacity building

Strengthening DiCC's capacity in climate M&E and MRV through training

Measure, report and verify

Vietnam's first MRV-verified LED lighting emissions reduction

INSTITUTIONAL CAPACITY BUILDING IN M&E AND MRV WITHIN THE PROVINCIAL CLIMATE AGENCY, DiCC

By and large these were in-class theoretical trainings and practical workshops.

As for CCA M&E, key interventions and outputs included: a roadmap, design of the M&E framework and data collection methods, IPCC informed M&E indicator sets (510 indicators for vulnerability, 200 for climate impact and risks, and 345 for adaptation actions and financial resources, adaptation results and impact), 27 different data collection tools, an SPSS database template, and a web portal for documenting and sharing relevant information and data on climate change responses to the public, besides strengthened capacity of the provincial and district agencies on data collection and data entry.

The baseline for the CCA Database Management System was completed after 24 months into the project, with secondary data collected from thirteen provincial and nine district agencies, and primary data obtained from a sample survey of 4,069 households in 145 communes and wards.

The project organised a battery of trainings and workshops for provincial (DONRE, DARD) staff, on relevant climate topics (e.g. Paris Agreement, Intended Nationally Determined Contributions, NAMA's, GHG impact on global warming, models and predictions, etc.) and more work-specific topics such as result-based project management, project M&E, survey design, data collection/processing/analysis, CC and DRR-based investment decision making tools (e.g. Cost-Benefit Analysis, Cost-Effectiveness Analysis, Multi-Criteria Analysis), and baseline data collection for the CCA M&E system. After three years, when all was up and running, the DiCC conducted its first major provincial CC impact and vulnerability assessment using their own data from the new CCA M&E system.

As for MRV, this can take three forms: provincial level MRV, sectoral level MRV, and project level MRV. Considering the scope of project interventions, the main focus of institutional capacity strengthening within the DiCC was on increasing the agency's general understanding of the broader international mitigation context and need for MRV, the various forms of MRV, and on developing a provincial MRV framework for GHG mitigation and the technical capacity to do provincial and project level MRV.

Tracking and measuring of DiCC's institutional strengthening was primarily based on a process assessment checklist. (see further)

ACTUAL MEASUREMENT, REPORTING AND VERIFICATION OF THE EE (LED LIGHTING) INTERVENTION

Mitigation pilot VIE/401 aimed to do a full project MRV cycle, and get the measured GHG emission result of the EE/LED intervention independently verified and registered with the GoV. It was to become the first such formal registration in the country, and the first NAMA result to be included in Vietnam's biennial NDC report to the UNFCCC. This gave an excellent opportunity to get the DiCC and a few other relevant provincial agencies and partners in action mode, to not only learn about MRV but in fact do it as well. (see interview in separate box)

With MRV being an entirely new type of monitoring, no experience and little guidance, and the type of mitigation intervention especially LED installations in schools not the easiest to measure, challenges were plenty.

Since 2022, the GoV formally requires all mitigation interventions to measure GHG impact and produce a measurement report, with external experts to be hired to verify the content of the report.[1] However, guidelines on how to do this did not, and still do not exist even today, therefore the project developed all necessary components and steps in the process - e.g. the MRV framework and plan with institutional set-up, regulations, technical procedures and guidelines, etc. - in compliance with UNFCCC requirements and guidelines, and based on the most relevant documentation available under the UNFCCC's Clean Development Mechanism (CDM), i.e.: document AMS-II.L for outdoor lighting, and document AMS-II.N for buildings. Key features of these two documents are summarised and included as Annex A below.

Measurements of impact of LED replacements on streets

In collaboration with the city authorities and street lighting operating agency HEPCO, with whom the project signed a Delegation Agreement, 1,546 old high energy consuming sodium luminaires were replaced by an equal number of 'smart' and 5 dimming levels LED luminaires (120, 150, 180W) on 26 city streets.

Actual measurement of impact of energy consumption levels was relatively uncomplicated, as HEPCO had a well-equipped control room from where all operations are managed and monitored, on every street and every minute of day and night, and where all date are kept and can be analysed. Key factors that were required to calculate net energy savings (e.g. energy usage, operating hours, outage factors, transmission loss factors, etc.) were thus available, both for the baseline (earlier sodium lights) and after LED installation. Further, actual on-site measurements were also done on a regular basis by HEPCO technicians.

