BỘ XÂY DỰNG

PROJECT ENERGY EFFICIENCY IMPROVEMENT IN COMMERCIAL AND HIGH-RISE RESIDENTIAL BUILDINGS IN VIET NAM

PROJECT TERMINAL REPORT

Project Period: March 2016 - September 2021

EECB PROJECT MANAGEMENT UNIT
HA NOI, SEPTEMBER 2021

Milestone	Date
PIF Approval Date	Nov 15, 2013
CEO Endorsement Date	Jul 14, 2015
Project Document Signature Date by MOC	09 March 2016
Project Document Signature Date (by UNDP)	Apr 22, 2016
Date of Inception Workshop	Aug 26, 2016
Date of Mid-term Review	Jul 15, 2019
Date of Terminal Evaluation	Mar 20 2021
Closing Date	September 30, 2021

Disclaimer

This is the report of the implementation and results of the Project: Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings in Viet Nam. The analysis and recommendations of this report do not necessarily reflect the views of the United Nations Development Programme or the Ministry of Construction. This publication reflects the views of the project management unit.

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ACRONYMS

A

AWP: Annual Workplan

B

BAU: Business as Usual

BMS: Building Management System

BOP: Beginning of Project

C

Coninco: Consultant and Inspection Joint Stock Company of Construction Technology and Equipment

COP: Conference of Parties

CUWC: College of Urban Works Construction

D

DANIDA: Danish International Development Agency

DDT: dichloro-diphenyl-trichloroethane

DOIT: Department of Industry and Trade

DOSTE: Department of Science Technology and Environment

E

EE: Energy Efficiency

EE&C: Energy Efficiency and Conservation

EEBC: QCVN 09; 2017/BXD; National Technical Regulations on Energy Effciency Buildings

EECB: Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings in Viet Nam Project

EOP: End of Project

ESCO: Energy Service Company

EWS: Efficient World Scenario

F

FE: Final Evaluation

G

GBPN: Global Building Performance Network

GEF: Global Environment Facility

GHG, 12, 14; Green House Gas

H

HCMC: Hochiminh City

HPPMG: Harmonized Programme and Project Management Guidelines

I

IBST: Viet Nam Institute of Building Science and Technology

IDC: Hanoi Industrial Promotion and Development Consultancy Center

IEA: International Energy Agency

IFC: International Finance Coporation

IPCC: Intergovernmental Panel on Climate Change

IPMVP: International Performance M&V Protocol

L

LCEE: Low Carbon Transition in Energy Efficiency sector in Vietnam

M

M&V: Monitoring and Verification

MOC: Ministry of Construction

MOF: Ministry of Finance

MOIT: Ministry of Industry and Trade

MOST: Ministry of Science and Technology

MPI: Ministry of Planning and Investment

MTR: Mid-term

N

NAMA: Nationally Appropriate Mitigation Action

NIM: National Implementation Modality

NPD: National Project Director

O

ODA: Official Development Assistance

OTTV: Overall Thermal Transfer Value

P

PCB: polychlorinated biphenyls

PIR: Project Implementation Report

PRODOC: Project Document

S

SDG: Sustainable Development Goals

SEC: Specific Energy Consumption

SMART: Specific, Measurable, Achievable, Realistic and Time-bound

T

TA: Technical Assistance

TCVN: Vietnamese Standards

TOR: Terms of Reference

U

UNDP, 12; The United Nations Development Programme

UNDP CO: UNDP Country Office in Viet Nam

V

VCEP: Vietnam Clean Energy Program

VGBC: Viet Nam Green Building Council

VIBM: Vietnam Institute of Building Materials

VNCC: Vietnam National Construction Consultant Corporation

VNEEP: National Energy Efficiency Programme

W

WHO: World Health Organization

4. The government encourages the researches, applications of advanced technologies, information technologies in construction investments and certification of the works which is energy efficient, resources-saving and environment-protecting; and development of the urban areas which are ecological, smart, climate-resilient and sustainable

(Clause 4. Article 10, Law on amendments of a number of articles of the Construction Law, 2020)

KEY NUMBERS ON PROJECT ACHIEVEMENTS

1. Greenhouse gas emission reduction and improvement of energy performance

- **73,035 tCO2e:** Total direct greenhouse emission reduction as of March 2021:
- **75 energy saving solutions** implemented at 23 new and existing high-rise buildings of different typologies;
- **12,000 MWh or 10,000 tCO2e:** Energy saving from 23 demonstration projects;
- **3.5 years:** Average payback time of 23 demonstration projects;
- **US$ 1.53 million:** Cost saving from 23 demonstration projects.

2. Policy Strengthening

- **01 law:** Law on amendment and supplementation of a number of articles in Construction Law (Law No. 62/2020 / QH14, 2020) (partially supported);
- **01 decree:** Decree 15/2021/ND-CP specifying a number of contents regarding management of construction investment projects (partially supported);
- **01 circular:** on cost norm and consultation fee structures to better consider energy efficiency aspects of buildings (Circular 12/2021/TT-BXD, 2021) (partially supported);
- **01 roadmap** for development of energy efficient buildings (Decision No.1677/QĐ-BXD dated 30 Dec 2020);
- **11 technical standards:** on testing of EE materials properties and EE benchmarking and certification of buildings;

3. Capacity Buildings and Awareness Raising

- **558 trainees** (officials, architects, building technicians, building managers and operators) of 09 project training programs on design, construction, acceptance, operation and acceptance of EE buildings;

- **01 training manual:** Energy Efficient Buildings - Training Manual on Strengthening Capacity on Design, Construction, Acceptance and Energy Management;
- **Numerous building related conferences:** GEF conference 2018, Vietnam Green Building Weeks 2019 and 2020, etc.

4. Technical Accomplishments

- **01 toolset** on Building Specific Energy Consumption (SEC) profiles, energy benchmarking, Energy certification and M&V system firstly recommended in Viet Nam;
- **01 online building energy consumption disclosure system:** @ http://tietkiemnangluong.xaydung.gov.vn/;
- **02 online databases** established featuring energy efficiency products and materials @ http://tietkiemnangluong.xaydung.gov.vn/page-t314.html
- **01 web-based Overall Thermal Transfer Value** (OTTV) to support the compliance check of QCVN 09:2017/BXD (Vietnamese National Technical Regulation on Energy Efficiency in Buildings): @ http://tietkiemnangluong.xaydung.gov.vn/page-t307.html
- **30 certificates** on building energy performance awarded;

1. GENERAL INFORMATION

1.1. Project Summary Table

Project Title	**English**	Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings in Viet Nam (EECB)	
	Vietnamese	Nâng cao hiệu quả sử dụng năng lượng trong các tòa nhà thương mại và chung cư cao tầng tại Việt Nam Nam	
Atlas Award ID.	00092225		
Donor	Global Environment Facility (GEF)		
Executing Organization	United Nations Development Promgarmme (UNDP) Viet Nam		
Project Owner	Ministry of Construction (MOC)		
National Implementing Partner	Department of Science, Technology and Environment (DOSTE)		
Project Duration	05 years and 06 months		
Date of Approval	09 March 2016	**Actual Starting Date**	09 March 2016
Expected End Date	31 March 2020	**Actual End Date**	30 September 2021
Funding Sources	**Total Implementation Budget**	US$ 22,476,550	
	ODA Funding from GEF	US$ 3,198,000	
	Co-financing Sources	US$ 19,278,550	

Table 1: Project Summary Table[1]

1.2. Project Description

The National Environment Protection Strategy for Viet Nam aimed to promote the application of clean technologies, cleaner production processes and the use of less polluting, more environmentally sound fuels and materials. In 2010, Law on economic and efficient use of energy was promulgated, laying one of key foundations for related follow-up policies and actions in Viet Nam. In December 2011, Viet Nam approved the National Climate Change Strategy in which energy saving and efficiency were highlighted as the key area for GHG emission reductions. Further, the Viet Nam Green Growth Strategy (September 2012) specified promulgation of compulsory application of green building measures in new and retrofitted building and green material technology in construction as solutions to achieve Green Growth and low carbon economy. With this background, the project "Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings (EECB)" was formulated and and has been implemented in Viet Nam, to

[1] *Decision No.209/QĐ-BXD dated 09 March 2016 on the approval of EECB Project Document*

contribute to GHG mitigation measures as highlighted in the 2nd National Communication report, in which promoting Energy Efficiency and Conservation (EE&C) in the commercial/institutional sector has been regarded as short and long-termed measures. The project was expected to make a significant contribution towards enforcement of - National Technical Code on Energy Efficient Buildings (EEBC, or in the other words, QCVN 09:2017/BXD) in the building sector, and also expected to lead to investments in building EE technologies.

In addition, together with other UNDP projects, the project was anticipated to contribute to the implementation of the UNDP Viet Nam Country Program Document (2012-2016) and the UN One Plan III (2012-2016) under the "Inclusive, Equitable and Sustainable Growth" focus area, specifically Outcome 1.3 "By 2016, key national and sub-national agencies, in partnership with the private sector and communities, have established and monitor multi-sectoral strategies, mechanisms and resources to support implementation of relevant multilateral agreements and effectively address climate change adaptation, mitigation and disaster risk management" at the project design.

1.3. Project Objectives and Scope

The Project has the goal to reduce the intensity of GHG emissions from the building sector in Viet Nam. The project objective is to improve the energy utilization performance of commercial and high-rise residential buildings in Ho Chi Minh and Hanoi. Realization of this objective was expected to be achieved through the implementation of three components (1) Improvement and Enforcement of Energy Efficiency Building Code; (2) Building Market Development Support Initiatives, and (3) Building EE Technology Applications and Replications. Each component comprises a number of complementary activities designed to remove barriers to the stringent enforcement of the revised EEBC, and to the greater uptake of building energy efficiency technologies, systems, and practices in commercial and residential buildings. By EOP, the GEF investment was expected to have catalyzed direct GHG emission reduction of about 37,680 tCO2e. The cumulative direct reduction in GHG emissions over the lifetime of the project was envisioned to be 236,382 tCO2e.

1.4. Management Arrangements

The project has been implemented using National Implementation Modality (NIM) as per UNDP's procedures regulated in "Harmonized Programme and Project Management Guidelines" (HPPMG) between the Government of Viet Nam and the United Nations in Viet Nam. As the project national implementing partner, the Ministry of Construction is directly responsible for managing and implementing the project and being accountable to the Government and the UNDP for production of project results with effective use of the resources allocated.

At the top management level, the MOC established a project steering committee chaired by MOC Vice Minister with 08 members from related ministries and agencies including MPI,

MOF, MOIT, MOST, MOC and UNDP CO in Viet Nam. At the implementation level, assigned its Department of Science, Technology and Environment (DOSTE) to directly manage and implement the Project activities with the full support of the Project Management Unite (PMU) which was established in April 2016 by MOC and led by a National Project Director (NPD) who is the Director General of DOSTE . The NPD was supported by a Deputy NPD who is in charge of day-to-day management of the Project.. Assisting the PMU in day to day management of project activities is a team of technical experts, project accountant cum administrative assistant led by a project manager. It can be seen that compared to the project design, the project management arrangements are not very different with the main structure remaining unchanged as can be seen below:

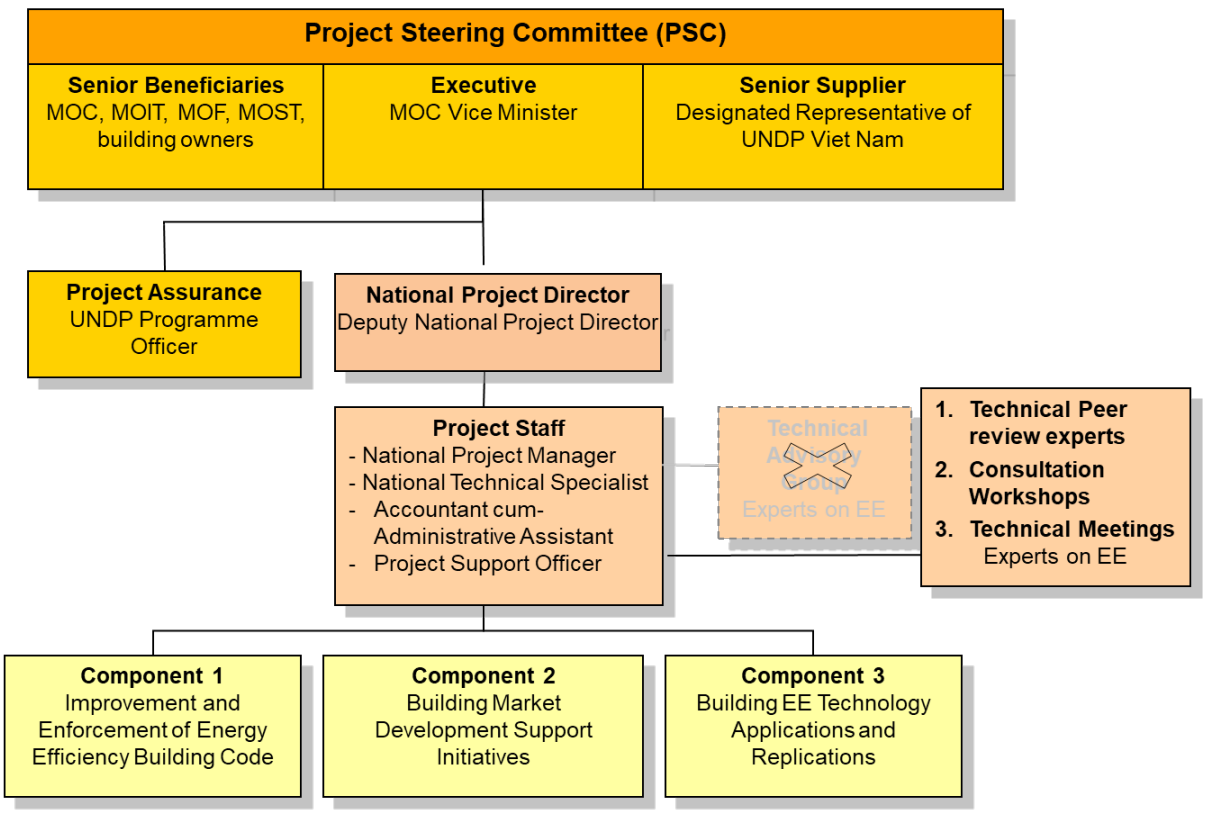


Figure 1 – Project Organization Structure

As shown in the chart above, there is only a slight difference in technical assurance of project deliverables. According to this change, the technical quality assurance is not supported by a technical advisory group as designed but by a combination of peer-review experts, national consultation workshops and technical group meetings depending on each situation. This has arisen from the fact that project-supported results are diverse in terms of professional requirements, and such a combination is believed to be a a suitable and flexible option for the PMU to select various inputs from not only individual experts but also other related project stakeholders such as policy makers, institutions or building owners, etc. This change in formulation has proved to be appropriate in delivering final project results as presented in the next section.

In parralell, as a GEF implementing agency, UNDP CO in Viet Nam provided adequate and timely support to the PSC and PMU in both technical and managerative project management in order to improve and assure the project implementation quality and results.

Finally, contributing to the project delivery quality, key project stakeholders have been selectively participated in relevant project activities in various roles such as project partners, contractors and/ or beneficiaries. This participation was determined by the PSC and/or PMU in order to ensure the best contribution of all related parties in project activites in a cost-effective manner. An updated table of key project stakeholders and their roles are provided in Appendix 1 - Updated List of stakeholders and roles in the project.

2. PROJECT RESULTS

2.1. Implementation of Project Objectives

73,035 tCO2e as direct GHG emission cut and 371,399 tCO2e as cumulative direct reduction in GHG emissions over the project lifetime – 1.5 – 2 times higher than the expected volume.

As mentioned in Section 1.3, the project objective was specified by a direct GHG emission reduction of about 37,680 tCO2e and the cumulative direct reduction in GHG emissions over the lifetime of the project of 236,382 tCO2e at EOP. This should be turned into a CO2 emission volume per capita per $1 GDP that could be reduced thanks to the project impacts. Notably, these results was expected to be quantified and synthesized from the impacts acquired by three components (i) building codes; (ii) demonstration & diffusion; and (iii) financial support.

Over 05 years and 06 months of project implementation, with the efforts of all project stakeholders made to a variety of institution- and capacity – related fields including upgrading and development of relevant policies, technical support to improve the energy efficient use in 23 of demonstration buildings and capacity strengthening programs provided to more than five hundreds of trainees, etc. at EOP, the project helped to reduce a direct GHG emission reduction of 73,035 tCO2e and the cumulative direct reduction in GHG emissions over the project lifetime of 371,399 tCO2e[2], meaning 1.5 – 2 times higher than expected at project approval. The achievement of the project objective has been calculated basing on 03 indicators reflecting direct impacts of the project to the building sector namely (i) 58% of new buildings that are fully compliant with the revised Energy Efficiency Building Code by EOP; (ii) 25% of existing commercial and high-rise residential buildings that adopt EE technologies and

[2] *UNDP/GEF Final Evaluation Report, March 2021*

practices and achieve at least 10% electricity savings by EOP; and (iii) 134 people gainfully employed in the building sector in Viet Nam by EOP[3]. It should be noted that these results are based on the assumption that project impacts on the financial component is zero due to no financial incentive mechanism produced at EOP.

The achievement of the project objectives is shown in the table below:

ID.	Indicator	Baseline	EOP Target	EOP Result	% of Completion	Rating to target level
1	Direct GHG emission reduced (tCO2e)	0	37,680	73,035	194%	Over target
2	Cumulative direct reduction in GHG emissions over the lifetime of the project (tCO2e) (I.0)	0	236,382	371,399	155%	Over target
3	Cumulative energy savings from commercial buildings by EOP (MWh) (I.1)	2528	61,137	113,909	186%	Over target
4	% of new buildings that are fully compliant with the revised Energy Efficiency Building Code by EOP (I.2)	20%	50%	58%	116%	Over target
5	% of existing commercial and high-rise residential buildings that adopt EE technologies and practices and achieve at least 10% electricity savings by EOP (I.3)	Less than 5%	20%	25%	125%	Over target
6	No. of people gainfully employed in the building sector in Viet Nam by EOP (I.4)	20	60	134	165%	Over target

Table 2: Objective Result

2.2. Implementation of Project Outcomes

The whole life cycle of a building consists of design, construction, operation and renovation stages[4]. At every step, policies, technologies, materials (including equipment) and human resources are the elements that are driving and vital to the success of each phase. This process can be illustrated as indicated in *Figure 2 – Building Cycle*.

