Independent Terminal Evaluation

Reducing greenhouse gas and ODS Emissions through technology transfer in industrial refrigeration

UNIDO Project No.: 120621
GEF Project No.: 5464

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO INDEPENDENT EVALUATION DIVISION

Independent Terminal Evaluation

Reducing greenhouse gas and ODS Emissions through technology transfer in industrial refrigeration

UNIDO Project No.: 120621
GEF Project No.: 5464

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna, June 2018

Distr. GENERAL
ODG/EIO/IED/17/R.19
June 2018

Original: English

This evaluation was managed
by the responsible
UNIDO Project Manager
with quality assurance by the
Independent Evaluation Division

Table of Contents **Page**

Acknowledgements

Thanks are due to UNIDO's Environmental Department and Office for Independent Evaluation staff who participated in the evaluation, provided information and/or advice. Thanks, are also due to Ms Nguyen Thi My Hoang of Viet Nam National Ozone Unit (NOU) to have contributed to the preparation of this assignment and the preparation of the field work. Special thanks also to the MONRE high-level staff who hosted the evaluation team during the Ozone day celebrations.

The evaluation took place from 14/08/2017 to 29/09/2017. The evaluation field mission took place 11/09/2017 to 17/09/2017. The TE covered the whole duration of the project from its starting date in 01/07/2013 to the completion date in December 2017. This evaluation was performed together with the evaluation of an equivalent project implemented in The Gambia. The evaluation team is composed of one international evaluation consultant, José de Bettencourt acting as the team leader and one national evaluation consultant, Le Ha Thanh. The tasks of each team member have been specified in the job descriptions annexed to the terms of reference (Annex I).

List of acronyms and abbreviations

Abbreviation	Meaning
AWP	Annual Work Plan
BAT	Best Available Techniques
BEP	Best Environmental Practices
CoP	Conference of the Parties
EA	Enabling Activities
ET	Evaluation Team
GDP	Gross Domestic Product
GEF	Global Environment Facility
GWP	Global Warming Potential
HDI	Human Development Index
HPMP	HCFC phase out management plan
HVAC&R	Heating, Ventilation, Air Conditioning and Refrigeration
LDC	Least Developed Country
MARD	Ministry of Agriculture and Rural Development
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment
NOU	National Ozone Unit
ODG/EVA	UNIDO Office for Independent Evaluation
ODS	Ozone Depleting Substances
OECD/DAC	Development Assistance Committee
PD	Project Director
PEB	Project Executive Body
PM	Project Manager
PMU	Project Management Unit
PSC	Project Steering Committee
PTC	Programme Development and Technical Cooperation Division
RBM	Results-based Management
SAP	Systems Applications Products
STAMEQ	Directorate of Standards, Metrology and Quality
TE	Terminal Evaluation
ToR	Terms of Reference
UN	United Nations
UNEG	United Nations Evaluation Group
UNIDO	United Nations Industrial Development Program
VNEEP	National Energy Efficiency Programme

Glossary of evaluation-related terms

Term[1]	Definition
Baseline	The situation, prior to an intervention, against which progress can be assessed.
Effect	Intended or unintended change due directly or indirectly to an intervention.
Effectiveness	The extent to which the development intervention's objectives were achieved or are expected to be achieved.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, intended and non-intended, directly and indirectly, long-term effects produced by a development intervention.
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention.
Lesson Learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations.
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results-based management) principles.
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs.
Outputs	The products, capital goods and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies.
Risks	Factors, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives.
Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed.
Target groups	The specific individuals or organizations for whose benefit an intervention is undertaken.

[1] For more related terms and definitions see also:
OECD-DAC Glossary of Key Terms in Evaluation and Results Based Management (2010); http://www.oecd.org/development/peer-reviews/2754804.pdf.
UNDG Results-based management handbook; https://undg.org/wp-content/uploads/2015/01/UNDG-RBM-Handbook-2012.pdf.
UNIDO e-learning course on: Results-based Management and the Logical Framework Approach; http://intranet.unido.org/training/rbm/#home

Executive summary

The medium size project (MSP) “Reducing greenhouse gas and ODS Emissions through technology transfer in industrial refrigeration in Vietnam” funded by the Global Environment Facility (GEF) was implemented from July 2013 to December 2017 by the United Nations Industrial Development Organization (UNIDO). The main national partner of the project was the Ministry of Natural Resources and Environment (MONRE) with the following financing sources: GEF: USD 290,000; co-financing (cash and in kind): USD 1,855,000; Total: USD 2,145,000.

The overall objective of the project was to reduce greenhouse gas emissions by creating an enabling environment for the use of hydrocarbon refrigerants (with a very low GWP) in cold storage facilities in Viet Nam that currently use HCFC-22 for servicing and maintenance purpose. The project used a synergistic combination of technical assistance on policy and regulation, technology transfer, capacity building and awareness-raising.