Measurements of impact of LED replacements in schools

There is no set of MRV guidelines directly applicable to schools, and as such, the closest approximation were the UNFCCC guidelines for buildings.

54 schools in Hue city were selected by the project for LED installation. Upon completion in May 2021, 18,692 LED tubes (14 and 24W) had been installed and put into operation in 934 classrooms, 82 language computer rooms, 117 offices, 64 lab and practice rooms, 39 libraries, and 107 functional service rooms. They replaced 13,676 old conventional fluorescent tubes of poor quality. Thus, not on a one-by-one basis like with street lighting, due to the formal requirements of the Ministry of Health regarding light quality in classrooms. Unlike what schools usually do, LuxDev wanted to have the highest standards and comply with these requirements, hence a higher number of LED tubes, each one of much higher Lumens (intensity) as well. This optimal (and exceptional) lighting quality in classrooms, often doubling the light intensity and visibility, constituted one major co-benefit

1 As per Decree No. 06/2022/ND-CP and Circular No. 01/2022/TT-BTNMT.

of the project. Major cost-savings for schools (and the city street lighting operator), and the proper handling of removed tubes as per the highest environmental safety standards were other major co-benefits of project intervention.

> "According to the measurements done by the school in collaboration with the project, from installation on 15.05.2021 and up to 31.12.2022 the amount of electricity saved amounted to 59.8 MWh. This power saving contributed to a reduction in GHG emissions of 53.48 tons of CO_2."
>
> **Deputy Principal of Quoc Hoc High School**

As for measuring electricity use pre and post LED installation, and calculating power savings, schools were a lot more complicated, not only due to the complexity of that higher number of units and Lumen per unit. E.g. how does one measure the actual precise power consumption from lighting only, in a classroom with several light switches and different circuits, with several other power consuming devices such as ceiling fans, an AC perhaps, a beamer, a TV, etc. on the same circuit? Furthermore, unlike street lighting, classrooms are not used in a standard way, roughly the same way each day. There are weekends, holidays, half days. There are rented out evening classes in some classrooms. There are rooms e.g. labs, study rooms, etc. that are used irregularly. There are days with lots of day light when less light may be needed, and some very dark days, and so on. The variability is enormous, and one cannot measure actual power consumption only from new LED lighting systems, and operational hours observed over a standard school day cannot simply be extrapolated. Hence a need for a lot of personal input and monitoring, by schoolteachers and technicians who were mobilised and trained to support that effort. With teachers and students for example keeping track of lighting usage in their classroom to ensure a more precise measurement of operational hours, and with some special equipment (monitoring loggers) procured to record actual use of lighting in classrooms, before and after installation, and on a large enough sample basis. As with street lighting, baseline and post installation measurements in schools were also supported by expert DOIT staff.

Despite many challenges, the MRV system was effectively operated to collect data on energy consumption of conventional vs. LED lighting systems, and to calculate power savings at target locations. Once those measurements were completed, the calculations to establish the reduction in GHG emissions into the atmosphere are fairly simple equations, in which a country's Emission Factor (EF) is critical. That EF is based on the average CO_2 emitted per unit of electricity generated for the grid. Thus, an EF needs to be adjusted regularly whenever renewables (solar, wind, hydropower, biomass) are added to the energy mix, and thereby change the CO_2 level emitted to produce one unit of power.[2]

All procedures, methods, data and GHG calculations were presented in detail in a Project Measurement Report. That report became the subject for verification by an independent authorised agency (under MONRE ministry), including through three days of on-site meetings and field checks.

2 The DCC at MONRE is responsible for adjusting the EF when needed. Since 2020 the EF = 0.8041tCO_2/ MWh.

OUTCOME AND IMPACT

FIVE INDICATORS

I3: Institutional capacity building

The agency's institutional capacity was strengthened to reach a moderately high level, as defined by the criteria in the M&E manual.