Having been designed to improve EE integration in this process, the EECB project was expected to have significant impacts on policy improvements associated with EE construction material regulations (Component 1), positive changes on the quality of human resources and financing market of the building sector (Component 2) and on the normal practice of building practitioners in design, construction, operation and renovation of high-rise buildings

[3] *UNDP/GEF Final Evaluation Report, March 2021*

[4] *This report does not mention the demolition of a building since it is not related to energy efficiency.*

(Component 3). Rated as Moderately Satisfactory by the final evaluation team, these achievements are reported as follows:

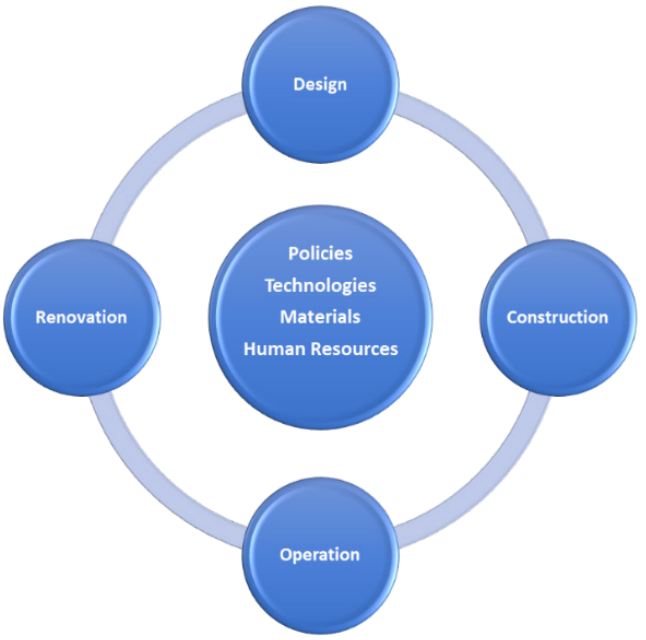


Figure 2 – Building Cycle

2.2.1. COMPONENT 1: Improvement and Enforcement of Energy Efficiency Building Code

As named above, Component 1 consists of two parts: (i) improvements of the existing institutional frameworks on the energy efficient design, construction and operation of commercial and high-rise residential buildings and (ii) better enforcement of the implementation, especially the compliance of the building code on the energy efficient use in buildings.

a. Outcome 1.1: Enforced, improved and comprehensive policy, legal, and regulatory frameworks on the energy efficient design, construction and operation of commercial and high-rise residential buildings

During the project implementation, the policy support was implemented at different levels, from revision of the construction law, inputs to other by-law documents to development of technical standards contributing to better construction practice of EE high-rise buildings[5] in Viet Nam. Although these results were not ideally achieved in a chronological order since they have depended a lot on the policy upgrading plan of the government, they have helped lay a steadier foundation for Viet Nam to formulate and update supporting policies for development of EE buildings in future.

Output 1.1.1: Improved and enforced implementing policy framework and regulations on EE in buildings, including revised/improved EE Building Code (EEBC), with a full EEBC compliance guide

[5] *According to QCVN 09:2017/QD-BXD, high-rise buildings are defined as the ones with total floor area of 2,500m2 or above.*

In 2016, the Ministry of Construction started revising the EEBC in order to make it easier for implementation. The EECB project contributed to this process through technical inputs to related consultation meetings. Thanks to this revision, the revised EEBC was promulgated in late 2017 at Circular No.15/2017/TT-BXD dated 28th December 2017 which came into effect in June 2018. There were 16 requirements in the former code having been changed or removed to ease the application, and 05 newly added for saving more energy based on specific demands of functional areas. Following the promulgation of this version, a compliance check toolkit was produced with the contribution of EECB project. The hard copies have been shared with all 63 provinces nationwide, followed by a number of guidance programs organized by MOC with support of different organizations including EECB PMU.

In an effort to improve the compliance of the EEBC and decision-making capacity of building practitioners, the EECB project also supported the MOC to develop a number of technical tools serving the EE calculation namely:

- ✓ **A set of 05 standards on the EE properties of building materials in Viet Nam;**
- ✓ **Two online databases of construction materials and equipment databases of construction materials established;**
- ✓ **A web-based software to partially support the calculation of EEBC compliance established.**

▪ *TCVN 13101: 2020 / (ISO 6946:2017) Building components and building elements. Thermal resistance and thermal transmittance. Calculation methods.*

▪ *TCVN 13104:2020 / (ISO 12631:2017) Thermal performance of curtain walling. Calculation of thermal transmittance.*

▪ *TCVN 13103:2020 / (ISO 10456:2017) Building materials and products. Hygrothermal properties. Tabulated design values and procedures for determining declared and design thermal values.*

▪ *TCVN 13105:2020 / (ISO 13789:2007) Thermal performance of buildings. Transmission and ventilation heat transfer coefficients. Calculation method.*

▪ *TCVN 13102:2020 / (ISO 10211:2017) Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations.*

(See Decision No.3172/QĐ-BKHCN dated 17 Nov 2020 by MOST)

Thanks to these standards, heat transfer characteristics of construction materials can be defined, allowing building designers to calculate heat insulation/ transmission values, etc. so that they can select suitable EE materials for their own buildings.

In addition, 2 online databases of construction materials and equipment systematized by the EECB project and disseminated on the MOC website[6] is also a channel for building practitioners to seek suitable EE items for their own buildings. While the construction material database recaps most of material types in the construction market with description of heat characteristics; for instance, glass (thickness, thermal transmittance and absorption coefficients, etc.), roof material (thermal transmittance), wall material (thermal transmittance), painting, insulation materials, etc., the other describes EE equipment brands with such categories as air conditioners, chillers, center water heating system, solar panels, etc. Building designers, building owners or even an ordinary person who looks for EE information of equipment for their buildings can easily filter the database to get the information they want, for example, about COP (Coefficient of Performance), Motor Capacity, etc.

Mr. Trần Ngọc Linh – a training learner expressed his satisfaction on the benefits that the database can bring to its users "With categorization and updating of technical specifications of EE materials and equipment, it is convenient for architects to seek information on appropriate EE materials and equipment for building energy modeling and bio-climatic solutions". Mr. Tran Anh Tuan from HUDLAND company also highly appreciated its applicability (the databases), saying that it will save time for project designers and increase the awareness of investors on the energy efficiency. These databases is actually not only useful to high-rise buildings but serve as a good reference to individual investors, for example, households. Ms. Phan Thanh Huyen, a local people at Long Bien district, emphasizes her interest in the database. "I do not have to go to different showrooms, asking for advice on EE materials/ equipment. Instead of that, I seek information from the website which is more reliable and time saving to me".

Excepted from EECB PIR 2019 (Communicating Impact)

Besides, the Overall Thermal Transfer Value Software (OTTV) upgraded and uploaded to MOC website[7] is also an effective supporting tool for calculation of the average thermal transfer per m^2 of a building envelop, an element to anticipate the necessary cooling load of a building. This calculation contributes to assessing the compliance of all envelop-related parameters of the EEBC requirements namely U value of walls, U value of roof and the solar heat gain coefficient of glazings. With comprehensive input information, a building designer can totally calculate the OTTV value (and by that, the compliance level) quickly and easily, helping save time by reducing traditional manual calculations.

A roadmap for development of EE buildings in Viet Nam (Decision No.1677/QĐ-BXD)

[6] *http://tietkiemnangluong.xaydung.gov.vn/project.html*

[7] *http://tietkiemnangluong.xaydung.gov.vn/page-t307.html*

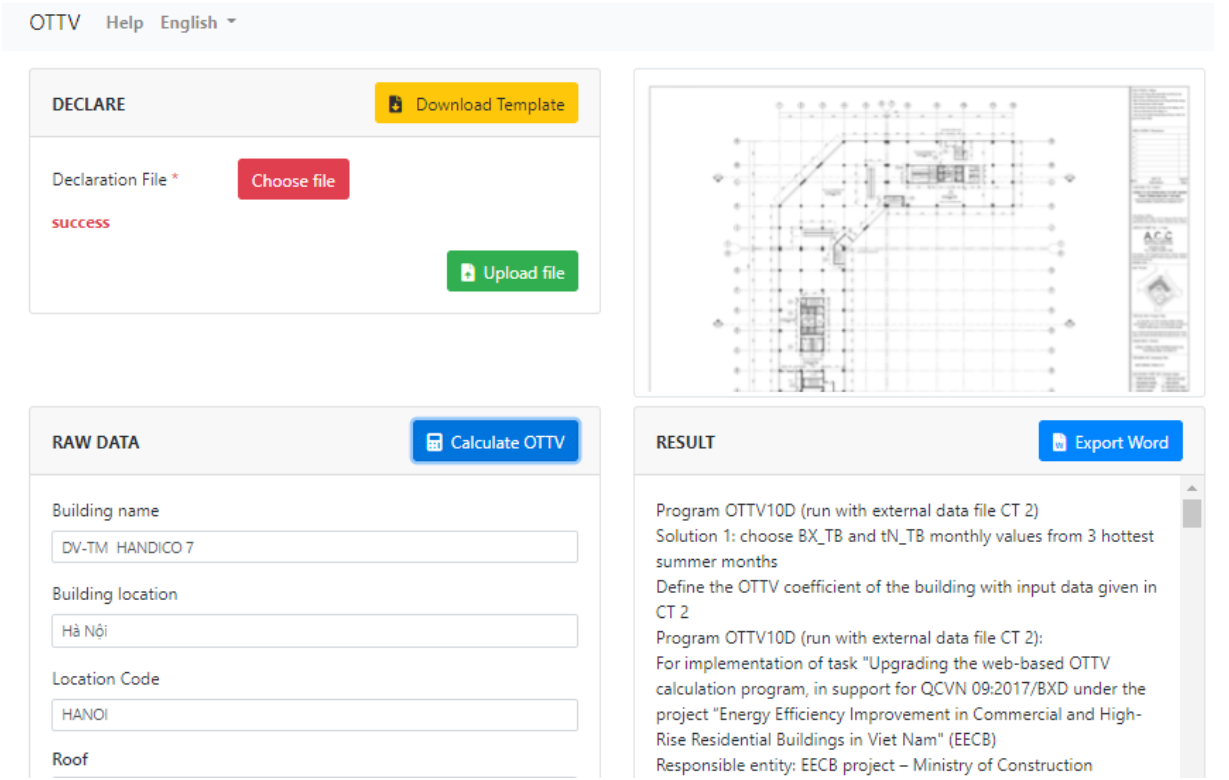


Figure 3 – OTTV web-based Software

During 2019 – 2021, the EECB organized a series of capacity strengthening courses on design, construction and acceptance of EE buildings, of which theoretical and practical guidance on the application of the EEBC and above-mentioned tools were provided to related building practitioners *(Detailed results of the training program will be discussed in Section 2.2.2, Output 2.2.3)*. With such efforts, a satisfactory percentage of 71% of training participants satisfied with the training courses and 51% referred to the EEBC compliance toolkits and guideline in their daily work[8].

Figure 4 – Consultation Workshop on Roadmap for development of EE buildings

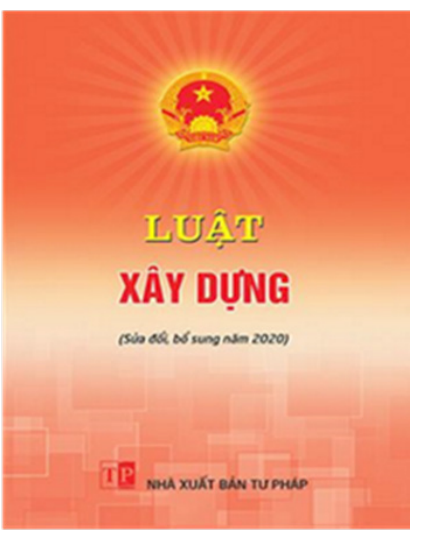
[8] *EECB M&E Report*

Based on such policy interventions, the EECB project supported MOC to roll out a roadmap for development of EE buildings through a program called a master plan for implementation of EE-related assignments in the period 2020 – 2030. Approved at Decision No.1677/QĐ-BXD dated 30 Dec 2020, this strategic plan indicates EE outputs of the construction sector expected to be achieved in the next ten years, contributing to the implementation of Decision No. 280/QĐ-TTg dated 13 March 2019 approving the National Energy Efficiency Programme (VNEEP) for the period of 2019-2030. The further development of project deliverables such as improvement of the Specific Energy Consumption (SEC) and energy benchmarking system through additional energy surveys, complementing the existing database[9] of energy consumption datasets of high-rise buildings, establishment of SEC and energy benchmarks for construction materials, etc is covered in this roadmap. Implemented within 10 years, the roadmap definitely compliments project achievements, increasing the project sustainability in the long run.

During this whole process, consultation workshops for the outputs were implemented in combination with technical meetings led by PMU. Depending on the nature of each output, PMU and UNDP would work together to determine suitable participants of each meeting/ workshop. In most of the consultation events, MOC, MOIT, MOST, DOCs, CEEBs and technical universities in Hanoi and HCMC were key actors. Since the energy efficient use in buildings was a new and challenging field in Viet Nam, such discussions were informative with various ideas from international and national organizations/ experts. They were therefore not only consultation events but also a multi-lateral capacity strengthening channel for involved parties on EE in buildings.

- ✓ **Technical Inputs to the Law on amendment and supplementation of a number of articles of Construction Law (No. 62/2020/QH14);**
- ✓ **Technical inputs to Decree on Management of Construction Investment Projects (No.15/2021/ND-CP).**

In 2020, Construction Law 2014 was revised with the active support by the EECB project. This resulted in the promulgation of the Law on revision of Construction Law 2014 (abbreviated as Law No. 62/2020/QH14) with a provision regarding *"The government encourages the researches, applications of advanced technologies, information technologies in construction investments and certification of the works which is energy efficient, resources-saving and environment-protecting; and development of the urban areas which are ecological, smart, climate-resilient and sustainable"*.



[9] *This database is also a project output and will be discussed in Outcome 1.2.*

This is the first time the concept of EE buildings, especially the certification of these buildings, is mentioned in a law, which reflects the interest of policy makers, or in the other words, the needs of the construction market for development of such kind of buildings. The above-said provision allows a broad opportunity for policy makers to develop policies for promotion of EE buildings which could be hardly done in the earlier time because of the unavailability of top-down directions. As a follow-up action, a related decree on management of construction investment projects was developed with guiding articles for implementation of the new law. Thanks to the project support, this decree was promulgated by the central government on 03rd March 2021 (Decree No.15/2021/ND-CP). According to this decree (Article 7), construction investments shall make available technical and managerial measures are required for efficient use of energy, natural resources and environmental protection. Besides, construction, development, assessment and certification of EE, green and natural resource-saving buildings are encouraged. This by-law document will help to open a window for official establishment of energy certification activities of the ministry, and a number of financial and non-financial mechanisms can be stipulated in the shape of a decree/ circular in near future. Section 2.2.2 below will discuss in details about how significant this provision is to enable the building market.

Article 7: Energy efficient, resource- saving and green buildings

1. When investing in construction works, there must be technical solutions and management measures in order to efficiently use energy, save natural resources and protect the environment.

2. The State encourages the development, construction, evaluation and certification of energy efficient, resource- saving and green buildings.

3. The development of the buildings mentioned in Clause 2 of this Article shall comply with the applicable policies, plans and roadmaps set forth by the Prime Minister.

4. The Minister of Construction shall formulate the standards of criteria and processes for the evaluation and certification of Energy efficient, resource- saving and green buildings.

(Excerpt from Decree No 15/2021/ND-CP)

Other on-going activities:

▪ Development of By-law documents to guide the implementation of Revised Construction Law

For implementation of the revised construction law, as a follow-up action, MOC has been supporting the government to revise Decree No.46/2015/NĐ-CP on quality management and maintenance of construction works and develop a new one on development of green urbanities. PMU has provided inputs to this process through contribution to the EE requirements, especially

international experiences on development of green buildings and cities and related criteria framework. This process is still on-going and should be further supported project stakeholders after project end.

▪ Inputs to development of Master Plan on Development of EE and Green Buildings

In order to implement the existing regulations (for example, the requirement of the Law on amendments of a number of articles of Construction Law on development of EE, resource-efficient and environment protection works, Decision 280/2019/ND-CP on the certification of green and EE buildings, etc.) and promote the development of this building typology as an inevitable trend in Viet Nam, MOC is supporting the government to develop the master plan on development of EE and green Buildings in Viet Nam. Lessons gained from the development of EE buildings can be applicable to this building typology given their similarity in nature. The draft master plan therefore includes such activities to accelerate this market as promulgation of green building criteria, creation of favourable conditions for development of ESCOs, availability of long-termed plan for each sector, etc. The draft master plan will be soon submitted to the government and promulgated in 2022 as expected.

▪ Updating of Bank of Questions for Construction Practice Certification

With revision of the EE building code, there was an arising need that relevant construction practitioners should be aware of these changes and be able to apply in their business. Therefore, another project support has been sent to the upgradation of the questions for construction practice certification which is a must-have requirement for construction engineers/ architects. The upgraded is therefore expected to further draw the attention of this key resource to the EE building code and their learning willingness, resulting in the improved capacity in design and construction of EE buildings.

Output 1.1.2: Established and operational EE certification scheme for buildings

Since this Output is very much related to the outputs of Outcome 1.2 (1.2.2, 1.2.3 and 1.2.4), it will be reported in the next Outcome (1.2) for consistency.

As results of the project support, the EOP achievements of Outcome 1.1 are summarized as follows:

ID.	Indicator	Baseline	EOP Target	EOP Result	% of Completion	Rating to target level
7	% of DOCs and building practitioners nationwide that reference EEBC compliance toolkits and guideline developed by the baseline and the projects by EOP (I.5)	30% of DOCs nationwide	70% of DOCs nationwide (at least)	71%	101%	Over target
		20% of building practitioners	50% of building practitioners	51%	102%	Over target

ID.	Indicator	Baseline	EOP Target	EOP Result	% of Completion	Rating to target level
8	No. of national testing standards for energy performance of building construction materials promulgated by EOP (I.6)	0	5	5	100%	On target

Table 3: Results of Outcome 1.1

b. Outcome 1.2: Strengthened compliance of the energy efficiency building code for commercial and high-rise residential buildings in Hanoi and HCMC

Output 1.2.1: Approved guidelines that support EE building initiatives and market

Output 1.2.2: Established and implemented Measurement & Verification (M&V scheme)

Output 1.2.3: Established and implemented building energy benchmarking system that is linked to the certification scheme

(In the PRODOC, Output 1.2.1: Approved guidelines that support EE building initiatives and market goes in between these ones. However, due to the close inter-relation among these outputs, the output 1.2.1 will be reported later).