This was a demonstration/pilot project and its major achievement was to establish in the country foundations to the use of HC refrigerants, by working on policy/regulations (central level), and simultaneously implementing demonstration projects in different parts of the country to show the feasibility and benefits of the new technology. The behavioural changes initiated with this project would require continued action to consolidate and expand.

It should be highlighted that the project has been designed prior to the Kigali Agreement, and therefore it is very innovative implementing alternatives that avoid use of HFC to replace HCFC. At the beginning of implementation there was no strong international commitment that set targets on phasing out HFC.

Conclusions

This project is highly relevant as Viet Nam is committed to phase out HCFC by 2040 and implementing an HPMP. By removing barriers to increased energy efficiency and establishing the enabling environment for the introduction of low global warming potential (GWP) alternatives to HCFC- 22, the project adds up to the HPMP. GEF 5 Focal Area Strategy for climate change mitigation, “to support developing countries and economies in transition toward a low-carbon development path”, namely with objective 2 “Promote market transformation for energy efficiency in industry and the building sector”.

The project design is clear but ambitious, with outputs and achievements formulated on a broad range of topics and this requires time for consultation and consensus building.

Effectiveness of the project is considered Moderately satisfactory. Quality outputs have been delivered and national stakeholders are satisfied with the performance of the machines. However, the overall objective goal and components 2 and 3 outputs have not been fully achieved, while the result of component 1 is yet to be integrated into policies, laws and regulations. Efficiency was moderately satisfactory as there have not been significant delays in the implementation of the project, but some activities have not been implemented.

The approach originally agreed upon by stakeholders for the implementation was not followed, in particular there was no steering committee. It was considered sufficient to have an informal set up for the technical coordination and inter-ministerial communication, given the reduced budget of the project - the evaluation found a limited integration of this project with other related on-going projects run by other ministries. Overall project management, supervision and monitoring were satisfactorily provided by UNIDO HQ with adequate staffing. Active involvement of national stakeholders in all the project activities contributed to high ownership and quality of outputs delivered.

This was a demonstration/pilot project and its major achievement was to establish in the country foundations to the use of HC refrigerants, by working on policy/regulations (central level), and simultaneously implementing demonstration projects in different parts of the country to show the feasibility and benefits of the new technology.

Some risks have been identified, namely regarding the low penetration of HC in the country (except R-600a in refrigerators) and the uncertainty of the adoption by the government of the measures recommended in component 1. Therefore, likelihood for sustainability of benefits and continuous sustained impact of the project is considered moderately likely.

Sustainability of project outcomes from a financial and institutional point of view is not ensured. It must be noted that threats for environmental quality in Viet Nam are still very significant and that there are differences in the understanding of the importance and linkages between environmental protection and development. Continuation of support by stakeholders to consolidate key results of the project is recommended.

Recommendations

In order to maximize impact of the project, MONRE should take quick action to sensitize policy makers on the alternatives to HCFC and implement the policy/legal/institutional recommendations and guidance (produced by component 1). This includes sensitization to policy makers and decision-makers of several departments of the government and the national assembly. In particular, MONRE should seek increased communication and synergies with MOIT and the energy efficiency project supported by the World Bank, which includes HCFC phase out in industry.

MONRE should continue the process of mobilizing interest of enterprises for the use of HC in the refrigeration industry. This could be done by mainstreaming training and certification of refrigeration technicians on HC technology, and by improving conditions for the availability in the country of alternative refrigerants as well as of technical assistance to HC systems.

Lessons Learned

1. The evaluation was affected by the very ambitious objective and goals set in the project document, namely regarding companies' adherence to the conversions and use of Viet Nam Environmental Fund, as well as establishment of Business Support Centers and private sector development of viable project pipelines. When designing future projects, it is preferable to set quantitative objectives and goals on issues the project can control to a certain extent, instead defining them on issues that depend solely/mostly on external factors.
2. All agencies involved in a project must have a common understanding of the extent to which the chosen issues and indicators represent changes in the real world, and about the limitations and factors affecting those changes. This is key for implementation partners/institutions to avoid taking up responsibilities that are out of reach given their capacities (for example existence of required staff) or mandate, unless the project itself has provisions to satisfy the requirements. Responsibilities of each participating institution should be fully owned through formal institutional commitment.
3. To change behavior on the refrigeration and AC industry it is an excellent idea to mobilize beneficiaries/stakeholders from industry and strengthen awareness to achieve stakeholder commitment. However, it is equally important to train RAC technicians (service providers) as they are at the forefront to sensitize the end-user.