I6: Provincial monitoring systems

Provincial monitoring systems for climate change interventions, aligned with national systems, have been established with at least 90% of the required procedures and steps from the manual completed.

I7: Knowledge and skills improvement

Improvement in knowledge and skills among provincial and district staff trained by the project in planning and M&E of adaptation, and MRV of mitigation interventions.

I4: GHG emission reduction verification

Impact and result of project EE interventions in terms of GHG emission reduction were verified, endorsed and officially registered with the GoV.

I11: LED lightning MRV system

MRV system for LED lighting mitigation action in place, following national and international guidelines, collecting operational data from the pilot.

CAPACITY OF HUE'S DIVISION OF CLIMATE CHANGE (DICC) FOR PLANNING, M&E AND MRV

The capacity of Hue's DiCC for planning, M&E, and MRV of adaptation and mitigation interventions was tracked and measured by three key indicators:

- Indicator 3 - Institutional Capacity Building: This measures the strengthening of the agency's institutional capacity to reach a moderately high level, as defined by the M&E manual criteria;
- Indicator 6 - Provincial Monitoring Systems: This assesses whether provincial monitoring systems for CC interventions, aligned with national systems, were established with at least 90% of the required procedures/steps completed;
- Indicator 7 - Knowledge and Skills Improvement: This evaluates the improvement in knowledge and skills among provincial and district staff trained in planning, M&E of adaptation, and MRV of mitigation interventions.

Indicator 3 - Institutional Capacity Building

Indicator 3 was one of three final outcome indicators, highlighting the importance of this component. The assessment used a point scoring method and a checklist of 33 capacity criteria, focusing on:

- Technical Capacity: Knowledge and skills;
- Core Performance Capacity: Individual and organisational behaviour and capabilities;
- Enabling Environment: Policy frameworks, legal systems, and resources.

Based on the 2008 Capacity Assessment Handbook by JICA Research Institute, data were collected before the project, annually during implementation, and at the end of the project (EOP). The institutional capacity of the DiCC increased significantly from 22 points to 85.5 points by EOP. This made the DiCC in TT Hue the first provincial entity in Vietnam capable of independently performing its expected tasks.

Indicator 6 - Provincial Monitoring Systems

Although national guidelines for CCA M&E were unavailable during the interventions, the pioneering work in Hue provided relevant provincial and district agencies with the necessary tools (e.g., databases) and capabilities. A process assessment checklist within the DiCC tracked progress. The provincial MRV framework for GHG mitigation was developed, with 95.8% of the required procedures and steps completed, surpassing the EOP target of 90%. DiCC staff were equipped with the tools and skills

to measure and report on GHG interventions, and the MRV manual developed was aligned with national guidelines issued in 2022. The project's final evaluation (FE) praised this as a "power result," highlighting the project's pioneering efforts and collaboration with the national DCC.

Indicator 7 - Knowledge and Skills Improvement

A survey of trainees, who attended various training sessions, used a capacity assessment checklist as per the M&E manual. It showed that 100% of trainees either 'improved' (59.3%) or 'significantly improved' (40.7%) their knowledge and skills for planning, M&E, and MRV of climate interventions. Additionally, 58.8% reported effectively applying these skills in their daily work.

Key Findings

Key Informant Interviews with DiCC staff confirmed a substantial increase in institutional and staff capacity. The acquired knowledge and skills are effectively applied in daily operations, leading to better planning, more effective monitoring of CCA interventions, and reliable MRV of mitigation actions. This progress sets an example for other provinces establishing similar DiCC units with comparable responsibilities.

APPLIED MRV

Two indicators directly measured the impact of the work done in applied MRV:

- Indicator 4 - GHG Emission Reduction Verification: This measures whether the impact and results of project EE interventions in terms of GHG emission reduction were verified, endorsed, and officially registered with the GoV, with a yes or no answer;
- Indicator 11 - MRV System for LED Lighting Mitigation: This assesses whether an MRV system for the LED lighting mitigation action, following national and international guidelines and procedures, was in place and collected operational data from the pilot, with a yes or no answer.

Detailed Outcomes and Impact

The official registration of the first NAMA project for Vietnam was the final step in a comprehensive MRV process. Achieving this indicator means that all steps in the process (measurements, reporting, verification, registration) were completed according to formal requirements.