Methodology of the proposed SEC, energy benchmarking, energy certification and M&V systems

One of the crucial project objectives was to foster the compliance of building practitioners with the EEBC, and the availability of incentive and penalty mechanisms was expected to become a momentum to change their awareness and behaviors towards design and construction of EE buildings in a more responsible way. The establishment of SEC and energy benchmarks is one of the measures popularly used in many countries (for example, Singapore, India, Thailand, etc.) in order to enable the formulation of such mechanisms. The energy consumption assessment of high-rise buildings in Viet Nam is recommended as necessary to help define the energy benchmarks of buildings and get to know the energy efficiency for appropriate supporting/ mitigation measures of the government. The EECB project supported this whole process from the definition of methodology to the final legal bases for the establishment of SEC profiles, energy benchmarking, energy certification and information disclosure programs. This establishment requires the readiness of (i) the methodology approved by the government; (ii) survey data and analysis results for identification of the benchmarks; and (iii) the administrative set-up of the government for operation of this system.

For the proposed establishment of SEC and energy benchmarks, international experiences from India, Singapore, Thailand and from other similar programs/ projects in Viet Nam such as Viet Nam Clean Energy Program (VCEP by USAID), Low Carbon Transition in Energy

Efficiency sector in Viet Nam (LCEE by DANIDA), etc., were considered. As a result, two most popular methods applied in the world for assessment of the energy efficiency of a building were discussed, either simulation (somehow based on "best effort" method) or actual measurement of energy consumption ("performance-based" method). A comparison of strengths and weaknesses showed that the "performance-based" method seems more suitable for Viet Nam since it reflects the actual energy consumption of a building which implies human behaviors in energy use. It should be emphasized that together with the commissioning propriety of equipment, the behaviors of building users may increase up to 140% energy consumption volume compared to it as designed or vice versa reduce up to 40% with best practice[10]. The calculation can be simply described as follows:

$$Building\ SEC = \frac{Yearly\ Energy\ Consumption\ (kWh\ or\ Btu\ or\ Joule\ or...)}{Comparision\ parameter\ or\ GFA\ (m^2\ or\ ft^2)}$$

A large-size survey of 195 high-rise buildings conducted in big cities (Hanoi, Ho Chi Minh and Da Nang) for 06 typologies of buildings of 03 climate zones has enabled the calculation of SEC profiles and the definition of energy consumption benchmarking (Details will be discussed in Output 1.2.4). Based on the SEC and benchmarking results of the project and of related international ISO standards, especially EN 16231:2012 Energy efficiency benchmarking methodology, performance class intervals were defined for ranking the energy consumption of each building typology, helping to determine the energy benchmark for each building typology. Finally, an energy efficiency certificate system and template will be ready-to-go when all legal conditions are met. For the first stage, it is envisaged that building owners will be awarded with this certificate on request, and their energy consumption information disclosure is voluntary. However, the energy consumption information disclosure will become compulsory when other conditions (for examples, readiness of the market and related policies) are well met. Below figures describe the ranking system and certificate templates introduced by the EECB project.

It is necessary to note that this whole process was broadly consulted back and forth with relevant government agencies, research institutions, related organizations and experts including VIBM, IBST, VNCC, UNDP, IFC, VGBC, , etc. before the optimal option was selected. Supporting the continuous upgradation of SEC and energy benchmarks, a monitoring and verification (M&V) system was developed in order to track and report on mitigation actions and GHG emission targets. It introduces M&V schemes for the government and building owners to report the energy consumption of their buildings or of the country. The proposed International Performance M&V Protocol (IPMVP) or ISO17741:2016 to measure

[10] *Codes With Benchmarking" from the Global Building Performance Network (GBPN) and Institute for Market Transformation (2014), [page 4) Ryan Meres -Jason Antonoff*

energy savings in EE projects can be used to calculate consolidated contributions of Viet Nam to GHG emission cuts for international reports.

Class A	if	EP < 0.5·Rr;
Class B	if	0.5·Rr ≤ EP < Rr;
Class C	if	Rr ≤ EP < 0.5·(Rr + Rs);
Class D	if	0.5·(Rr + Rs) ≤ EP < Rs;
Class E	if	Rs ≤ EP < 1.25·Rs;
Class F	if	1.25·Rs ≤ EP < 1.5·Rs;
Class G	if	1.5·Rs ≤ EP.

With Rr = 0,7Rs

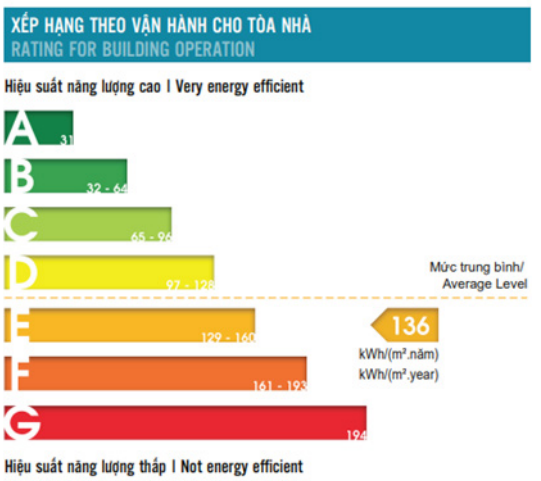


Figure 5 – Energy Consumption Rating System

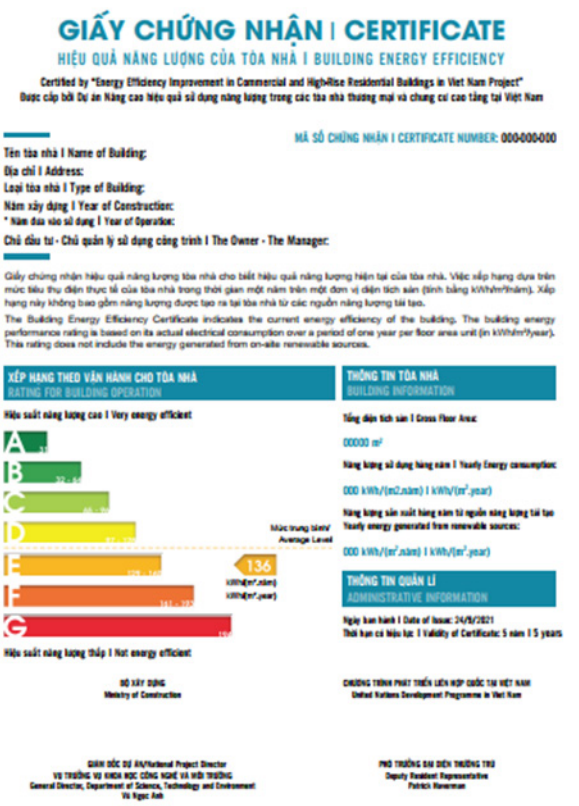


Figure 6 – Certificate Template

Furthermore, in order to sustain the yearly update of SEC profiles and energy benchmarking system, an online data submission and management system was established, enabling different beneficiaries i.e related governmental management office (not yet defined at this stage), building owners and licensed certification entities to access, input their building data and the defined algorithm will automatically calculate the energy consumption level of their building. The calculation results will allow building owners to compare their building performance with the energy consumption benchmark of the same building category or with its own performance during previous years for suitable energy use adjustments. Such added data will contribute to the enlargement of the building database, allowing the competent agency to update the SEC and energy benchmark on a regular basis. This sustainable tool has been uploaded to the MOC website[11].

Although data submission and calculation systems have been well set up and are ready for operation, it is necessary to ensure governmental resources to be adequately allocated to run these systems, including institutional readiness and human resources. At the current stage,

[11] *http://tietkiemnangluong.xaydung.gov.vn/page-t307.html*

the tools are in place but the necessary recourses have not been there since they need to be legalized. This legalization process was divided into two steps: (i) to include the EE building certification covenant in a law such as Law of Construction or Law of Architecture, etc.; and (ii) to officially approve the certification methodology and the associated management scheme.

As presented in Section 2.2.1, although the inclusion of the EE building certification provision in the law on amendment and supplementation of a number of articles of the construction law was achieved in June 2020, the second half of the project duration, it still helps the project to complete a number of expected policy interventions. One of them was 06 standards on SEC and Energy benchmarking methodology.

As the second step supported by the EECB project, 06 energy certification standards[12] are ready to be issued by the government (approved by MOC and pending for promulgation of MOST), of which energy class intervals for rating energy consumption in high-rise buildings are introduced. Based on SEC and energy benchmarking results defined from the energy survey data, this interval (R_r=0,7 x R_s) then helped to define performance class boundaries of the energy certification system for each building category. With the methodology approved, the last step to make it workable is to successfully set up a governmental management system to operate it. This system shall cover all related tools of building SEC, energy benchmarking, energy certification, M&V and information disclosure. At end of the project, with the project support, MOC is finalizing a draft legal document on certification of EE buildings which describes the arrangements of this system which is expected to be available in late 2021. With this current status when the M&V scheme has not been put in place at end of the project, the related result in the log frame (See Table 4: Results of Outcome 1.2) is unachievable. It is regretful that the project preparation phase under-estimated the complexity and necessity time to ensure adequate policy conditions in order to be able to put the above-mentioned system in place, which then could hardly be controlled by the EECB project implementers. The system therefore could not be promulgated at EOP, and the related project result could not be fully achieved.

06 standards as a base for SEC and Energy Benchmarking Methodology

- *TCVN xxxxx:2021 (EN 16231:2012) Energy efficiency benchmarking methodology;*
- *TCVN xxxxx-1:2021 (ISO 52000-1:2017) Energy performance of buildings – Overarching EPB assessment – Part 1: General framework and procedures;*
- *TCVN xxxxx-1:2021 (ISO 52003-1:2017) Energy performance of buildings – Indicators, requirements, ratings and certificates – Part 1: General aspects and application to the overall energy performance;*

[12] *These standards have been approved by MOC and are pending for the promulgation of the MOST.*

▪ *TCVN xxxxx:2021 (ISO 17741:2016) General technical rules for measurement, calculation and verification of energy savings of projects;*

▪ *TCVN xxxxx:2021 (ISO/TR 52000-2:2017) Energy performance of buildings – Overarching EPB a*ssessment - Part 2: Explanation and Justification of ISO 52000-1:2017.

▪ *TCVN xxxxx:2021 (ISO/TR 52003-2:2017) Energy performance of buildings - Indicators, requirements, ratings and certificates - Part 2: Explanation and Justification of ISO 52003-2:2017.*

Output 1.2.4: Completed energy consumption survey of commercial and high-rise residential buildings

Established SEC, energy benchmarks and energy certification recommended for Viet Nam

With the "performance-based" method approved as mentioned in the earlier section, the EECB PMU carried out the surveys at 195 buildings of 06 typologies (Governmental Administrative Office, Small-size commercial office buildings, Large-size commercial office buildings, Malls, Hotel 2 -3*, Hotel 4 -5*) in Hanoi, Danang and Ho Chi Minh City where the density of high-rise buildings is high. There are some highlights that should be noted as follows:

▪ *Baseline survey results of MOC in previous studies could not be aligned with the current study of the EECB project because of different methodologies and then parameters applied.*

▪ *Residential buildings have not been taken into account given (i) the complication of the research object. For example, building apartments are owned by many different owners, so the data collection is extremely complicated; (ii) SEC and energy benchmarks for residential buildings (if any) will hardly have some influence on households since it is finally produced for the building, not for their own apartments. Therefore, it hardly changes the behaviors of building users; and (iii) it is costing and time-consuming for such a study which might go beyond the limitation of the EECB project.*

▪ *The SEC and energy benchmarking results introduced by the EECB project are a good signal sent to the building market, and MOC can totally take it over for their official use and further upgrading. The more survey results will be added, the better the SEC and energy benchmarking results would be.*

The established SEC profiles and energy benchmarks for the first 06 types of building are then expected to be endorsed and then dramatically change the awareness and behaviors of building practitioners towards efficient energy use in future since it allows each building owner to see where they are located in the energy consumption ladder, and they will then voluntarily (or compulsorily one day) change their behaviors in design, construction and operation of

EE building towards the positive side. At the current stage, these results are still pending for an official decision for promulgation of MOC. Meanwhile, based on the SEC and energy benchmarks results and the defined interval, the energy certification system for 06 building categories was established as shown through the example below:

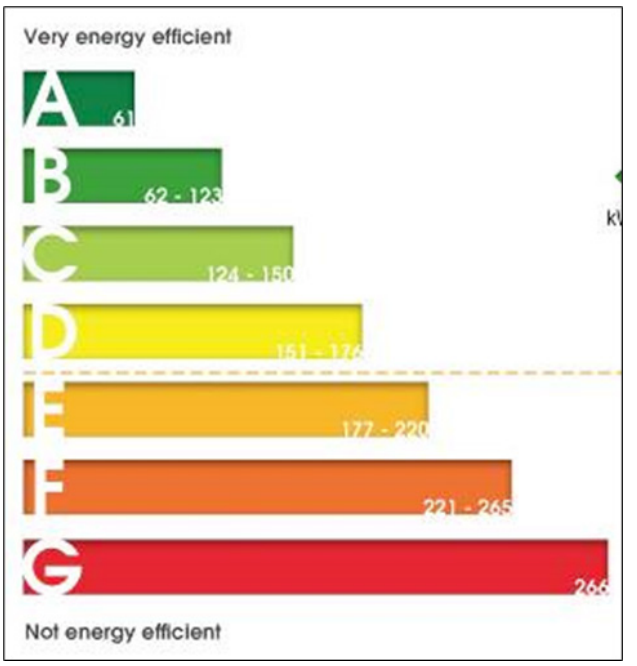


Figure 7 – Energy Consumption Grading System of large size commercial building in HCM City (GFA>7,500m²)

With the energy consumption survey results of 195 buildings, the energy certification was tested at project level on 30 buildings, of which 2 buildings are at A grade (very energy , 12 at B grade, 14 at C, and 02 at D (F as not energy efficient) etc. (See *Appendix 2 - List of Energy-Efficient Buildings certified by EECB Project*)

Output 1.2.1: Approved guidelines that support EE building initiatives and market

- ✓ **Training Manual on Strengthening Capacity on Design, Construction, Acceptance and Energy Management;**
- ✓ **Technical Inputs to University Training Curriculums on Design of EE Buildings;**
- ✓ **A System of 04 EE Technology Demonstration Models installed for Energy Trainings.**

In less technical relation to SEC and energy benchmarks outputs and more to the project results on demonstration of EE technologies and equipment (Component 3) and related training courses (Component 2), this output satisfied the expectations set out in the PRODOC and came in one training manual called: "Energy Efficient Buildings. Training Manual on Strengthening Capacity on Design, Construction, Acceptance and Energy Management", it provides the readers who could be building developers/ owners, construction project managers,

designers, construction supervisors or appraisal officers of DOCs with following knowledge when designing and constructing of a new building:

▪ *Detailed guidance on how to design, construct and accept a EE building, which goes beyond the code requirements (QCVN 09:2017/ BXD);*

▪ *Reference sources on EE materials and equipment, building simulation softwares (Design Builder Software, Integrated Environmental Solution Virtual Environment Software (IES VE), etc.), OTTV, etc. These tools help building designers to quickly and effectively select the best inputs for their EE designs and determine the optimal technical options;*

▪ *Detailed guidance on the investment profitability calculation of a building project. This allows the building owners/ developers to make the final decision on what design option should be selected among best EE designs;*

For operation phase, the publication delivers to building owners, building energy managers, operation officers, energy auditors, construction designers following information:

▪ *How to manage energy consumption of a building;*

▪ *How to carry out a energy audit for a building;*

▪ *How to renovate a building for better energy performance.,*

Thanks to the comments received from 09 capacity strengthening courses organized nation-wide in 2019, 2020 and 2021 (06 courses for new buildings and 03 for existing buildings), the quality of the draft manual had been gradually improved. The post-training surveys indicate a percentage of 23% of the trainees who frequently and 46% of the trainees who sometimes refer to the EE design guidelines during their daily work to improve their EE building designs[13].

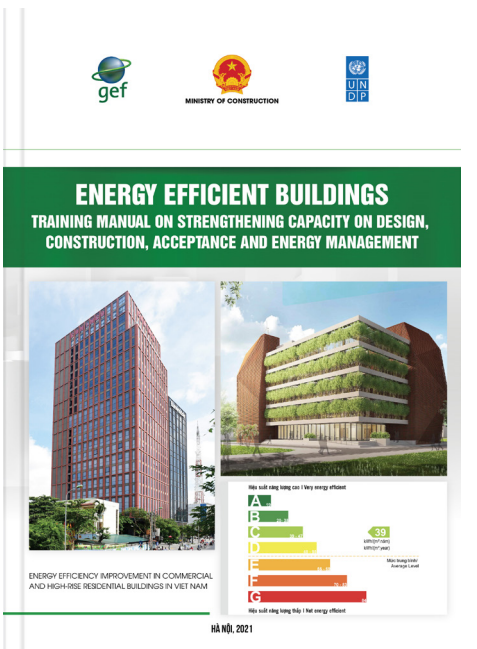


Figure 8 – Manual Cover

This publication was broadly shared in the events supported by EECB project (Online Training Course Sep 2021, Final Project Workshop, etc.), disseminated to 63 DOCs all over the country in hard and soft copies. It was also posted to the MOC website[14] for public reference.

[13] *The results calculated from the data collected and analyzed from the first 05 courses of the EECB project.*

[14] *http://tietkiemnangluong.xaydung.gov.vn/project-c60.html*

Aside from that, the technical substance from this book has been integrated into the university training curriculum on the design of EE buildings for students of architecture, construction and MEP. This inclusion will definitely have positive and sustainable impacts on future labor resources, not only in their technical practice but also in the awareness of their professional responsibility in design, construction and operation of EE buildings for reduction of energy consumption in buildings.