4. Entrepreneurs are averse to the risk of having to stop activities and to uncertainty of supply of consumable goods required for the operation. Therefore, when introducing new technology, it is important to set conditions for the availability of consumable goods and technical assistance. Besides, the proposed solutions need to be perceived as being within reach of the targeted sectors (technologically and financially), useful (namely regarding competitiveness and compliance), and relevant (return of investment, added value).

I. Evaluation objectives, methodology and process

The GEF Monitoring and Evaluation Policy (February 2006)[2] specifies that the GEF partners, in addition to conducting various other evaluations, will also evaluate projects "at the end of the intervention (terminal evaluation)". The policy states that through monitoring and evaluation (M&E) the GEF aims to "promote accountability for the achievement of GEF objectives through the assessment of results, effectiveness, processes, and performance of the partners involved in GEF activities." It further states "GEF results will be monitored and evaluated for their contribution to global environmental benefits". Similarly, according to UNIDO's evaluation policy, Project and program evaluations are part of project cycle management. Evaluations serve three main purposes: to assure accountability, to support management, and to drive learning and innovation.

The evaluation was conducted in accordance with the UNIDO Evaluation Policy[3] and the UNIDO Guidelines for the Technical Cooperation Project and Project Cycle4. In addition, the evaluation followed the GEF Guidelines for GEF Agencies in Conducting Terminal Evaluations, the GEF Monitoring and Evaluation Policy and the GEF Minimum Fiduciary Standards for GEF Implementing and Executing Agencies.

The evaluation took place from 14/08/2017 to 29/09/2017. The evaluation field mission took place 11/09/2017 to 17/09/2017. The TE covered the whole duration of the project from its starting date in 1/07/2013 to the completion date in December 2017. This evaluation was performed together with the evaluation of an equivalent project implemented in The Gambia.

The evaluation team is composed of one international evaluation consultant, José de Bettencourt acting as the team leader and one national evaluation consultant, Le Ha Thanh. The tasks of each team member have been specified in the job descriptions annexed to the terms of reference (Annex I).

The Terminal Evaluation (TE) is intended to provide an analysis of the attainment of the project objective and the corresponding technical outputs and outcomes. The TE assessed project performance against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact. The TE has an additional purpose of drawing lessons and developing recommendations for UNIDO and the GEF that may help for improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion.

The evaluation has three specific objectives:

i. Assess the project performance in terms of relevance, effectiveness, efficiency, sustainability and progress to impact;

ii. Identify key learning to feed into the design and implementation of the forthcoming projects; and

iii. Develop a series of findings, lessons and recommendations for enhancing the design of new and implementation of ongoing projects by UNIDO.

The key question of the TE is whether the project has achieved or is likely to achieve its main

[2] The GEF Monitoring and Evaluation Policy, Evaluation Document No. 1 (GEF Evaluation, 2006) is available at http://gefeo.org/uploadedFiles/Policies_and_Guidelines-me_policy-english.pdf.

[3] UNIDO. (2015). Director General's Bulletin: Evaluation Policy (UNIDO/DGB/(M).98/Rev.1)

[4] UNIDO. (2006). Director-General's Administrative Instruction No. 17/Rev.1: Guidelines for the Technical Cooperation Programme and Project Cycle (DGAI.17/Rev.1, 24 August 2006)

objective, i.e. to reduce greenhouse gas emissions by creating an enabling environment for the use of hydrocarbon refrigerants (with a very low GWP) in cold storage facilities in Viet Nam that currently use HCFC-22 for servicing and maintenance purposes.

The key evaluation questions are the following:

a) What are the key drivers and barriers to achieve the long-term objectives? To what extent has the project helped put in place the conditions likely to address the drivers, overcome barriers and contribute to the long-term objectives?

b) How well has the project performed? Has the project done the right things? Has the project done things right, with good value for money?

c) What have been the project's key results (outputs, outcome and impact)? To what extent have the expected results been achieved or are likely to be achieved? To what extent the achieved results will sustain after the completion of the project?

d) What lessons can be drawn from the successful and unsuccessful practices in designing, implementing and managing the project?

In line with the practice adopted by many development agencies, the UNIDO Independent Evaluation Division uses a six-point rating system, where 6 is the highest score (highly satisfactory) and 1 is the lowest (highly unsatisfactory).

The desk and literature review of documents related to the project, include but is not limited to: The original project document, monitoring reports (such as progress and financial reports, output reports, back-to-office mission report(s), end-of-contract report(s) and relevant correspondence), as well as project outputs; and Notes from the meetings of committees involved in the project.

The project has been implemented by the National Ozone Unit (NOU) of the Ministry of Natural Resources and Environment (MONRE), with the support of Cleaner Production Center of the Hanoi University of Technology (technical expert). During the field visits the evaluation team conducted interviews, with authorities, project stakeholders, and other civil society entities involved in refrigeration (see Annex II), visited 2 plants in which pilot technology transfer has been implemented, and participate in the Ozone Day, a national level event.