Other indicators also provided evidence of a successful MRV process and calculations, including power savings, cost savings, and reduction in GHG emissions versus EOP targets. Key outcomes include:

- power savings:
  - streets: 1,564 LED luminaires replaced high-energy sodium luminaires on 26 streets, saving 586.4 MWh over 23 months since installation,
  - schools: 18,692 LED tubes installed in 54 schools saved 982.3 MWh in 13.5 months since installation,
  - projection 2030: Assuming continued average power consumption and unchanged emission factors, total power savings by 2030 are expected to reach 10,441 MWh;
- lighting quality: 49,734 students and 2,805 teachers and staff benefited from improved classroom lighting quality;
- cost savings:
  - cumulative actual savings: 44.4% electric energy savings on streets and 63.3% electric energy savings in schools since the start of operations, totalling VND 2.9 billion (approximately EUR 116,000);
- GHG emission reduction:
  - cumulative reduction: 877.69 tCO_2 from LEDs in schools and 524 tCO_2 from LEDs on roads, totalling 1,401.6 tCO_2,
  - projection by 2030: With an unchanged 2020 emission factor (0.8041 tCO_2/MWh), projected reductions are expected to reach 9,327.9 tCO_2.

An important point is that these savings did not exclusively result from LED hardware installation. The mitigation pilot also included a significant software component aimed at enhancing awareness and understanding of the link between EE and CC. This involved school communities, teachers, and EE Student Action Groups working on IEC materials, activities, and action plans. While measuring the impact of behaviour change on energy use is complex, qualitative research by the FE team suggested substantial contributions from behaviour changes among students, extending to their families.

"The new lamp capacity decreases by 20-40%, but the average illuminance increases by 2.5 times. The completed project improves the street lighting of the city, reduces power consumption and reduces operating costs for the state budget."

General Director of HEPCO

Verification and Registration Process

A "Final Report - Project Results of GHG Emission Reductions" was prepared, detailing methods and consolidating measurements and calculations. This report underwent verification by the Ozone Layer Protection and Low Carbon Economy Development Centre (CCOZONE), an independent agency under the DCC. The verified methodologies, outcomes, and calculations were then submitted to the competent authorities. The TT Hue Provincial People's Committee submitted the measurement and verification reports to MONRE, which registered the result and shared the data with the energy ministry MOIT, marking a significant achievement for Vietnam.

The project's final evaluation highlighted the pioneering nature and successful completion of the MRV cycle as a major achievement, influencing GoV guidelines and providing consultations and advice to major organizations like Asian Development Bank and PricewaterhouseCoopers on MRV of street lighting.

KEY SUCCESS FACTORS

Overall climate context and challenges: people and authorities in Central Vietnam face rapidly increasing risks and economic vulnerabilities due to the impacts of global warming and climate change, hence the province's urgent need for reliable systems, models, data and capacity to predict major weather events, and properly plan, manage and assess CCA adaptation interventions. Such a context and need create an enabling environment for action and effective collaboration.

Institutional mechanism and harmonisation and alignment

Further, as the final evaluation observed, LuxDev's way of working, directly with and through local government partners, can be considered a key driver of success, as "the approach leads to optimal effectiveness of the investments and interventions due to harmonisation and alignment with government policies and plans, and allows for guidance and steering from within". That was certainly also the case for all activities in climate monitoring, considering national level legislation and requirements for capacity in M&E and MRV to be established in all provinces. This was reflected inter alia in the day-to-day collaboration and partnerships (Delegation Agreements) signed with DiCC, DOIT, DOET, HEPCO. Given that context, the final evaluation, unsurprisingly, scored both projects highly on the OECD/DAC evaluation criteria of Relevance (is the intervention doing the right thing?) and Coherence (how well does the intervention fit?). Further, with the technical assistance office based at a heavy-weight department DPI and the Provincial People's Committee formally steering these projects, strong local leadership was also considered a key element of progress and results.

Collaboration of school communities

Some types of measurement of power use and savings are complicated and require substantial human input. The mitigation project was fortunate to get the support of the education department and school management, technicians, teachers and students in manually recording data.