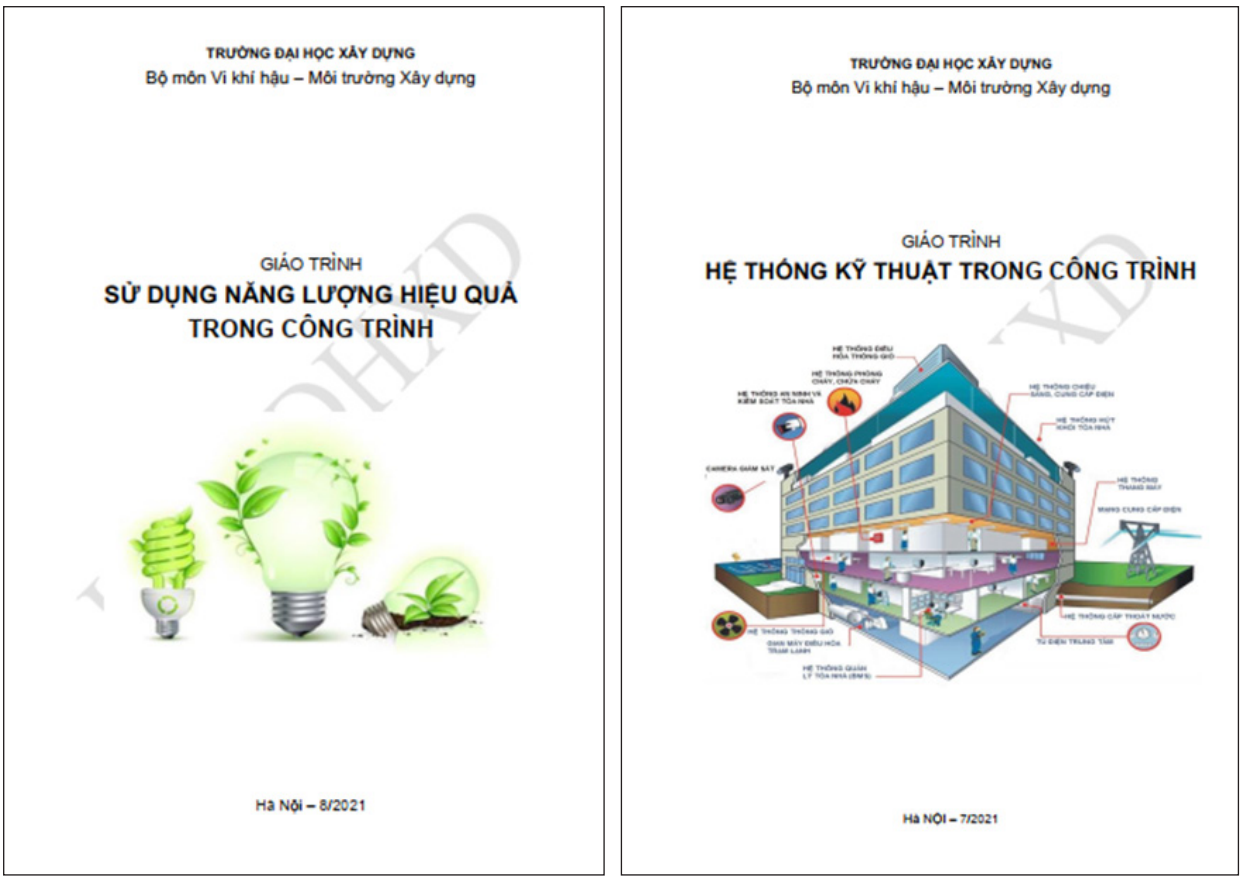


Figure 9– Curriculums on Energy Efficient Use in Buildings

Together with the provision of technical trainings and materials on Building EE improvements, a hardware system of 04 EE technology demonstration models were installed at one of the project beneficiaries – IDC Hanoi. Having in-depth experience in energy efficiency activities including trainings, surveys and scientific studies, IDC was among the project stakeholders and targeted as a potential beneficiary of the project who could sustain project results in long term. In late 2019, IDC Hanoi was equipped with 04 EE technology demonstration models (solar cell, head pump water heater, water pump and ventilation systems) by the EECB project. And this hard and soft technical assistance was utilized into professional training courses organized by IDCs. As reported by IDC, there were 46 trainees of IDC indirectly benefitted from the EECB project.

Figure 10 – Installation of Solar Hot Water Plumbing System Model

Figure 11 – Ventilation System Model

In summary, achievements of Outcome 1.2 are summarized in two indicators as presented below:

ID.	Indicator	Baseline	EOP Target	EOP Result	% of Completion	Rating to target level
9	% of building practitioners nationwide that reference the EE design guideline to achieve a higher level of EE than the EEBC requirements by EOP (I.8)	20%	50%	69%	138%	Over target
10	% of commercial and high-rise residential buildings referencing M&V schemes in EE implementation by EOP (I.9)	0%	70%	71%	101%	Over target

Table 4: Results of Outcome 1.2

2.2.2. COMPONENT 2: Building Market Development Support Initiatives

Outcome 2: Increased Local Capacity in the EE design, construction and operation of commercial and high-rise residential buildings

As described in the project document, the objective of this component is finally to enhance the capacity of building stakeholders in implementation of energy services (ESCOs) through the delivery of supporting mechanisms, tools and capacity strengthening courses. However, as justified in the mid-term review and then final evaluation report (Recommendation 7, Page 64), "*In order to implement the ESCO models, there is a need to address the issues relating to the requirement of legal documents for paying for the energy savings in case of implementation of the EE measures through ESCO route for the government buildings and government owned enterprises. At the same time need to have guidelines on M & V system to verifying the ESCO energy savings achieved. Possibilities may be explored for creation of a super ESCO for EE in Viet Nam".* Under this circumstance when the legal base is not yet available, it is hard to foster this model in Viet Nam, and this is the reason why related results have been advised to be removed by both MTR and FE experts.

Outcome 2.1: Formulated, approved, funded and implemented financial mechanisms and incentives to support EE efforts in the buildings sector and cost norms for construction

Technical inputs to a revised cost norm regarding EE considerations in consultancy services (Circular 12/2021/TT-BXD)

One of the project objectives is to help deliver mechanisms to develop the EE building market. Similar to the SEC and energy benchmarking system, the legal base for promulgation of these mechanisms had not been mentioned in the Vietnamese laws until the availability of the EE building promotion provision mentioned in the Law No. 62/2020/QH14, 2020. A by-law document is still required in order to be able to activate supporting mechanisms, especially financial ones. At the project level, a report on recommended supporting mechanisms was developed by the project and approved by PMU. Its findings and recommendations were disseminated with MOC for reference. According to this report, EE buildings can be granted special features like floor area, height, etc. based on their level of certification satisfaction and related regulations. This is an on-going process that requires further attempts of the executing partner (MOC) after the project.

In parallel with creation of supporting mechanisms for building owners, to promote the EE building market, it is also necessary to provide experts in this sector with incentives so that they are willing to consider EE in their business. During the project implementation, the EECB PMU had tried to address one of their popular concerns i.e EE- consultancy fee paid for them while this time-consuming task requires the related in-depth knowledge. The cost norm (Decision No.79/QĐ-BXD dated 15th Feb 2017) about the cost estimation of construction project management and consultant services did not cover the costs for design of EE public buildings. In 2019, MOC started revising this cost norm with the technical inputs of EECB project for EE-related contents. The revised cost norm was promulgated by MOC in 2019 (Circular No.16/2019/TT-BXD dated 16th Dec 2019) and then replaced by Circular No.12/2021/TT-BXD dated 31st August 2021 with the related contents remaining unchanged, of which additional costs can be paid to EE consultants for EE inclusion in building designs. This legal base is expected to partially create a momentum not only for the designers but also building owners to finally consider EE in their designs. Together with the law on supplements and amendments of a number of Construction Law, this result is regarded as a key supporting mechanism for further development of the EE building market.

a. Output 2.2: Fully operational Centers for Energy Efficiency in Buildings (CEEBs) under MOC

(Omitted as justified in the introduction of Section 2.2.2)

b. Output 2.3: Trained CEEB staff to implement awareness and training programs to promote EE in the building sector

558 officials, architects, building technicians, building managers and operators benefitted from 02 Training Programs with 09 courses on Design, Construction and Acceptance, Operation and Renovation of Buildings for High Energy-efficient Performance;

With the aim to improve the capacity of construction practitioners for better energy services provided to the building sector, based on the revised EEBC, associated tool, project results, especially the experiences gained from demonstration projects, training documents have been developed to cover the phases of a building cycle: (i) design, construction and acceptance of a new building; and (ii) renovation of a retrofitting building.

The first training program introduces the requirements of the revised EEBC, reference sources for related calculations including the database of construction materials and equipment with EE features and OTTV software tool technically supported and disseminated by the EECB project as described in Section 2.2.1 above. The experiences and lessons learnt from 09 demonstration projects have been imbedded in related training contents with one of key recommendations namely the integrated design approach should be comprehensively applied during the whole process, from concept note to acceptance phase with comprehensive information shared with relevant partners (architects, MEP engineers, construction supervisors, building owners, appraisal officers of DOCs, etc.). For example, the envelop of a building and functions of its zones will help determine its energy demands. As such there must be a good communication among these actors. The full understanding of the should and shouldn't will result in appropriate and timely decisions which then help to reduce unnecessary costs when optimal conditions of the energy system can still be met.

There were totally 06 courses organized nationwide with participation of 387 trainees totally, of which 05 were face-to-face organized in 2019 (261 trainees) and 01 added as requested by Provincial Departments of Construction (DOCs) for in-depth training on appraisal and acceptance of EE construction works. The later was virtually organized in September 2021 for 126 DOC officers (This was a result of the forth Covid-19 wave having happened in Viet Nam since April 2021 and not yet completed until the reporting time.) As shown in the post-training report, 94% out of 91% questionnaire respondents was satisfied with the training program, and 69% could actually apply the knowledge from the program for their daily work.

The second training program focused on the trainees who deal with the operation phase of a building cycle namely building owners, energy managers, energy auditors, construction management officers of DOCs and energy management officers DOITs, etc. With 03 courses and 171 trainees organized in Hanoi, Dalat and Ho Chi Minh cities, it provided the trainees with in-depth knowledge and skills on (i) energy audits as the prerequisite condition of any comprehensive

energy renovation; (ii) communication of the energy audit results and related recommendations with decision makers; (iii) M&V of energy consumption for timely modification after renovation, etc. The lessons learnt from demonstration projects were disseminated at these training courses, followed by team-working exercises. According to the trainees' feedbacks 90% felt satisfied with the training program. After the training, as one of the actions to improve the sustainability of project impacts, a fan page on energy efficient buildings was created to maintain the network of the trainees and trainers for further exchange of relevant professional information, especially updating of advanced technologies or new technical alternatives[15].

Figure 12 – Team-working Activity at a capacity strengthening program on improvement of energy performance in retrofitting buildings

Figure 13 – Certificate Awarding

In both of the training programs, the female trainees were limited with 11%. It could be explained as female labors only account for 10% of the labor resources in the construction sector. This percentage is even lower in technical departments. *(Source: EECB gender analysis report).*

c. Output 2.4: Operational support program for ESCOs in the negotiation and implementation of building energy performance contracts

(Omitted as justified in the introduction of Section 2.2.2)

In the end, rated as moderately satisfactory by the final evaluation team, the results of these outcomes are described as follows:

ID.	Indicator	Baseline	EOP Target	EOP Result	% of Completion	Rating to target level
11	No. of supporting mechanisms and incentives for commercial and high-rise residential buildings approved and implemented by EOP (I.10)	0	1	2	200%	Over target

[15] *https://www.facebook.com/C%C3%B4ng-tr%C3%ACnh-Hi%E1%BB%87u-qu%E1%BA%A3-n%C4%83ng-l%C6%B0%E1%BB%A3ng-106306848041301/?ref=pages_you_manage*

ID.	Indicator	Baseline	EOP Target	EOP Result	% of Completion	Rating to target level
12	# of trainees (building project developers, design & appraisal experts, appraisal officers of DOCs) that are trained on EE building designs and construction by EOP (I.11)	0	250	387	155%	Over target
13	# of trainees (relevant officers of DOCs, energy auditors, building operation managers) that are trained on building operation and M&V by EOP (I.12)	0	70	171	244%	Over target

Table 5: Results of Outcome 1.2

2.2.3. COMPONENT 3: Building EE technology applications and replications

Outcome 3: Increased use of EE building materials and application of EE building technologies in HCMC and Hanoi

As indicated in the project document, Component 3 targeted the enhancement of energy efficiency performance in both new construction and the retrofit/ refurbishment in 16 buildings through application of technical specifications and guidance provided in the EEBC. Aligned with five-year energy conservation plans (EE&C plans) for selected buildings, this process was technically supported by EECB project. The energy consumption of each building then would be reported by building owners with an associated supporting energy consumption monitoring and verification (M&V) system equipped by EECB project. Apparently, compared to the other components of the project, the project results and impacts of this component are the most visual or fastest since they focuses on the "**EE technology"** implementation.

a. Output 3.1: Developed Five-year EE&C plans for the selected commercial and high-rise residential buildings

Technical inputs to a revised cost norm regarding EE considerations in consultancy services (Circular 12/2011/TT-BXD);

Described in the project document, the five-year plan was set to be based on the review of supporting conditions including actual situations of the building, technical scope of assistance and supporting mechanisms. This plan was expected to "help lay out the realistic implementation timeline of priority EE&C measures"[16] and be updated during the implementation if needed. In order to ensure the best support to those buildings, it was designed to be a two-phase plan instead of a five-year one: (i) Phase I: before and during the demonstration with the project support; (ii) Phase II: after the demonstration without the support. This division aimed at

[16] *Excerpted from PRODOC (Para. 108)*

clarifying different objectives of each phase, expected results and responsibilities of related stakeholders (PMU and building owners) and timely adjustment of the plan if needed.

Phase I: Before and during the demonstration with project support

Figure 16 – MOU Signing Ceremony between Building Owner and EECB PMU

After selection of suitable demonstration buildings, pre-feasibility studies using the energy modeling method for new buildings and energy audit for the others were implemented at potential demonstration projects in order to determine the current situation of a supported building before project intervention. The cooperation for energy efficiency improvements then would be realized in a minutes of understanding (MOU) between the EECB PMU and building owner, of which the analysis results and recommendations, for example, energy saving target, timeline, mutual responsibilities, financial support and etc were reflected in this MOU, or in the other words, a committed Phase I plan. At EOP, 23 buildings including 09 new and 14 retrofit buildings have joined the project with 23 MOUs signed. Key changes had been updated to the MOU during the implementation. *(Please see Appendix 3 - List of Demonstration Buildings* and *Appendix 4 - A sample of Minutes of Understanding for information).*

Phase II: After the demonstration without project support

Being the continuity of Phase I, the Phase II plan was developed when the technical support almost finished. This plan therefore excluded PMU's responsibilities and actually served as a guideline for the building owner in order to best operate their buildings for sustainable energy efficiency. Beside technical instructions, this plan emphasized the importance of the BMS system and regular energy audits for appropriate and timely energy control actions if needed. This guidance was discussed and disseminated to the building owner as part of the final technical report for the demonstration building.

b. Output 3.2 Completed demonstrations of the design, application and operation of EE equipment, building materials and building energy monitoring and management/ control systems in the selected commercial and high-rise residential buildings based on the EEBC

- ✓ **75 energy saving solutions implemented at 23 new and existing buildings (highrise office and residential, serviced apartments, public buildings, hotels and educational buildings).**
- ✓ **04 M&V systems installed at 04 demonstration buildings**
- ✓ **Energy Saving: 12,000 MWh or 10,000 tCO2e:**
- ✓ **Average payback time: 3.5 years;**
- ✓ **Cost saving: US$ 1.5 million.**

Ideally a building should be supported from its design to operation phases in order to achieve best energy performance. The provided technical assistance therefore was 2-fold, one developed for new buildings with composition of architecture, mechanical and energy modelling expertise, mainly focusing on design and construction works and another developed for existing buildings with energy audit and renovation consultancy. Depending on the size and complexity of a new building, a design and construction phase can spread along several years (2 to 6 years) and this process may last even longer for existing depending mainly on the financial condition of the building owner. The technical assistance process was divided into two phases: Demonstration of EE technologies (EE consultancy) and Application of M&E systems (verification of results and sustainability of impacts).

Phase 1: Demonstration of EE technologies (EE consultancy)

New Buildings:

At design phase, all selected buildings (09) have been supported with review and analysis of existing design documents. This analysis aimed at ensuring that EEBC requirements (QCVN 09:2013/BXD before 01st June 2018 and QCVN 09:2017/BXD afterwards) could be met, and even be surpassed. The design documents were coupled with energy modelling performance through comparison of 3 different angles (design configurations): a "Business as Usual" (BAU) case (with typical / basis equipment and material), a "strictly QCVN09 compliant" case, and the finally "proposed" case, including all proposed design recommendations made by the technical team for higher efficiency. This was followed by a financial analysis i.e. related costs, payback period and expected energy saving and profits, etc. for decision of the building owner.

Whenever possible, i.e. when the building could actually start construction, the TA then also supported design and construction teams in order to ensure that design recommendations could actually be implemented during the construction phase and until the Testing and Commissioning step in a proper manner. This has been the case for Anland, Nam Cuong, Feliz and vista Capitaland, CONINCO office building, etc. Unfortunately, some others like Golden Lotus and Daikin projects have not been able to apply the technical advice due to their serious delay in construction.

Figure 17 – Land Breaking Ceremony (Mar 2021) at New Admin and Educational Center (CUWC)

Figure 18 – A site visit at New Admin and Educational Center (CUWC)

At end of the construction stage, the energy modelling was re-done to obtain the final expected figures in terms of energy savings and GHG emission cuts. Although energy modelling figures are not necessarily accurately forecasted the future actual energy consumption, such data could represent a first baseline.

Existing buildings

Provided technical assistance to existing buildings mainly consisted of the performance of energy audits, provision of technical and financial analysis results and of technical recommendations for the renovation of identified equipment and materials. Depending on financial, operational and technical situations, a partial or entire list of recommendations got accepted and retrofitting works initiated. As a matter of fact, primary audit results got used as a reference baseline to calculate actual savings.

Similar to the new buildings, the technical support was also provided during the renovation through review of technical requirements for expected replacements and other crucial inputs. The renovation works were mainly implemented by a third party procured by the building owner, and PMU's technical support also covered this stage with bid preparation, bid evaluation, monitoring of the renovation, testing and commissioning works in order to ensure the expected quality level. When retrofitting works could take place before the project end, energy savings results got analysed through the M&V system, in view of forecasted / planned savings during the audit.

<u>Phase 2</u>: Application of M&V systems (verification of results and sustainability of impacts)

Together with the technical support to the design and construction/ renovation of buildings, the TA also provided the assistance for definition of the M&V system and later on supplied it (if need be) for a number of buildings to help measure and record the energy saving during their operation for appropriate and timely actions of the building owner. In parallel with the construction

work, the purchase of M&V systems was supported by either PMU through the building owner (if appropriate and agreed by the donor) or UNDP. At the end of the project, there were 04 M&V systems installed for 03 new (Felix En vista, Coninco and New Admin and educational building, College of Urban Works Construction) and 01 existing building (Somerset).