Technical assistance expertise, time and budget

LuxDev brought in the necessary budget and were fortunate in finding sufficient basic M&E expertise locally, with the potential to further develop into high-level climate-specific M&E and MRV expertise, for guidance and advisory services to local partners.

> "The high-quality LED has given us much improved illumination, reduced glare (...) and is saving us money for lamp replacements and maintenance."
>
> **Deputy Principal of Quoc Hoc High School**

CONSTRAINTS AND SOLUTIONS

Some major challenges the intervention faced over the years, and how they were dealt with:

KEY CONSTRAINT (INTERNAL / EXTERNAL)	ACTION
Procurement of hardware (LED) through government systems > procedures were extremely slow inter alia due to numerous legal obstacles e.g. formal complaints filed by tendering companies not being successful.	Slow procurement directly impacted MRV piloting, procedures and results. Procurement steps however had to follow their course and respect legal timelines, therefore not much project management could do except from keeping the dialogue open, preparing for next steps well in advance, and keeping the pressure on partners to act asap. Hardware was in place about a year later than anticipated, and had an obvious negative impact on the final GHG emission reduction result.
Draft guidelines for CCA adaptation M&E and mitigation MRV were drafted at the start of these projects, however remained a draft for years, and throughout projects' implementation. That included guidelines on technical work dealing with new substance, but also on procedures e.g. how to register.	Project had to go its own way and relied completely on UNFCCC guidelines. Being new subject matter, this was a steep learning curve, with continuous uncertainty whether methods, procedures, tools, calculations, etc. would all be in line with national guidelines once these were formalised. At the same time it created an opportunity for a direct dialogue with the relevant national agency on work, experiences and impact on the ground in one pilot province, ultimately contributing to finalising national guidelines.
A low starting point, with limited capacity, and limited staff within key government agencies.	Given the novelty of the subject matter, and the recent establishment of a separate DiCC in the province, capacity development had to start pretty much from scratch, and cover a wide range of topics, for M&E as well as MRV, and with just a few officers appointed parttime for many tasks at hand.
Commitment and slow progress driven by limited staff availability and decentralized control.	One negative of Delegation Agreement is that it gives away a good part of control over the process, with sometimes slow progress as a result, due few appointed government staff being very busy, etc. Helpful in that context, to have an institutional setup with a key government agency (DPI) being the project's immediate counterpart and the Provincial People's Committee in charge of project delivery and in a position, above line agencies, to push agencies if necessary. Further, as always, important to have a good rapport with partner agencies (under project control), and to have people in positions with the right attitude and commitment (not under project control).
Needed manpower for measurements, especially in schools.	Thanks to the institutional setup, and active involvement of DOET with whom a Delegation Agreement was signed, the project got the collaboration of all schools to help with actual measurements in sampled classrooms.

LESSONS LEARNT

BUILDING PROVINCIAL EXPERTISE: COMMITMENT IS KEY

Commitment and collaboration, the journey of building provincial expertise

Creating a provincial center of expertise for climate adaptation M&E and mitigation MRV is feasible within a reasonable time-frame but demands government commitment, high-level support, expertise, time, and effort. Successful piloting, aligned with local government collaboration, can lead to sustainable initiatives.

CHALLENGES OF EXPANSION AND UPSCALLING

Scaling up, the complex road to comprehensive MRV

While the initial MRV efforts in Hue have shown promise, expanding, replicating, and upscaling these interventions will be challenging. The current MRV covers only a small part of necessary actions, such as energy efficiency, leaving many other interventions like solar farms unmonitored. Sectoral and provincial MRV are more challenging than project MRV, and also not done as yet. Comprehensive MRV for all mitigation interventions remains an ambitious goal in the short to medium term.

EFFECTIVE MITIGATION: LED LIGHTING'S QUICK GAINS

LEDs as a cost effective mitigation strategy

The mitigation pilot demonstrated that replacing conventional lighting with LEDs on streets is a smart, cost-effective strategy for reducing GHG emissions. This approach offers quick gains, making it an efficient option for Vietnam's policymakers aiming for net zero emissions by 2050. The longer fossil fuels dominate power generation, the greater the potential GHG reductions from such interventions.