To guaranty effective and sustainable operations of such a system, a training on how to operate the M&V system was also provided to the building energy manager/ officer(s) after the installation. The ones (Metropole Hotel, DIC office, etc.) with minor repair/ replacements of energy equipment or with a BMS system available were not installed, energy checks after renovation were implemented for them instead.

Figure 19 – Installation of the M&V system at CUWC

Whether the construction could be completed or not, a tailor-made guideline document (a 5-year EE&C plan as mentioned in Output 3.1) stating short-term, mid-term and long-term actions to be conducted, has been discussed and sent to each building owner in order to adequately monitor energy consumption of the building for further improvements if needed. The regular monitoring and verification of energy consumption, based on EECB project's provided advice, would serve as a mean of verification for the implementation of this EE&C plan and appropriate correction actions (if needed). With the establishment of the SEC profiles and energy benchmarks and operation of the online SEC, the building owner would be comprehensively equipped with tools to locate their position among the others or itself by time with timely correction actions for each energy equipment if necessary. The detailed technical results to 23 demonstration buildings are presented in A

Output 3.3 Documented and disseminated results and lessons from the demonstrations of implementing EEBC and EE&C in new and existing buildings

Numerous building related conferences with key inputs to Green Building Week events (2019, 2020)

The results and lessons learnt from demonstration projects have been documented and disseminated all along the project implementation in project events and related other contributions.

Building fact sheets were the very first key products disseminated through such project events such as GEF Conference 2018, Viet Nam Green Building Week (GBW) 2019, Viet Nam Energy Summit organized by the government in 2020, etc. An individual project profile

sheet was produced for every new and existing demonstration buildings, recapping building's general information, qualitative and quantitative data for each brought improvements (building envelope, air conditioning system, lighting system, etc.), financial analysis figures, total estimated energy savings and GHG emission cuts. Such project information sheets have been published in hard and soft copies for wider dissemination and are available on the MOC EE website.

Besides, organised trainings represented opportunities to showcase component 3 outcomes. The first training sessions related to QCVN09:2017/BXD compliance encompassed lectures about Integrated Energy Design techniques, including specific group work exercises organised to generate the necessary synergies in between architects and engineers, following the lessons learned during demo projects. Besides, the presentation of estimated energy and financial savings achieved along the demonstration buildings performance demonstrated the feasibility and viability of proposed EE designs to demo building designers.

Besides, in 2020, specific trainings dedicated to energy audit, buildings retrofitting and energy management, also generated a strong interest among energy service providers, building owners and managers, and equipment manufacturers. In addition to necessary theoretical aspects detailing Energy audit methodology and principles, Energy management and energy monitoring systems, the project could present its achievements regarding retrofitted real case studies that also illustrated the viability and profitability of such cases nationwide in several different building typologies.

Notably, the project also took the opportunity to disseminate such achievements during the Vietnam Green Building Week events, organised in both 2019 and 2020. These 3-day events gathered nearly 1,000 participants from building and construction sectors stakeholders.

Besides, other specific events (i.e. the handover of M&V system for Somerset Grand Chancellor) have been organised to showcase some of the demonstration buildings in particular. Results got also disseminated through other workshops (i.e, Energy nexus conferences, Viet Nam Energy Summit organised in 2020, Viet Nam Smart Cities Summit organised by MOC in 2020, etc.). During these events, site visits at Coninco office buildings, Somerset Grand chancellor were also conducted to provide practical illustrations and visualisation of achieved works.

The project's information, approach and results were also shared at the Viet Nam Energy Partnership Group meetings/ conferences to present project's achievements to government officials, international donors and other Energy related actors.

A specific technical report, like the "Component 3 lessons learned report" is also available to provide a summary of approaches, procedures, technologies recommended, challenges and opportunities faced and recommendations for integration of EE in the design, construction and operation of buildings as well as for building retrofits.

All of these communication products can be found at the webpage of EECB which is integrated in the MOC website[17].

ID.	Indicator	Baseline	EOP Target	EOP Result	% of Completion	Rating to target level
14	No. of demonstration projects that adopted EE equipment, building materials and building energy monitoring and management/control systems promoted by the EEBC project by EOP **(I.13)**	5	21	23	112%	Over target
15	No. of completed M&V exercises in accordance with the guidelines proposed by the project by EOP **(I.14)**	0	16	17	106%	Over target

Table 6: Results of Outcome 3

2.3. Financial Performance

At beginning of the project, the total resource was expected to be US$ 24,696,550 contributed from 03 resources namely GEF, parallel resource and in-kind contribution from UNDP and the government. However, at EOP, the total allocated resource was up to US$ 128,938,639 with the major change recorded from the contribution of the private sector as can be seen in the table below:[18]

Description of project resources		Expected Resource at BOP[18]	Actual Resource at EOP
Total allocated resources:		***24,696,550***	**128,938,639**
· GEF		***3,198,000***	***3,198,000***
· Parallel		***16,728,550***	***120,388,683***
	o UNDP	150,000	150,000
	o Private Sector	16,578,550	120,238,683
· In-kind Contributions		***4,770,000***	***5,351,956***
	UNDP	2,070,000	2,070,000
	GoV	2,700,000	3,281,956

Table 7: Planned vs. Actual Project Resources

2.3.1. GEF Funding

At end of the project, the disbursement amount is US$3,198,000, accounting for 100% of the approved budget of US$3,198,000. Detailed disbursement amounts of each component are as presented in Table 8: Planned vs. Actual Project Disbursement by Component below.

[17] *www.tietkiemnangluong.xaydung.gov.vn*

[18] *PRODOC, Section III – Budget and Workplan*

Name of Component	Planned (US$)	Actual (US$)
I	635,500	770,158.98
II	807,500	733,457.07
III	1,605,000	1,606,927.27
IV	150,000	87,456.68
Total	**3,198,000**	**3,198,000**

Table 8: Planned vs. Actual Project Disbursement by Component

The funding allocation by year is however different. As shown in the chart below, the disbursement of the GEF resource was expected to be at peak in the second year. However, it was different in the reality with a very low disbursement rate in the first two years but a gradual increase by time.

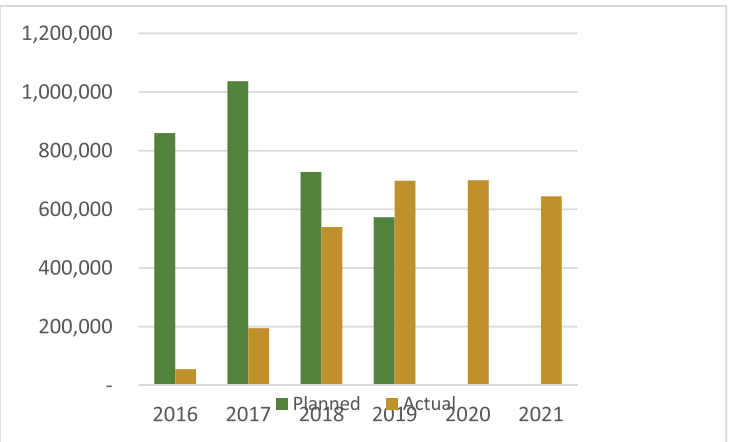


Figure 20 – Planned vs. Actual Project Disbursement

This difference was mainly because of the project owner's limited experience as a newcomer in management of a NIM project at the project start, which had caused significant delays in the first year. In addition, the limited high-quality human resource in the EE building sector was also another reason hampering the engagement of expected experts in project activities in the first years. Thanks to timely and flexible solutions of both MOC/PMU and UNDP/GEF, these constraints had been step by step addressed, resulting in a growth in disbursement in following years. In the end, this delay did not result in any adverse influence on both technical and financial delivery of the project, it enriched the project owner with lessons for future projects.

2.3.2. Co-financing Funding

The co-financing resource is understood as a total amount of parallel and in-kin contributions of UNDP, Vietnamese government and private sector as indicated in Table 8: Planned vs. Actual Project Disbursement by Component. While the UNDP funding comes from in-kind and cash contributions such as human resources to support the project, office

allocation, and etc.; the government's consists of (i) human resources for project management and implementation assigned by MOC; (ii) office facilities arranged for PMU and project staff ie. office space, utility water and electricity costs; (iii) logistic costs for the meetings organized in the MOC compound (meeting room, water and electricity costs); and (iv) studies and tasks for promotion of EE in buildings implemented by MOC. The project has successfully leveraged the co-financing much beyond the commitments made at the time of CEO endorsement. In particular, the Project has additionally engaged with 22 project developers with an investment commitment of about USD 112.7 million for the project with total investment commitment to nearly USD 115 million as mentioned above, achieved nearly 7 times higher than the project targets. Please see Appendix 5 – Parallel Financing Resource for sector. for details.

2.4. Factors that affected the project implementation

2.4.1. Policy environment

The EECB project had been implemented in the period (2016 – 2021) when the development of EE and green buildings has become a growing trend in the world. This trend has been quickly responded in Viet Nam with significant changes in institutional environment that had resulted in policy support achievements of the EECB project.

Global Context

Since commencement of the project implementation, several major steps have been made to push further the sustainability agenda. In September 2015, the United Nations and world leaders defined and commited to the 17 Sustainable Development Goals (SDG). They represent a series of ambitious objectives that target to end extreme poverty and hunger, fight inequality and injustice, and tackle climate change, by 2030. The building and construction sectors are related to 9 of these goals. Soon after the same year, the twenty-first session of the Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC) (COP21) paved the way for signature of the Paris agreement later in 2016, aiming to keep global warming below 2°C above pre-industrial levels, and even preferably limit this increase to 1.5 °C, as per recommended by the IPCC (Intergovernmental Panel on Climate Change).

Besides, specific initiatives have also been initiated to address EE and carbon emissions in the building sector. The International Energy Agency (IEA) issued the "Efficient World Scenario" EWS in 2018. It states that potential energy savings using current available technologies could still allow a world population to grow by 20%, with a 60% more building space with no additional energy use by 2040.

In 2018, the World Green Building Council, in line with the UN SDGs, advocated for a Net Zero Carbon Building commitment. It called businesses, organisations, cities and

subnational governments to reduce all operational and embodied carbon emissions within their portfolios by 2030, and to advocate for all buildings to be net zero whole life carbon by 2050. Such an objective aims at halving emissions of the building and construction sectors by 2030 and at a total decarbonization by 2050.

Such momentums have partly resulted in stronger efforts and actions of relevant entities including the Vietnamese government and UNDP to reduce GHG emission in Viet Nam in general and in building sector in particular *(These efforts and actions will be discussed further in the next section National Context).* By demonstrating that significant energy savings could be achieved in both new and existing buildings, and through new EE policy developments, the EECB project surely helped MOC to start paving the long way for a successful implementation of the Efficient World Scenario (EWS) and the Net Zero Carbon Building objectives.

National Context

In response to the global trend in development of EE and green buildings, Vietnamese commitments in the Paris Agreement (2015) and requirements of the socio-economic development plan of the government, the Vietnamese Government has taken a number of actions to reduce energy use. One could be listed as Decision No.2053/QD-Ttg dated 28 October 2016 on Implementation Plan of Paris Agreement on Climate Change and then Decision 280/QĐ-TTg dated 13 March 2019 on National Program on Economical and Efficient Use of Energy (VNEEP3). The common point of these two decisions is to promote the efficient use of energy in order to reduce the GHG in Viet Nam. Decision No. 280/QD-TTg has specified a number of targets related to the construction sector i.e (i) 80 buildings certified as green or EE buildings by 2025 and 150 by 2030; (ii) 50% of construction materials energy-labeled; (iii) related codes/ standards/ regulations reviewed and developed/ revised; (iv) institutional support mechanisms to be studied/ issued for development of ESCOs, etc. This has been further directed with Resolution No.55/NQ-TW dated 11/02/2020 by the Vietnamese political bureau on directions for strategy on development of national energy to 2030 with view to 2045. The reslution has indicated specific requirements for Vietnamese energy sector to achieve in each phase in order to ensure adequate energy for national development. Beside energy production requirements, it also emphasizes the energy saving target of 7% by 2030 and 14% by 2045 against conventional conditions. As follow-up to this decision, MOC (with the project support) issued a master plan for implementation of EE tasks for the period 2020 - 2030 (Decision 1677/QĐ-BXD dated 30 December 2020) as reported in Section 2.2.1 above). On the other hand, the promulgation other related laws such as Law of Planning, Law of Public Investment, Law of Architecture (2019) after Law of Construction (2014) uplifted the needs of amendment of Law of Construction. Initiated by the National Assembly in 2019, this was a good opportunity for the EECB

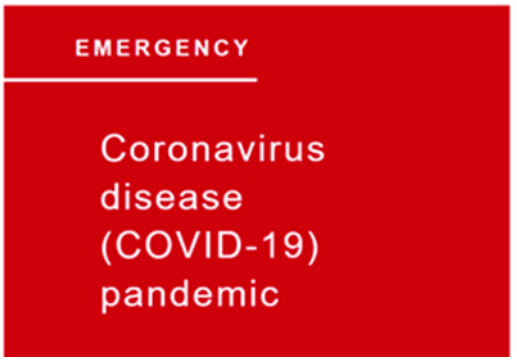
project to have valuable contributions to this process which was followed by a series of discussions, meetings, consultations. Thanks to the amendment, promotion of development and certification of EE and green building was first time ever stipulated in a law and then followed with other by law documents which have been mentioned in Section 2.2.1 above. Besides, the EECB project was also involved in the revision of Decree 21 on Efficient and Economical Use of Energy, an on-going process led by Ministry of Industry and Trade, with inputs to the drafts through written and consultation workshops.

In general, international and national policy achievements, as mentioned above, have made positive influence on the project implementation, resulting in significant project achievements (for example, inputs to the Law on amendments of a number of articles of Construction Law (2020), Decree 15/2021/ND-CP, etc.). This process will be continued in following years with consolidation or development of other by law documents such as Decree 46/2015/ND-CP, Decree on development of green buildings, etc.

Regarding project management policies, there have been a number of new decrees and circulars issued during the project implementation, which have affected both the project procurement and management. The Law on Procurement No.43/2013/QH13 which came into effect on 01/7/2012 was followed with a series of replacement documents, for example, Decree 63/2014/ND-CP (effective on 15/8/2014) and circulars guiding development of bidding documents based on the new law. These new policies required an adaptive approach of the project owner who, as mentioned earlier, was a newcomer to both NIM modality and procurement activities. Notably, the regulation on announcement of procurement information on the website of the MPI (http://muasamcong.mpi.gov.vn) and online procurement obligative to a number of packages was transparent; however, it was also a challenge to PMU regarding deadlines of the announcement and information-uploading issues. On the other hand, the government also issued a number of new decrees and circulars instructing the project implementation namely Decree 16/2016/ND-CP effective on 12/5/2016, supported with Circular No.12/2016/TT-BKHDT coming into effect on 22/9/2016 and Decree No.132/2018/ND-CP effective on 01/102018 regarding amendment and supplementation of Decree 16/2016/ND-CP. With these decrees, the extension of EECB project had met a number of difficulties regarding the competence of extension approval, which would then be addressed with the new decree No.56/2020/ND-CP dated 25/5/2020. However, the new decree has still affected the project closure with VAT-refund regulation (Clause 4, Article 80) about the certification responsibility of financial incoming - outgoing resources between MOF and State Treasury. This resulted in a PSC meeting dated 27/8/2021 to seek advice from PSC and PMU on solutions and then a number of official letters among PMU, the competent tax agency (Hanoi Tax Bureau) and MOF in order to fully address this issue.

2.4.2. Covid-19 Pandemic

Breaking out in a global scale since 2020, affecting hundreds of countries, Covid-19 pandemic has made severe impacts on many fields of human life and society with no signal of its end. Many countries have applied "lock-down" or "social distance" in order to limit the coverage of this disaster since it can be transmitted through close contact.



Considered as one of the most severe pandamics in history, Covid-19 pandamic has severly impacts on health, education, economy, trade, etc. It has even dramatically changed the habit of communication with online means used more frequently. Priorities of many countries have been changed also to be adapted to the new situation.

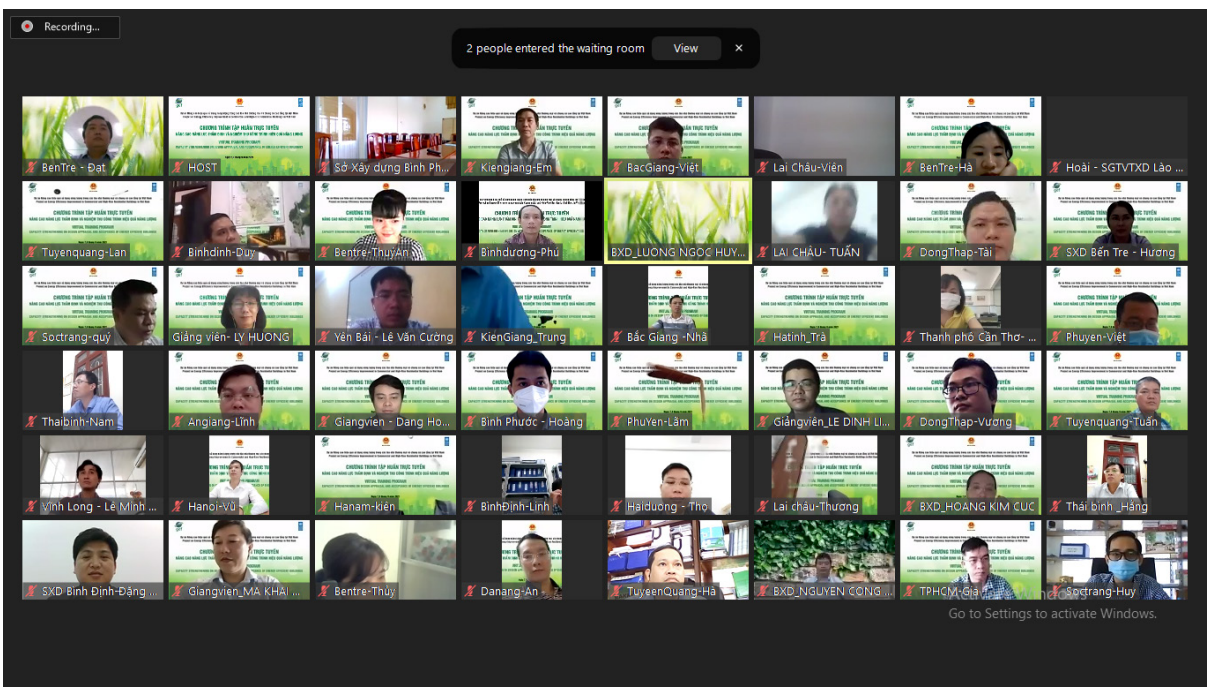


Figure 21 – A virtual training course organized by EECB Project in Sep 2021

Among Covid-19 affected countries, Viet Nam has gone through 03 waves of Covid-19 since its start and been in the forth wave since Feb 2021. In fighting to the pandemic, Viet Nam has applied "lock-down" and "social distance" with flexible measures since 2020. Falling in this period, the EECB project has been dramatically impacted with a number of activities affected namely: additional surveys of energy consumption in buildings, consultation workshops or training program, field missions. The project has applied flexibile messures to replace the face-to-face training by virtual training or undertake online energy certification of buildings, etc.) and/ or a combination of these forms. Thanks to various solutions applied, the project is still

able to deliver activities and outputs as planned.