SUSTAINABILITY AND UPSCALING

Interesting lessons can be learned from Luxembourg's first interventions with International Climate Finance and key success factors are not so difficult to identify. However, the more important questions are to what extent the interventions will be sustainable, and if they can be upscaled and expanded to other provinces.

Projects had numerous components, and some of these components may be easier to sustain, or to replicate than others.

CAPACITY

The capacity in the Hue DiCC that was developed should be sufficient to keep the on-going work in M&E and MRV going, considering the urgent need for good and reliable data for planning, as well as in response to the requirements from the national government to all provinces. However, as the FE observed, whereas projects' served as both a pedagogical tool and a valuable case study to ensure a sustained CCA M&E and climate change mitigation MRV system going forward, and the training that occurred during the project proved invaluable", it also stressed that the province will need to allocate a sufficient budget to maintain the M&E work and comply with MRV requirements. Furthermore, the basic expertise will need to be further developed, and expanded, to include more staff to ensure continuity if and when certain staff are promoted, retire, or leave otherwise. To put the DiCC on the right track, upon completion partners agreed that limited project surplus funds were transferred to the DiCC, to keep operating and performing in the short term. Furthermore, in recent years LuxDev have been preparing a first proposal for a new CCA project, again in Hue, to be funded by the Green Climate Fund. That project, if approved, would bring substantial additional support to CCA M&E and to the DiCC.

As to replicating these capacity development interventions elsewhere, what can be done in one province can be done in other provinces as well. That is, in theory. It would require substantial inputs from a qualified team, whether external or internal in government, which considering the time, funds and effort that has gone into strengthening the capacity of the DiCC in Hue, will be a major undertaking. Perhaps, with commitment and if managed well, the capacity and expertise of the DiCC in Hue could be further developed and used somehow, e.g. to become a national resource to train and advise newly established DiCC's in other provinces, as all are required to establish such specialised units.

SYSTEMS AND HARDWARE

Much of the systems and hardware used by the DiCC (computers, monitoring frameworks, databases, data loggers, the DiCC portal, etc.) are available, but will need regular upgrading and in due course replacement, for which a budget will be needed. As for LED hardware, in place and operational, no major interventions are expected since all the LED hardware has a five-year warranty, with an expected lifespan of 10-15 years and schools as well as street lighting operator HEPCO have a budget for basic maintenance and replacements.

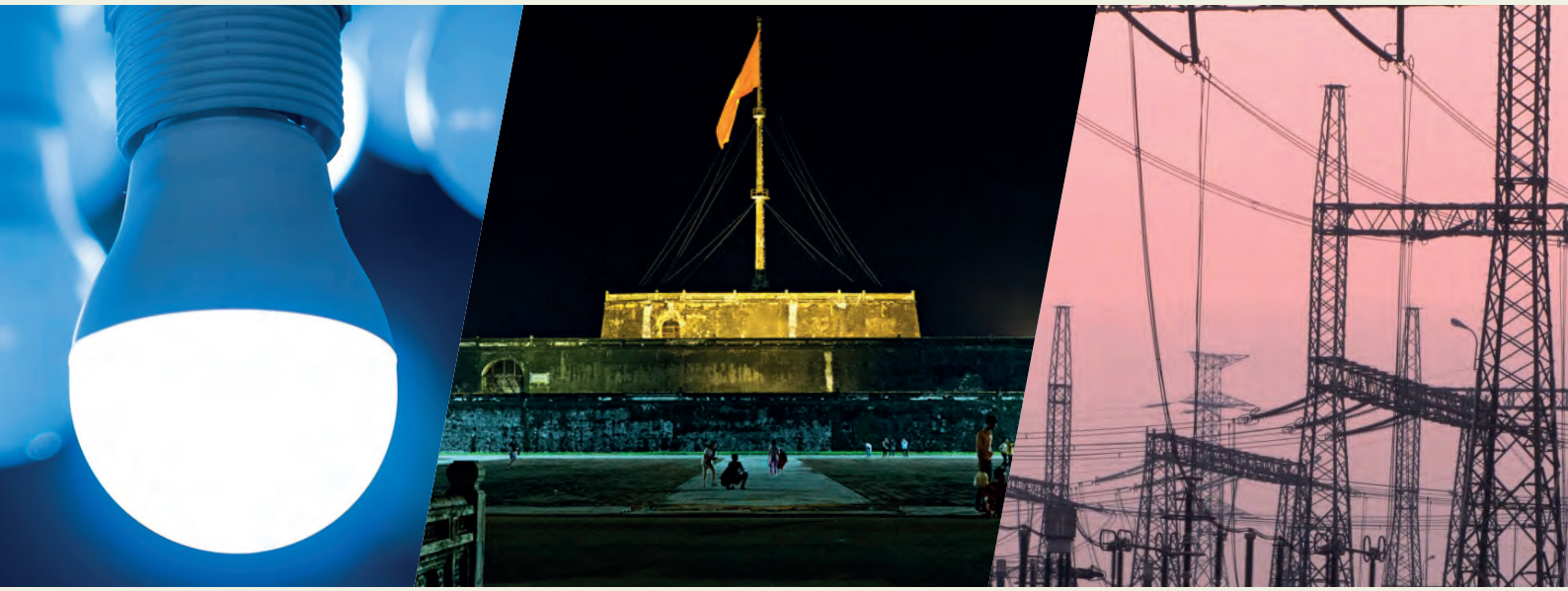
> "Activities related to measurement and verification of LED lighting systems are still maintained by part of the project budget after the project ends. We are committed to directing relevant agencies to continue promoting effectiveness and replicating the achieved results of the project."
>
> **Vice Chairman of TT Hue Provincial People's Committee**