2.4.3. Project Management

The historical milestones of the project formulation can be briefed as follows:

- *Decision No.74/QĐ-TTg dated 11/01/2016 by Prime Minister on list of projects and programs funded by UNDP; of which EECB project was decentralized to Ministry of Construction, and the Department of Science, Technologies and Environment as project owner;*
- *Decision 209/QĐ-BXD dated 09/3/3016 by MOC Minister on approval of EECB Project Document;*
- *Decision No.330/QĐ-BXD dated 08/4/2016 by MOC Minister on establishment of the Project Steering Committee. (Due to changes in human resources, the PSC continued to be adjusted twice with the first on 19/4/2018 at Decision 524/QĐ-BXD and the second on 19/6/2019 at 548/QĐ-BXD.)*
- *Decision No. 360/QĐ-BXD dated 14/4/2016 by MOC Minister on establishment of the project management unit. (Due to changes in human resources, the PMU continued to be consolidated on 20/4/2019 at Decision No.539/QĐ-BXD.)*
- *Official Letter by UNDP/GEF dated 04th February 2020 on no objection to the project extension to 31st March 2021;*
- *Decision No. 335/QĐ-BXD dated 10/3/2020 by MOC Minister on project extension to 31st March 2021.*
- *Official Letter by UNDP/GEF dated 21st July 2021 on no objection to the project extension to 30th September 2021*

As presented in Section 1.4, the project is directly managed by a project management board under direction of a project steering committee led by a MOC Deputy Minister. The EECB project was undergone two independent evaluation missions of UNDP/GEF (2019 and 2021), two micro assessment of project implementation capacity (2016, 2020) and 05 project audits (2017, 2018, 2019, 2020 and 2021). As evaluated, the capacity of both executing agency (MOC), project owner (MOC DOSTE) and PMU have been rated as satisfactory with low risks. However, it should be emphasized that it was a strong attempt of the implementation agency to achieve such significant results since it is the first project that is NIM-implemented. The delivery of technical and financial results as mentioned in the above sections has well reflected this attempt.

Procurement

The procurement activities have been done in full compliance with the HPPMG and regulations of the Vietnamese government (Law of Procurement and its related guiding documents). Based on the approved AWPs which covered new activities that may require the formulation of procurement packages, the EECB PMU would develop a procurement plan with

details of the name, package value, form of procurement, time of procurement, etc. These plans have been would be reviewed and approved by Ministry of Construction for implementation. Although the procurement activities can be solely done by PMU, related TORs were always consulted with UNDP for consensus.

With nature of a short-termed project with small-sized packages, the applied procurement process is on one hand to guarantee the transparency and accuracy of related costs; on the other hand, is lack of flexibility since it takes time for approval steps and related justifications, which was part of the reasons of project delays. According to the practice of the EECB project, it took 2-6 months for an individual consultant recruitment package, 6 – 10 months for a consulting firm one. This issue was discussed not only at PMU level, but at a PSC meeting (PSC Minutes of Meeting 2019), of which it was decided that PMU may request UNDP to support the procurement in order to speed up the project progress. Despite such an effort, delays in a number of procurement activities were still one of the delays in project implementation .

Social and Environmental Impacts

In the project preparation phase, a social and environmental risk screening checklist was completed, aiming at figuring out the potential risks to human rights, gender equality, women's empowerment and environmental sustainability. It was concluded that there would be no risk to the said fields; however, there would be a number of standards to be aware during the project implementation and followed by the project as described below:

- *Standard 2: Climate Change Mitigation and Adaptation: 2.2 – Would the potential outcomes of the project be sensitive or vulnerable to potential impacts of climate change?*
- *Standard 3: Community Health, Safety and Working Conditions: 3.7 - Does the Project pose potential risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during Project construction, operation, or decommissioning?*
- *Standard 7: Pollution Prevention and Resource Efficiency: 7.2 - Would the proposed Project potentially result in the generation of waste (both hazardous and non-hazardous)?*
- *Standard 7: Pollution Prevention and Resource Efficiency: 7.3 - Will the proposed Project potentially involve the manufacture, trade, release, and/or use of hazardous chemicals and/or materials? Does the Project propose use of chemicals or materials subject to international bans or phase-outs? (For example, DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Conventions on Persistent Organic Pollutants or the Montreal Protocol)*

The project execution has indicated the close relation of Component 3 – Building EE technology applications and replications with these standards. The risks were however indirect

since they would mainly caused by the construction/ renovation of demonstration buildings, not by the EECB project itself. The EECB PMU has tried to minimize those risks through explanations of the risks and responsibility obligations with building owners mentioned in all Minutes of Understanding signed between PMU and each building owner. Up to date, there have been no adverse results or impacts originated from those risks recorded.

Gender Equality

The project gender analysis report indicates 10% of human resources in the construction sector being female which implies a less than 10% percentage of female technical labors in this sector. To promote the participation of women in project activities and construction sector, the EECB project has encouraged the participation of women in project activities through (i) getting them involved in project consultancy services (female experts available in 20/59 UNDP/ PMU's contracts, accounting for a percentage of 34%[19]) and (ii) training activities (60/558, corresponding to 11%[20]). Compared to a less than 10% percentage of female technical labors, these results have proved a positive impact of the project on the gender mainstreaming in the project activities.

M&E Activity

The M&E activities were done in various manners including: (i) project implementation workplans and reports developed annually and quarterly; (ii) annual project implementation reports to GEF and MOC; (iii) site visits. A participatory approach has been applied in all related activities. For example, based on a SMART template provided by UNDP (in HPPMG), the project implementation workplans and reports were consulted with PMU, UNDP, PSC members with involvement of project stakeholders if required. Site visits were also consulted with UNDP and related parties in order to ensure the efficiency and effectiveness in terms of quality, time and cost of activities. Such M&E activities were useful to the project implementation since they helped to identify shortcomings for improvements of related parties, and therefore the implementation had been gradually better to the project end.

Risk Management

Similar to and at the same time with project M&E activities, the risk management has been regularly implemented by the PMU and discussed/ reported to the donor via regular workplans/ reports. Annual project implementation reports (PIRs), mid-termed report and final evaluation report also reviewed and updated the risks in order to ensure the risks well managed.

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[19] *Project Gender Analysis Report*

[20] *Summarized from Project Training Reports*

3. ANALYSIS OF SOCIO-ECONOMIC BENEFITS

3.1. Analysis of Achievements against project objective and design

As presented in Section 2.1, it can be concluded that the EECB project has fully achieved the committed objective and results, some of which even have gone beyond the expected targets at the project design. Considering the total GEF support provided to the project being USD 3.198 million, the cost of GHG mitigation works out to about USD 8.7 per ton of CO2e, corresponding to 64.4% of the expected cost per tCO2 (USD 13.5 at project design). Given the fact that buildings alone account for approximately 32 percent of global energy use, and for nearly 30 percent of total GHG emissions, including energy end-use emissions, electricity generation emissions and district heat[21], these results are positive and encouraging to building practitioners, especially project implementors.

3.2. Impacts on industry and region

Taking into consideration the specific situation of the country and its recent political will to foster energy efficiency measures to evolve in and around the building sector, the Project with its achieved targets and outputs has definitely created a significant impact in the country. With significant influences on the whole building cycle from design, construction, acceptance to operation in institutional, technical and awareness angles, the EECB project has contributed to the positive changes of the building and construction sector in not only recent years but also in long term. Covering a wide range of new and existing high-rise building types, the Project anticipates bridging policy implementation and technical best practices through some of its major outcomes:

- *Inclusion of energy efficiency provisions into the revised Law on Construction*
- *Improvement and enforcement of EE building code*
- *Promotion of energy audit, energy management, and investment opportunities in new and existing buildings*
- *Demonstration of best practices in new building design and renovations.*
- *Education and outreach to build replications.*

"Without the Project, improvements in building energy performance will only come slowly in pace with partial enforcement of the revised EEBC and phasing out of obsolete technologies, rather than being at the forefront of technology development. This is largely a consequence of the fact that without awareness/knowledge of the cost implications of design

[21] *Source: Main Issue, Energy Efficiency, GEF website*

and construction of low energy- efficient buildings, without access to attractive and reliable financing to build better, without effective implementation of the revised EEBC, and without supportive networks of information, incentives and expertise, there is little pressure on the market to move faster than a least-building-construction-cost philosophy would demand."[22]

As a fact, the EECB project has left its footprints in many policy achievements in policy improvements such as the new law on amendments of a number of articles of Construction Law 2013, Decree 15/2021/ND-CP, 11 technical standards, a revised cost norm, etc. It helped improve the EE practicing capacity of 117 demonstration staff through 23 demonstration projects; 558 building engineers, architects, DOC officers, etc. through 09 training courses, thousands of construction students who will be benefitted from related lectures technically supported by EECB project regarding EE contents, thousands of trainees who will visit the 04 energy modelling system installed by the project and millions of other indirect beneficiaries, especially building users. Such project results have been shared with international partners through such high-level events as GEF conference June 2018, an overseas study tour 2018, Energy Summit in Viet Nam 2020 and Green Building Week (GBW) 2019 and 2020, etc. These impacts can be measured in some cases i.e demonstration projects and feedbacks of the trainees. In many other cases, it can hardly be quantified but still physically proved, for example, through a written direction by the Prime Minister right after the GBW event 2020 on the necessity to develop green buildings or a series of legal documents in relation to efficient use of energy in buildings promulgated during the project implementation.

3.3. Sustainability

The Project was designed to have a balanced mix of capacity building and enabling environment activities tailor-made to the specific market and regulatory environment in Viet Nam. Such balanced mix of activities has been expected to promote the enforcement of the revised EEBC and the application of building EE technologies. Replication is considered to be an integral component of the project design as the expected energy savings from the application of EE technologies in the building sector in Viet Nam rely on the replication of the relevant Project activities.

As evidenced, the EECB project has significantly contributed to all above fields including policy strengthening, capacity building, on-the-job trainings and replications at demonstration buildings. Such interventions are also reflected through consolidated policies for promotion of these building typologies in Viet Nam during the project implementation (the new law on amendment of a number of articles of Construction Law, related decrees, revised cost norms, etc.). With 86% out of 558 trainees confirming the usefulness of the capacity strengthening

[22] *Mid-Term Evaluation Report (UNDP/GEF)*

courses provided by the project[23], the code compliance therefore has been reinforced and will be certainly strengthened in future. In addition, results of the technical support to demonstration buildings with 75 solutions applied have been widely disseminated through Green Building Week event in 2019 and the workshop on renovation of EE buildings in November 2020 and summarized in the lesson learnt report and related training materials. Together with written inputs to building EE-related curriculums of the Hanoi University of Civil Engineering, these technical results will firmly be valuable for the building practitioners in Viet Nam in long term. As such, the project sustainability has been evaluated as "likely sustainable" in the final evaluation report.

4. LESSONS LEARNT AND RECOMMENDATIONS

This section presents a number of important lessons learnt and recommendations during the project implementation. Other key lessons and recommendations can be sought from the other project reports namely (i) Executive report on development of SEC, energy benchmarking and energy certification system in Viet Nam; (ii) Lessons learnt Report (focusing on technical lessons from demonstration buildings); and (iii) EECB Policy Brief Report.

4.1. Lessons learnt

Several lessons could be learned along this project implementation which can be broken down into 02 major areas i.e technical aspect and project management considerations.

a. Technical Lessons:

- Lack of regulations on energy-efficient use in operation phase for buildings: Although various construction activities are regulated in Construction Law 2014 (Clause 21, Article 3) i.e construction planning, development of investment projects, surveys, design, construction, construction supervision, acceptance, hand-over, maintenance, etc. The building operation management (except for maintenance work) however has not been mentioned in the law while the operation phase, as mentioned in the earlier part, emits the GHG most. This shortcoming therefore leads to a lack of the building owner's concern in their energy performance, resulting in slow changes of the market in reduction of energy consumption during operation.

- No incentive schemes for development of EE buildings: As mentioned in Law 62/2020/QH14, the government encourages the development of EE buildings regulates. This is a legal base that allows the promulgation of supporting mechanisms for development of

[23] *M&E Project Report 2021*

this building typology in Viet Nam. It should be noted that incentive/ penalty mechanisms are necessary, and non-financial mechanisms proposed by the EECB project can be put into the policy development program of the government to push up the EE and green building development market.

- Enormous energy reduction potential in high-rise buildings: With 75 solutions applied at 23 new and retrofitting buildings, it has been proved that EE new and retrofitting buildings are viable business models and that the investments in EE buildings are not that much, the incremental cost for EE inclusion is 2.6% with the payback time of less than 4 years on average while it helps save up to 67% energy consumption volume compared to conventional conditions.

- Lack of prerequisite inputs for development of Building EE service companies in Viet Nam: Many studies show that there is a potential for development of the ESCO market in Viet Nam. The development of this type of market will allow to effectively mobilize financial resources for EE buildings. However, this market including that for the EE building is faced with a number of challenges including financial and legal constraints and limited human capacity. There is a need to address the issues relating to the requirement of legal documents for paying for the energy savings in case of implementation of the EE measures through ESCO route for the government buildings and government owned enterprises. At the same time need to have guidelines on M & V system to verifying the ESCO energy savings achieved. Such an accreditation process, a legal contract template and M&V system are the prerequisite conditions for development of ESCOs in Viet Nam.

- Demand and need for EE vocational trainings: The demand for EE knowledge is high among designers, builders and even building operators, however no permanent training structure exists nationwide. Besides, not many case studies or demonstration buildings are available for visit to inspire practitioners, developers and building owners.

- Lack of awareness of the general public: Although EE and green building concepts finally arise in the society, related knowledge still remains quite limited among most stakeholders. EE environmental and financial benefits are not regularly advertised to the general public.

b. Project Management

- TA and demo project development respective timeline inadequacy: Building design and construction phases are often spread over several years, which might represent an issue as the development timeline of the demonstration buildings might not be fully compatible or adequately phased with Technical Assistance's one. This means that the provision of TA all along design, construction, and operation stages is rather impossible as such a timeline normally requires at least 6 years. Besides, it also meant that the TA could often only start when the design was already quite advanced, limiting the scope of potential EE improvements.

- Frequently updated regulations of the government: it has been observed that there have been quite a lot revisions in legal documents during the project implementation. Some have been updated only after one year revised. For example, the decree on ODA project management or the cost norm on construction. Such amendments require a high adaptation capacity of the implementors. However, thorough considerations of policy makers during the revision would minimize the need for future revisions.

4.2. Recommendations

a. Technical Considerations

- Promulgate (and yearly update) the SEC, energy benchmarks, energy certification and M&V system as a toolset to help reduce energy consumption in operation phase: It appears crucial to put this system in place and apply the certification voluntarily in the short and compulsorily in the long term. With the online submission platform, this system should be enriched with more building typologies and data yearly. The pilot tested EE certification system developed though the EEBC project should also be similarly yearly expanded and advertised to become a national milestone. This is an effective way to raise building owners and public awareness. It is the only proven way to monitor and improve the existing building stock performance, and to use this feedback loop to improve EE codes.

- Define incentive schemes for EE and Green Buildings: As required efforts to surpass EE code requirements can sometimes lead to incremental costs, central and/or local governments should provide financial or non-financial/fiscal incentives to help cover these ones in a first place if specific requirements of EE and Green Buildings can be satisfied by the building owner. For this recommendation, the project recommendations on incentives on granted special features like floor area, height can be considered.

- Promulgate a national Energy Monitoring, Reporting and Verification (MRV) system and ESCO development roadmap: Based on the proposal made by the EECB project to adopt an adapted version of the IPMVP – ISO 17741:2016 system and CDM, the government should select and promulgate such an official Energy saving Measurement and Verification system. It will help foster the development ESCOs and Energy Performance Contracts and provide that GHG emission cut data for statistical purposes.

- Establish a building material testing center and EE material labelling scheme: MOC should establish a dedicated testing center(s) and define a labelling system to assess EE properties. Besides, MOC should also regularly update and upgrade both online building materials and equipment databases. Besides, MOC should also study and apply advanced technologies for production of green construction materials.

- Organize intensive training programs on development of EE and green buildings. These programs should focus on provincial officers, building owners, building developers, construction engineers and architects, building managers. Training materials and manuals have been uploaded to the MOC website[24].

- Implement further awareness raising programs focusing on building investors and building users: Building on previously organized events, like the Viet Nam Green Building Week 2019 and 2020, it is important to continue running such yearly event that attracts a larger audience each passing year. Other punctual EE and green building events should be regularly organized all year long. Annual official disclosures of building Energy consumption benchmarking, EE certifications and other related contests and campaigns should be organized to help mainstream such new concepts to the public. Lessons learnt from demonstration projects, especially the technical and economic efficiency of EE buildings should be broadly disseminated at such events.

b. Project Management

- Indicator "Direct Reduction in the GHG emissions over the lifetime of the investments made during the project implementation" to be recommended for such type of this project: Considering that the process of building approval, detailed design, and actual construction involves time consuming sequential activities, any new building complying with the energy efficiency (EE) building code will at best get occupied towards the end of the implementation timelines of the GEF project. Thus, the benefits of the project in terms of reduced energy consumptions (and reduced GHG emissions) would get realized only after the project implementation timelines. In this regard it is important to note that as per the Revised Methodology for Calculating GHG mitigation benefits for the GEF Energy Efficiency Projects, for projects where building codes lead to building EE improvements prior to the project closure, the resulting emission reductions (over the lifetime of those improvements) are considered as direct project impacts. Building improvements that occur after project closure are considered to result in direct post-project impacts. Hence, for future mitigation/ energy efficiency projects, the indicator of "Direct Reduction of the GHG emissions) should be designed as "Direct Reduction in the GHG emissions over the lifetime of the investments made during the project implementation".

- <u>Project deliverables hand-over</u>: at this stage, project deliverables are owned by the Ministry of Construction. However, they should be widely disseminated to building practitioners through easy-to-access channels such as the MOC website and such project beneficiaries as

[24] *http://tietkiemnangluong.xaydung.gov.vn/project-c60.html*

MOC DOSTEs, IDC, Sihub, etc. The detailed recommended beneficiaries are presented in the Appendix 6 - List of key technical materials of EECB Project for hand-over.

- **Project asset hand-over:** based on the project document and/or the approved annual workplans, a number of goods have been purchased and installed at the project office or project beneficiaries, it is recommended that these project assets be handed over to where it is most useful to as mentioned in the Appendix 7 - Project Fix Assets.

Ha Noi, 30 September 2021

Approved by: Vu Ngoc Anh[25]

National Project Director

[25] *Drafted by: Hoang Kim Cuc, National Project Manager*

Appendix 1 - Updated List of stakeholders and roles in the project

Stakeholders	Role
Ministry of Construction (MOC)	Implementing partner and key central government proponent for EE in buildings, including commercial and high-rise residential buildings. Responsible for managing and operating day-to-day project implementation.
Ministry of Industry and Trade (MOIT)	Responsible party involved in developing policies, standards and regulations for energy end-use equipment. MOIT will also provide technical advice, co-develop and review activities related to training, certification system for energy auditors and energy managers in the building sector.
Ministry of Finance (MOF)	Responsible party involved in co-development of incentive/penalty scheme(s), mechanisms to support EE in the building sector.
Ministry of Science and Technology (MOST)	Participating agency involved in developing policies and providing technical advice on EE standards for energy intensive appliances and equipment in buildings, building construction materials and provision of technology transfer.
Local Governments and Local Authorities (Provincial and District Departments of Construction – DOC - and Departments of Urban Planning - DUPA)	Local agencies responsible for monitoring EE compliance during and after the construction phase and reviewing EE compliance against previously defined zone restrictions for new development, urban development plans, and environmental ordinances who will be involved in and benefit from capacity building on integration of EE in project design, energy auditing and certification of EE compliance.
Center for Energy Efficiency in Buildings (CEEBs)	CEEBs under MOC will be involved in gathering relevant data, delivering technical training for energy managers, energy auditors, and conducting research and development on EE in buildings. CEEBs' capacity will also be enhanced through knowledge sharing during training and workshops.
Energy Conservation Centers (ECCs) in Hanoi and Ho Chi Minh	Local agencies responsible for provision of research, consultation and capacity building to government and private sector organizations to implement EE&C. ECCs has already been involved in development of energy database and energy benchmarking for buildings.
Academia (Hanoi University of Architecture, HCMC University of Architecture, National University of Civil Engineering, and other universities and institutes)	Universities and institutes will be involved in the development of capacity building for organizations and individuals involved in design, development and implementation of EE buildings.
Building Developers (Viet Nam National Construction Consultants Corp., CONINCO., JSC, Housing and Urban Development Corporation)	Building developers will be involved in strengthening EEBC compliance during the design phase of new construction projects, and co-financing EE technologies and application in demonstration projects. Building developers will also benefit from capacity building, training, workshops and seminars.

Stakeholders	Role
Building Practitioners (Designers, Design Consultants, Building Sector Consultants, Contractors, Operators)	Building practitioners (organizations and individuals) play critical roles in delivering EE performance of buildings. They will be engaged in development and implementation of capacity building programs and development of demonstration projects. They will be identified and firmed up during project implementation.
Viet Nam Association of Civil Engineering Environment (VACEE), Viet Nam Association of Architects (VAA) and Viet Nam Green Building Council (VGBC)	Professional and industry association will play an active role in disseminating information and raising the awareness of different stakeholders on EE in buildings by using their current networks, and participate in development of demonstration projects.
Technology/Equipment Suppliers	These are partners for promoting EE and training/ workshops/ seminar activities. They will also support project activities with their expertise on technology and equipment through EE equipment exhibitions and by identifying demonstration opportunities.
Other stakeholders such as building owners, energy managers, groups of building technical managers (e.g. hotel chief engineers) tenants and occupants who directly pay for the energy consumed	These stakeholders will support investment (co-financing) in EE technologies, materials and products that can reduce their energy costs. Co-financing commitments have been provided by the following buildings which will participate as demonstrations: HITC Building, Hanoi Sheraton Hotel, Melia Hanoi Hotel, FPT telecom Building, JW Marriot Hanoi Hotel, Majestic Hotel, Cendeluxe Hotel, Michelia hotel, Vinpearl Resort, Somerset Service Apartment, Riverside Renaissance Hotel, Intercontinental Hotel, and Pedagogical University of HCMC.

Appendix 2 - List of Energy-Efficient Buildings certified by EECB Project

No	Name of building	Type of building	Address	Class
I	**HA NOI**			
Governmental administrative office building				
1	Thanh Xuan District People's Committee's building	Governmental administrative office building	No. 9 Khuat Duy Tien Road, Thanh Xuan Distr., Hanoi	C
2	Department of Performing Arts's building	Governmental administrative office building	No. 32 Nguyen Thai Hoc Str., Ba Dinh Distr., Hanoi	C
Small size commercial office building				
3	Au Viet Building	Small size commercial office building	No. 1 Le Duc Tho Str.,Mai Dich Ward, Ba Dinh Distr., Hanoi	B
4	Tòa nhà Vietinbank Đội Cấn	Small size commercial office building	No. 126 Doi Can Str., Ba Dinh Distr., Hanoi	C
Large size commercial office building				
5	Centre Building	Large size commercial office building	No. 1 Nguyen Huy Tuong Str., Thanh Xuan Distr., Hanoi	A
6	Cornerstone Buildling	Large size commercial office building	No. 16 Phan Chu Trinh Str., Hoan Kiem Distr., Hanoi	A
7	Handico Tower	Large size commercial office building	New urban area Me Tri Ha, Nam Tu Liem Distr., Hanoi	B
Mall				
8	Savico Megamall	Mall	No. 7-9 Nguyen Van Linh Str., Long Bien Distr., Hanoi	B
9	AEON Mall Long Biên	Mall	27 Co Linh Road, Long Bien Ward, Long Bien Distr., Hanoi	B
10	Vincom Phạm Ngọc Thạch	Mall	No. 2 Pham Ngoc Thach Str., Dong Da Distr., Hanoi	C
11	Royal City	Mall	No. 72A Nguyen Trai Str., Thanh Xuan Distr., Hanoi	B
Hotels 2&3 stars				
12	Thăng Long Opera hotel	Hotels 2&3 stars	No. 1C Tong Dan Str., Hoan Kiem Distr., Hanoi	C
13	Sen Hotel Luxury	Hotels 2&3 stars	118/26 Nguyen Khanh Toan Str., Cau Giay Distr., Hanoi	B
Hotels 4&5 stars				

No	Name of building	Type of building	Address	Class
14	Sheraton Hanoi Hotel	Hotels 4&5 stars	K5 Nghi Hàm Str., Quang An Ward,Tay Ho Distr., Hanoi	B
15	Novotel Suites Hanoi Hotel	Hotels 4&5 stars	No 05, Duy Tan Str., Cau Giay Dist., Hanoi	C
II	**HỒ CHÍ MINH**			
Governmental administrative office building				
1	Ho Chi Minh City Department of Science and Technology	Governmental administrative office building	No. 244 Dien Bien Phu Street, Ward 7, District 3, HCMC	D
2	District Party Committee of District 3	Governmental administrative office building	No. 99A Tran Quoc Thao Street, Ward 7, District 3, HCMC	D
Small size commercial office building				
3	Building 6A- QTSC	Small size commercial office building	No. Quang Trung Software Park, Tan Chanh Hiep Ward, District 12, HCMC	C
4	Kim Do Office	Small size commercial office building	No. 123 Le Loi Street, Ben Thanh Ward, District 1, HCMC	C
Large size commercial office building				
5	QTSC Building 1	Large size commercial office building	No. Quang Trung Software Park, Tan Chanh Hiep Ward, District 12, HCMC	B
6	QTSC Building 9	Large size commercial office building	No. Quang Trung Software Park, Tan Chanh Hiep Ward, District 12, HCMC	C
Mall				
7	AEON Mall Binh Tan	Mall	No. 1 No. 17A Street, Binh Tri Dong B Ward, Binh Tan District, Ho Chi Minh	C
8	AEON Mall Tan Phu Celadon	Mall	No. 30 Bo Bao Tan Thang Street, Son Ky Ward, Tan Phu District, Ho Chi Minh	C
9	Vincom Le Van Viet	Mall	No. 50 Le Van Viet Street, Hiep Phu Ward, District 9, HCMC	B
10	Vincom Thu Duc	Mall	No. 216 Vo Van Ngan Street, Binh Tho Ward, Thu Duc District, HCMC	B
Hotels 2&3 stars				
11	Golden Crown Hotel Saigon	Hotels 2&3 stars	No. 50A Truong Quoc Dung Street, Phu Nhuan District, HCMC	C
12	177 Hotel	Hotels 2&3 stars	No. 01 Nguyen Cong Tru Street, Binh Tho Ward, Thu Duc District, HCMC	B

No	Name of building	Type of building	Address	Class
13	Star 39 Hotel	Hotels 2&3 stars	No. 39 Nguyen Van Ba Street, Thu Duc District, HCMC	B
Hotels 4&5 stars				
14	Ramana Saigon Hotel	Hotels 4&5 stars	No. 323 Le Van Sy Street, Ward 13, District 3, HCMC	C
15	Norfolk Mansion	Hotels 4&5 stars	No. 17-19-21 Ly Tu Trong Street, District 1, HCMC	C

Appendix 3 - List of Demonstration Buildings and Related Technical Support Results

A. 09 New Buildings

Name of buildings	CONINCO Building	New Admin and educational building, College of Urban Works Construction	High-rise Residential and Commercial Building Y1 Capitaland - Felix En Vista	Anland 2 New High rise Residential in Hanoi	Golden Lotus Building	Ha long Inn	DIC Hotel of DIC CSJ	DIC Condotel of DIC CSJ	Headquarter building of Daikin Air Conditioning Vietnam JSC
	1	2	3	4	5	6	7	8	9
Location	Hanoi	Hanoi	HCMC	Hanoi	HCMC	Halong	Vung Tau	Vung Tau	HCMC
Building Type	Office	Office	Resi. Bld.	Resi. Bld.	Resi. Bld.	Hotel	Hotel	Hotel	Office
Building Floor Area (Sq. M)	20,279	3,338	66,500	56,500	5,564	27,507	32,110	37,077	15,108
Address	Trung Tu Diplomatic Compound, Dang Van Ngu, Dong Da, Hanoi	Yen Thuong Village, Gia Lam District, Hanoi	Floor 8, Vista Building, Y1 Lot, Dong Van Cong Road, District 2, HCMC	CT3 Building, Me Tri Road, Co Nhue Urban area, Yen Hoa, Cau Giay, Hanoi	No 7 Nam Quoc Cang, Pham Ngu Lao Ward, District 1, HCM	Area V, Bãi Cháy Ward, Halong city, Quang Ninh province	265 Le Hong Phong, Vung Tau City, Ba Ria Vung Tau Provice	265 Le Hong Phong, Vung Tau City, Ba Ria Vung Tau Provice	Tầng 14-15 số 201-203 Cách Mạng Tháng tám, P4, Q3, TPHCM
Estimated yearly energy saving proposed case Vs BAU case (MWh)	1,464	145	2,391	896	916	3,295	1,663	4,337	125
Estimated Energy saving % Proposed case compared to BAU case	48%	55%	36%	22%	67%	38%	22%	36%	31%
Estimated Investment cost increase	5.30%	8.0%**	2.50%	1.80%	-	0%*	2%	2.50%	-

Name of buildings	CONINCO Building	New Admin and educational building, College of Urban Works Construction	High-rise Residential and Commercial Building Y1 Capitaland - Felix En Vista	Anland 2 New High rise Residential in Hanoi	Golden Lotus Building	Ha long Inn	DIC Hotel of DIC CSJ	DIC Condotel of DIC CSJ	Headquarter building of Daikin Air Conditioning Vietnam JSC
	1	2	3	4	5	6	7	8	9
Payback time (year)	4.1	15.3**	3.3	6.3	-	-	2.7	1.4	-
Estimated Energy saving % QCVN09 case compared to BAU case	9%	17%	3%	4%	48%	14%	n/a	n/a	n/a
Main retrofitting recommendations	VRF system, LED lighting, CHP	PV system, LED lighting, ground thermal system	High COP AC, LED lighting	PV system, LED lighting, thermal isolation glasses	VRF system, LED lighting, thermal isolation glasses	Bulding envelop, LED lighting, CHP	VRF system, High COP AC, LED lighting, thermal isolation glasses	VRF system, High COP AC, LED lighting, thermal isolation glasses	VRF system, High COP AC, LED lighting, thermal isolation glasses

B. 14 Existing Buildings

Name of buildings	Melia Hotel	Somerset Grand Chancelor Building	Nam Linh Office Building	Administration Building of District 8 People's Committee	Administration Building of District 10 People's Committee	Cuu Long Majestic Hotel Building	Sofitel Legend Metropole Hotel	DIC Office	Ramana Hotel	Equatorial Hotel	Ho Chi Minh Television Building	Ho Chi Minh University of Food Industry Building	CEO Tower	Royal Hotel Saigon
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Address	44B, Ly Thuong Kiet, Tran Hung Dao, Hoan Kiem, Hanoi.	21-23 Nguyen Thi Minh Khai, Ben Nghe, District 1, HCMC	915/27/12 Le Van Luong, Village 3, Phuoc Kien, Nha Be District, HCMC	04, Dương Quang Dong street, Ward 5, District 8, HCMC	474 3 February Road, Ward 14, District 10, HCMC	01 Dong Khoi, Ben Nghe Ward, District 1, HCMC	15 Ngo Quyen, Trang Tien, Hoan Kiem District, Hanoi	265 Le Hong Phong, Vung Tau City, Ba Ria Vung Tau Province	323 Le Van Sy, Quart 13, District 3, HCMC	242 Tran Binh Trong, Ward 4, District 5, HCMC	14 Dinh Tien Hoang, Ben Nghe Ward, District 1, HCMC	140 Le Trong Tan, Tay Thanh Ward, Tan Phu District, HCMC	HH2-1, Me Tri Ha, Pham Hung, Me Tri, Nam Tu Liem, Hanoi	131-133 Nguyen Hue, Ben Nghe, District 1, HCMC
Building Type	Hotel	Hotel	Office	Office	Office	Hotel	Hotel	Office	Hotel	Hotel	Office	Office	Office	Hotel
Building Floor Area (Sq. M)	33,000	37,930	3,084	13,543	7,200	16,603	27,300	2,600	26,800	39,308	19,667	15,200	20,000	14,861
Estimated yearly energy savings (kWh)	473,610	711,224	77,560	250,213	58,141	994,600	880,520	71,191	778,831	476,854	796,112	553,253	283,786	254,862
Estimated yearly Cost savings (MVND)	2,337	1,785	301	525	124	2,875	2,175	260	2,202	1,275	1,665	988	969	905
Estimated Investment cost (MVND)	8,101	9,158	1,358	3,000	684	11,882	3,471	867	7,302	1,719	3,369	6,219	833	2,793

Name of buildings	Melia Hotel	Somerset Grand Chancelor Building	Nam Linh Office Building	Administration Building of District 8 People's Committee	Administration Building of District 10 People's Committee	Cuu Long Majestic Hotel Building	Sofitel Legend Metropole Hotel	DIC Office	Ramana Hotel	Equatorial Hotel	Ho Chi Minh Television Building	Ho Chi Minh University of Food Industry Building	CEO Tower	Royal Hotel Saigon
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Simple Payback Period (years)	3.5	3.9 for chiller 0.5 for lighting 6.2 for AC	5.4 for PV 4.8 for AC shading system	5.7	7 years for PV 2.8 for Ac	4.1	1.6	3.3	3.3	1.8	2	6.3	1.2	3.1
Estimated yearly Energy saving %	6% on total electricity 43% on oil	8% for chiller 1% for LED 13% for split AC	N/A for PV	41%	N/A for the PV 23% for AC	23%	8%	31%	21%	8%	11%	51%	14%	12%
Main retrofitting recommendations	Reflective film for the West facade	- Replace chiller system	-Installation of PV panels	- Replacement of all CFL and fluorescent lights by LED	-Installation of 25.2kWp of PV	- Replacement of CFL by LED	Replacement of electrical boiler by heat pump	- Replacement of CFL by LED	- Replacement of CFL by LED	- Replacement of CFL by LED	- Replacement of Fluorescent lights and CFL by LED	- Replacement of Fluorescent and HPS lights by LED	- Replacement of T8 FL with LEDs	Replacement of old split units and VRF by higher efficiency ones
	Replace chiller and install VSD	Change CFL for LED	Provision of protective casing for split units	Replacement by AC splits inverter	Replace 30 split ACs inverter	Installation of heat pump for hot water		Replacement of split AC by inverter	Replacement of split AC by inverter		Replacement of split AC by inverter	Replacement of 12 split AC by inverter	Installation of reflective film on glazing	Replacement of existing FL by LEDs
	Replace oil boiler by heat pump	- Replace all slit ACs		Installation of PV (96kWp)		Replacement of AC split by VRF		Installation of 26kWp PV	Installation of 203kWp PV			Installation of 260kWp PV		Install PV solar system

Appendix 4 - A Template of Minutes of Understanding with Building Owners

MEMORANDUM OF UNDERSTANDING
On Technical Assistance

- Pursuant to the decision by the Ministry of Construction, Government of the Socialist Republic of Vietnam (Decision No. 209/QĐ-BXD, dated 03rd, Sep 2016) on approval of the project "Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings in Viet Nam" (*hereinafter called "the EECB Project")* financed by Global Environment Facility (GEF)/ United Nations Development Programmer (UNDP).