As for replication, systems and hardware may be the easiest of components. Tools for M&E that were developed for the Hue DiCC can be used elsewhere. As for LED hardware, the FE made a strong case for replication, of street LED in particular. Indeed, a major conclusion they drew from Luxembourg's pilot intervention and data, as well as from their own cost-benefit analysis, has great significance for planners and policy-makers: i.e. that investing in LED street lighting is a much more cost-effective investment compared to LED in schools/buildings, if saving power and a reduction in GHG emissions is the only criterion considered. The cost to bring GHG emissions down by 1 unit is substantially less for street than for school lighting, and investments in LEDs for roads are also simpler in terms of installation and measurement. Thus, the final evaluation concludes, LED replacing old conventional lighting on roads, is "a great option for cities and municipalities seeking to reduce their footprint and save money on energy costs (...) and for a GoV in the context of their ambitious commitments to become 'net zero' by 2050". With all data verified, endorsed and available, the GoV needs to consider that option and could allocate budgets for a rapid rollout.

MRV

As for sustainability, TT Hue's DiCC and DOIT should be in a position to continue measuring impact of LED installed on streets and in schools. A provincial decision has formally given DONRE the task to measure and report results every two years, and get these verified and registered with the GoV, similar to the pilot phase. That process is on-going at the moment, and independent from external support for the first time, with an eye on Vietnam's next (biennial) NDC report.

However, widening the scope of MRV, and replication to other provinces, is going to be a major challenge. The pilot phase demonstrated that MRV requirements and interventions, whereas necessary to have proof of mitigation action and GHG impact, are complicated. They require expertise, time and substantial human and financial resources. And MRV is not limited to EE, like in Hue. Under the umbrella of the UNFCCC, every country that commits to reduce GHG emissions by x%, is supposed to track progress and measure GHG impact of every mitigation action in the country. And not only at project level, also at sectoral and provincial level, which are different approaches and methodologies. E.g. like in Vietnam, where GHG emissions not only come from fossil fuel power stations but also from agriculture (methane from livestock, burning of paddy residue on fields, etc.), burning of waste (as part of waste management, or burning at homes as part of cultural traditions, etc.), or transportation. It is clear, that not only in Vietnam but globally, there will be a major gap between what needs to be done in MRV in theory, and what will be done in practice. Between what will be reported, and actual impact on the ground. Considering the urgent need for that expertise globally, perhaps LuxDev should consider building upon its M&E and MRV experience in Vietnam and develop that expertise further, as a lot of money will flow into that field in coming decades.



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