- Pursuant to the official letter by EECB Project Management Unit dated 09th May 2017 regarding selected buildings for demonstration activities of energy saving technologies;

- Based on Commitment Letter by the building owner dated xxx;

- With reorganization of common interests towards sustainable development, the efficient use of energy sources and the cost effective and lasting solutions to energy issues;

- Based on interest of xxx regarding reduction of future energy consumption of the building xxx (hereinafter called The building);

Today, xxx, the following parties consist of:

The EECB Project Management Unit

Address:

Tel/ Fax:

Representative:

Position:

And

XXX

Address:

Tel:

Representative:

Position:

Agree to sign this Memorandum of Understanding (MOU) with the following terms and conditions:

1. Terminologies

Within this MOU, following terms are interpreted as follows:

- EECB PMU (PMU) includes (i) members of EECB PMU as mentioned in Decision No. 360/ QD-BXD dated 14th April 2017 on establishment of EECB PMU; representatives of UNDP donor; and staff/ consultants/ contractors as hired/ recruited by EECB PMU;

- Building Owner is xxx with its staff/ contractors/ consultants;

- Project or EECB Project means the project "Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings in Viet Nam";

2. The building

- Name of the Building: ***xxx***

- Location: Purpose of use:

- Existing conditions:

- Category (New/ Existing):

3. Objective

To reduce energy consumption as much as possible.

4. Rights and responsibilities of Parties

a) PMU

The PMU, within its financial and technical capabilities under the scope of the EECB Project, agree to provide technical support to the Building Owner in the following domains:

i. Enhance capacity and coordinate with Building Owner in implementing an Energy Audit, preparation of an Audit Report which identifies energy efficiency measures that can be implemented, follow up during implementation of selected option, and implement an energy monitoring and assessment program subsequent to implementation of energy efficiency measure so as to achieve the objective as mentioned in 3) Objective with most reasonable cost and pay-back time.

- Energy related parts, as mentioned above, include:

- The building envelope

- The lighting system

- The mechanical and electrical systems of the building.

ii. Estimate the cost-effectiveness of a number of proposed energy efficient solutions in comparison with the present building design.

iii. Review of detailed design of the energy efficiency related parts of the building and building systems.

iv. Provide input to the project owner during design on the installation of selected monitoring equipment as per the choice of the UNDP team.

v. Follow up during the energy retrofit phase with regards to the solutions of energy efficiency design that have been approved.

vi. Assist in the energy performance verification of the Building during the operation phase.

Promote images and energy achievements of the Building on mass media.

b) Building Owner

The Building Owner agrees use the EECB PMU as a demonstration project under UNDP/ MOC Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings in Viet Nam project. In particular, the Building Owner agrees to:

i. Support the PMU team to work with building owner and related contracts of the building owner in order to integrate relevant energy efficient solutions that are seen to be cost effective and technically feasible.

ii. Assign a competent team to work with the consultant team during the whole duration of this technical assistance;

iii. Provide to the PMU team with all required technical documents of the ECC Building project, namely:

- Legal documents of the Building;
- Historic data on energy consumption for at least 5 years (if available).
- Basic design drawings of the building
- Technical designs and support documentation;
- Materials and equipment specifications documents;

iv. Allow PMU to install monitoring equipment in the Building as per the recommendations of the EECB team.

v. Allow the UNDP team access to the project site with labor safety conditions guaranteed by the Building owner and to the project energy performance documentation, including energy bills, for necessary verification during the construction of the ECC Building project as well as during the 1st year of operation of the building;

vi. Be responsible for application of selected option for renovated items so as to ensure that the Building will be most effective in energy consumption and cost-effective also.

vii. Be responsible for being fully compliant with PMU's guidance during the renovation process.

viii. Have right to take full use of building images/ clips for communication purposes.

5. Timeframe

Below is the estimated implementation plan of the building as agreed by both Parties.

Stage/Time	Starting	Completion
Energy Audit	MM/YYYY	MM/YYYY
Presentation of Audit Report to the owner	MM/YYYY	MM/YYYY
Decision of actual measures to implement	MM/YYYY	MM/YYYY
Implementation of energy retrofit measures	MM/YYYY	MM/YYYY
Improvement of apartments	MM/YYYY	MM/YYYY
Monitoring program	MM/YYYY	MM/YYYY

6. Cost sharing and responsibilities

PMU agrees to provide the technical assistance to the Building Owner as defined in this MOU free of charge at no cost.

PMU shall not be liable for any financial support or any monetary expense resulted from the energy retrofit project of the Building following the energy efficiency measures proposed by PMU.

The EECB project will cover energy consulting and monitoring costs of The building including costs for energy monitoring equipment which serves EECB PMU's purposes.

7. Information and Disclosure

Confidentiality

Each party agrees to keep as confidential every document delivered by the other party under this agreement and to not disclose or provide same to any third party without written agreement by both parties to this MOU.

Disseminate of the results of the project

UNDP and MOC can use the Building's images, photos as well as any information or documentation generated as a result from technical assistance by UNDP, for the training or advertising or other communication purposes under the scope of UNDP/MOC Energy Efficiency Improvement in Commercial and High-Rise Residential Buildings in Viet Nam project.

Validity of this MOU

This MOU comes into effect from the date of signature by both parties.

This MOU shall terminate in xxx or at the termination of the EECB project, if any comes first.

This MOU is made in four (4) original copies in Vietnamese. Each party keeps two (2) original copies.

Amendments

Any amendments shall be officially agreed through a written document between two parties.

Withdrawal from MOU

One party can withdraw from the MoU if the other party does not respect the conditions set out in the paragraph "Rights and Responsibilities", if the time schedule is seriously delayed in any of its individual stages, or if the overall commitment regarding energy savings cannot be met.

None of the two parties will be responsible for any claim from the other, financially or otherwise, should it needs to withdraw from this MoU.

Notice

All communications related to this MOU shall be addressed to:

The EECB Project Management Unit

Address: No.2, 1st floor, CDC Building, Ministry of Construction, 37 Le Dai Hanh, Hai Ba Trung, Hanoi;

Tel/ Fax: (04) 36331750

Focal Point:

Email: contact. eecb@gmail.com

(Name of Building Owner here)

Address:

Tel: - Fax :

Focal Point:

Email:

For EECB PMU	**For (Building Owner)**
(signed and sealed)	(signed and sealed)

Appendix 5 – Parallel Financing Resource by Sector

#	Name	Type	Co-financing type	Committed contributions at the date of project approval	Actual contributions at the end of project
1	Melia Hotel	Private sector	Equity	77,700	177,000
			Inkind	3,750	200
2	Hanoi training center for energy management officials	Private sector	Equity	665,000	960,000
			Inkind	35,000	20,000
3	Majestic Hotel	Private sector	Equity	248,950	7,529
			Inkind	134,050	2,630
4	Somerset Grand Chancelor	Private sector	Equity	320,000	833,798
			Inkind	80,000	7,028
			Inkind	3,500	0
			Inkind	80,000	0
			Inkind	20,000	0
			Inkind	2,850,000	0
5	CONINCO Building	Private sector	Equity		17,308,524
			Inkind		3,000
6	Golden Lotus Building	Private sector	Equity		103,851
			Inkind		0
7	Felix En Vista	Private sector	Equity		22,543,920
			Inkind		1,500
8	Anland 2 New High rise Residential in Hanoi	Private sector	Equity		11,899,611
			Inkind		2,000
9	College of Urban Works Construction	Public sector	Equity		5,000,000
			Inkind		2,000
10	DIC Condotel of DIC CSJ	Private sector	Equity		54,829,078
			Inkind		3,500
11	CEO Tower	Private sector	Equity		6,000
			Inkind		1,000
12	DIC Office	Private sector	Equity		13,674
			Inkind		2,100
13	Ramana Hotel	Private sector	Equity		9,693
			Inkind		3,500
14	Sofitel Legend Metropole Hotel	Private sector	Equity		150,222
			Inkind		2,500
15	Administration Building of District 8 People's Committee	Public sector	Equity		233,925
			Inkind		1,500
16	Administration Building of District 10 People's Committee	Public sector	Equity		29,598
			Inkind		1,500

#	Name	Type	Co-financing type	Committed contributions at the date of project approval	Actual contributions at the end of project
17	Ho Chi Minh Television Building	Public sector	Equity		132,000
			Inkind		1,500
18	Ho Chi Minh University of Food Industry Building	Public sector	Equity		18,563
			Inkind		1,500
19	Equatorial Hotel	Private sector	Equity		127,351
			Inkind		1,010
20	Royal Hotel Saigon	Private sector	Equity		189,572
			Inkind		1,000
21	Headquarter building of Daikin Air Conditioning Vietnam JSC	Private sector	Equity		0
			Inkind		0
22	Ha long Inn	Private sector	Equity		0
			Inkind		0
	Total			**19,278,550**	**114,632,876**

Appendix 6 - List of key technical materials of EECB Project for hand-over

ID	Project technical outputs	Recommended Beneficiaries	Further Actions Recommended	Reference
1	Law on Supplementation and Amendments of a number of articles of Construction Law *(Partly supported by EECB Project)*	Building Practitioners	Dissemination of related regulations for in-depth understanding	No. 62/2020 / QH14, 2020 by National Assembly of Viet Nam
2	Decree on construction project management *(Partly supported by EECB Project)*	Building Practitioners	Dissemination of related regulations for in-depth understanding	No 15/2021/ND-CP, 2021 by the Government of Viet Nam
3	A roadmap for development of EE buildings (included in Tasks of Ministry of Construction on economical and efficient use of energy for the period of 2020-2030)	Building Practitioners, related International Organizations, policy makers	Dissemination of related regulations for in-depth understanding	Decision No.1677/QĐ-BXD, 2020 by MOC
4	Revised cost norm and consultation fee structures (in the revised Cost Norm on Construction Fees) *(Partly supported by EECB Project)*	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to DOCs, public and private developers, so that both public and private projects can be allowed to budget for high grade EE consultancy costs.	Circular 16/2019/TT-BXD, 2019 by MOC (replaced by Circular 12/2021/TT-BXD, 2021)
5	TCVN 13101: 2020 / (ISO 6946:2017) Building components and building elements. Thermal resistance and thermal transmittance. Calculation methods.	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Decision No.3172/QĐ-BKHCN, 2020, by MOST
6	TCVN 13104:2020 / (ISO 12631:2017) Thermal performance of curtain walling. Calculation of thermal transmittance	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Decision No.3172/QĐ-BKHCN, 2020, by MOST

ID	Project technical outputs	Recommended Beneficiaries	Further Actions Recommended	Reference
7	TCVN 13103:2020 / (ISO 10456:2017) Building materials and products. Hygrothermal properties. Tabulated design values and procedures for determining declared and design thermal values.	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Decision No.3172/QĐ-BKHCN, 2020, by MOST
8	TCVN 13105:2020 / (ISO 13789:2007) Thermal performance of buildings. Transmission and ventilation heat transfer coefficients. Calculation method.	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Decision No.3172/QĐ-BKHCN, 2020, by MOST
9	TCVN 13102:2020 / (ISO 10211:2017) Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations.	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Decision No.3172/QĐ-BKHCN, 2020, by MOST
10	TCVN xxxxx:2021 (EN 16231:2012) Energy efficiency benchmarking methodology	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Pending for official announcement of MOST
11	TCVN xxxxx-1:2021 (ISO 52000-1:2017) Energy performance of buildings – Overarching EPB assessment – Part 1: General framework and procedures	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Pending for official announcement of MOST
12	TCVN xxxxx-1:2021 (ISO 52003-1:2017) Energy performance of buildings – Indicators, requirements, ratings and certificates – Part 1: General aspects and application to the overall energy performance	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Pending for official announcement of MOST

ID	Project technical outputs	Recommended Beneficiaries	Further Actions Recommended	Reference
13	TCVN xxxxx:2021 (ISO 17741:2016) General technical rules for measurement, calculation and verification of energy savings of projects	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Pending for official announcement of MOST
14	TCVN xxxxx:2021 (ISO/TR 52000-2:2017) Energy performance of buildings – Overarching EPB Assessment - Part 2: Explanations and Justification of ISO 52000-1:2017	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Pending for official announcement of MOST
15	TCVN xxxxx:2021 (ISO/TR 52003-2:2017) Energy performance of buildings - Indicators, requirements, ratings and certificates - Part 2: Explanations and Justification of ISO 52003-2:2017	Building Practitioners (Engineers, Architects, Building Developers, etc.)	Ensure adequate dissemination and information to related national institutes and to the private sector	Pending for official announcement of MOST
16	Online EE building materials database uploaded on MOC website	Building Practitioners	Appoint a governmental agency to manage and update this database on a yearly basis	http://tietkiemnangluong.xaydung.gov.vn/page-t274.html
17	Online EE equipment database uploaded on MOC website	Building Practitioners	Appoint a governmental agency to manage and update this database on a yearly basis	http://tietkiemnangluong.xaydung.gov.vn/page-t275.html
18	Updated/upgraded MOC EE website	Building Practitioners	MOC IT team should partner with competent official / academia and private sector	http://tietkiemnangluong.xaydung.gov.vn

ID	Project technical outputs	Recommended Beneficiaries	Further Actions Recommended	Reference
19	Web-based OTTV Software	Building Practitioners (Engineers, Architects, Building Developers, etc.)		http://tietkiemnangluong.xaydung.gov.vn
20	Specific energy consumption profiles and energy consumption benchmark calculation methodology	Building Practitioners, Related Policy Makers, International Organizations	In order to be updated / upgraded, MOC should appoint a competent technical entity to ensure the continuity of the approved methodology in future.	Attachment
21	Specific Energy Consumption profiles, Energy Benchmarks and EE certification system for 2017 – 2018 and 2019.	Building Practitioners	To be officially endorsed by MOC in 2022. Same as above point, the same appointed technical entity should be entitled such a work.	Attachment
22	Energy consumption Online submission platform and EE certification simulator	Building Practitioners, Related Policy Makers, International Organizations	EE related works and research should be handled by a specialized team (an EE technical center), either directly under MOC, or to an academia agency to sustain the knowledge and to be able to troubleshoot or assist building owners to entering their data. MOC should officially appoint an entity and ensure the yearly update of such a database. Besides, a national information / dissemination campaign should be set up to raise awareness of building operators/ owners	Attachment

ID	Project technical outputs	Recommended Beneficiaries	Further Actions Recommended	Reference
23	EE certification (labelling) methodology report	Building Practitioners, Related Policy Makers, International Organizations	To be officially endorsed by MOC in 2022.	Attachment
24	Building Energy consumption Information disclosure system report.	Building Practitioners, Related Policy Makers, International Organizations	MOC should base on this report to define and promulgate clear policy and plan as regards information disclosure principles / obligations on the long run	Attachment
25	Energy saving Monitoring and Verification system report and M&V system guideline report	Building Practitioners, Related Policy Makers, International Organizations	MOC should use this report to officially have the VN translated ISO 17741:2016 and promulgate it as the official M&V official framework in Viet Nam.	Attachment
26	Executive Report on Establishment of SEC and E benchmarks in Viet Nam	Building Practitioners, Related Policy Makers, International Organizations	MOC to refer to the recommendations of this report for further actions.	
27	Video clips about SEC, EE benchmarks and EE certification	MOC	Integrate/ upload on MOC website	Attachment
28	EE incentives mechanism for EE buildings development report	MOC/Department of Science and Technology	MOC to officially promulgate supporting mechanisms for development of EE buildings in 2022 – 2025.	Attachment

ID	Project technical outputs	Recommended Beneficiaries	Further Actions Recommended	Reference
29	EE Buildings - Training Materials on Strengthening Capacity on Design, Construction, Acceptance and Energy Management	MOC / Department of Science and Technology	Hard copies should be printed out and distributed to concerned associations. The electronic version should be made available for download on MOC website	Attachment
30	Inputs to 06 training manuals on EE Buildings	Hanoi University of Civil Engineering	Design Builder Software to be transferred to Hanoi University of Civil Engineering	Attachment
31	Technical reports of new demonstration buildings (09 buildings)	Delivered to related building owners of the project	To further implement recommendations of the PMU in the report	Attachment
32	Technical reports of existing demonstration buildings (14 buildings)	Delivered to related building owners of the project	To further implement recommendations of the PMU in the report	Attachment
33	04 M&V systems	CONINCO, Yen Thuong College, Somerset and Capitaland	To be handed over to the related beneficiaries for long-termed use and EE improvements	Attachment
34	Demonstration building - Lessons learnt report.	Building Practitioners (Engineers, Architects, Building Developers, etc.)	To be disseminated to relevant building owners, engineers, architects, etc. for reference.	Attachment
35	Summary Datasheets for CONINCO, FELIZ EN VISTA, CUWC, AN LAND and GOLDEN LOTUS projects	Distributed to public during EEBC events.	To be uploaded on MOC website	Attachment
36	Project Policy Paper	Building Practitioners, Related Policy Makers, International Organizations	For reference and actions by MOC and related entities as mentioned in the report.	Attachment

ID	Project technical outputs	Recommended Beneficiaries	Further Actions Recommended	Reference
37	Exit Strategy Report	MOC, UNDP, International Organizations	To have actions for sustaining the project results	Attachment
38	Project Terminal Report	MOC, UNDP, MPI, MOIT, etc. and all project stakeholders	To have actions for correction or for sustaining the project results	This report

Appendix 7 - Project Fix Assets

#	Full description including serial No., chassis and engine No. (if applicable)	Present Location	T/D	Destination
1	External hard driver(WD 1TB WDBK8Z0010BBK)	EECB Project Office	Transfer	Department of Science, Technology and Environment
2	Sofa	Department of Science, Technology and Environment	Transfer	Department of Science, Technology and Environment
3	Laptop Microsoft Surface Pro 4	Department of Science, Technology and Environment	Transfer	Department of Science, Technology and Environment
4	Laptop Microsoft Surface Pro 4	Department of Science, Technology and Environment	Transfer	Department of Science, Technology and Environment
5	Photocopier- Fuji Xerox DocuCentre-V2060 CPS	EECB Project Office	Transfer	Department of Science, Technology and Environment
6	Phone Panasonic KX-TG F320	EECB Project Office	Transfer	Department of Science, Technology and Environment
7	Laptop Dell 5739	EECB Project Office	Transfer	Department of Science, Technology and Environment
8	Bookshelf system	EECB Project Office	Transfer	Department of Science, Technology and Environment
9	Destop Dell S2319H 23 Inch	EECB Project Office	Transfer	Department of Science, Technology and Environment
10	Laptop Dell Vostro 3590GRMGK 2	EECB Project Office	Transfer	Department of Science, Technology and Environment
11	Accounting software	EECB Project Office	Transfer	Department of Science, Technology and Environment
12	Energy Efficiency modelling system	Industrial Development and Promotion Center	Transfer	Industrial Development and Promotion Center
13	Provision, installation, testing and comissioning of M&V system of CONINCO Building	CONINCO.,JSC	Transfer	CONINCO.,JSC