Stakeholder consultations were conducted through structured and semi-structured interviews and focus group discussion. Evaluation findings, conclusions and recommendations were discussed in detail at physical face-to-face de-briefings to the key stakeholders in Viet Nam and in Vienna. The purpose of these de-briefings was a factual verification of key findings and an in-depth discussion of evaluation results. The feedback and comments received during these presentations have been considered in this report.

The main limitations for the evaluation are: (i) Dispersion of stakeholders, particularly the companies implementing pilots, which prevents the visit to all of them; (ii) Non-existence of a project completion report detailing all activities carried out and main results in each component; (iii) the fact that despite efforts, one of the beneficiary companies could not find availability to talk to the evaluation team.

II. Country and project background

2.1. Brief country context and project background

The Socialist Republic of Vietnam lies at the crossroads of two major biogeographic realms: the Palaearctic realm's Himalayan and Chinese sub-regions and the Indo-Malayan realm's Sundaic sub-region. The country extends over 1,650 km from north to south between 23°30'N and 8°30'N covering a total area of 329,314 km2, with a maximum width of approximately 600 km and a minimum width of little more than 50 km.

The country shares its border with China to the north, Laos to the northwest, Cambodia to the southwest and the East Sea to the east. Three quarters of the country is hilly or mountainous, while its lowland areas include two major river deltas: the Red River in the north and the Mekong River in the south. A narrow coastal plain runs along much of the country's 3,260 km coastline. With a population of around 90 million, 68% of who live in a predominantly rural agrarian society (GSO, 2013), Vietnam is one of the most densely populated agriculture-based countries in the world.

Viet Nam's biogeographic location combined with the great variation in topography, climate[5] and soils across the country, has given rise to Viet Nam's diverse and distinct biodiversity. The country is estimated to harbour some 10% of the world's known species and is considered among the ten most biologically diverse countries.

Viet Nam has been undergoing a series of political and economic reforms to move towards a more market-based economy since 1986. Rapid economic growth, especially over the past two decades, has resulted in Viet Nam transitioning to a lower middle-income country (as defined by the World Bank) with a per capita GDP of USD2,052 in 2014[6]. The country has made significant progress on human development indicators, particularly on education, health and living standards, as reflected in the steady increase of its human development index (HDI) over the last decade.

With the dramatic decrease in recorded poverty rate, however, many households have risen barely above the poverty line and growth has also been associated with an increase in inequality, particularly a widening rural-urban income gap. Three regions account for more than two-thirds of Viet Nam's poor: the Northern Uplands, Mekong Delta, and North Central Coast. Ethnic minorities, which comprise 14 per cent of the population and live mainly in the remote upland areas, are disproportionately affected by poverty, representing almost 30 per cent of the poor. About 90 per cent of the poor live in the rural areas[7].

The project document indicates that Viet Nam is one of the leading countries for aquaculture, aquatic product processing and export in the world, and there are about 400 cold storage facilities in the country used the fisheries sector. Each facility has an average of 10 refrigeration machines running on HCFC-22, for a total of around 4,000 units with capacities between 10 and 200 HP. The majority of cold storage equipment is domestically manufactured using second-hand or locally produced compressors and unit coolers. There are about 30 of contractors who assemble ice making and cold storage equipment in Viet Nam. Those contractors have limited engineering capacity and basically reassemble refrigeration equipment using second-hand compressors imported from abroad.

[5] Viet Nam has a tropical monsoonal climate dominated by the south-westerly monsoons from May to October and north-easterly monsoons during the winter months. Annual rainfall averages between 1,300 mm to 3,200 mm, but can be as much as 4,800 mm in some areas and as little as 400 mm in others. Snow occasionally falls in the higher elevations in the north. In the south, temperatures rarely drop below 20°C; in the north, they seldom drop below 10°C.

[6] Source: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD

[7] Source: http://www.undp.org.vn/digitalAssets/12/12856_ban_do.jpg.

Due to the age and the particular design of the cold storage systems, the overall efficiency is generally low and there is great room for improvement, and, when it becomes necessary for equipment to be upgraded, owners are currently likely to favour the use of HFCs that have very high global warming potentials. HFC technology, specifically that using the refrigerant designated as R-404A (GWP 3922), is currently the standard alternative to HCFC-22 in these types of applications. The technology is well known, relatively affordable and energy efficiency can be good.

Within the scope of Montreal Protocol, Viet Nam has committed to phase-out HCFC by 2030, and when ratifying the Kigali agreement also HFC will be phased-out by 80-85% until 2045. The key barriers to promoting energy efficiency in the cold storage sector in Viet Nam, while using chemicals with lower global warming potential (GWP) and minimizing the use of chemicals damaging to the ozone layer, include:

- an overall lack of policy and regulatory incentives to move away from HCFC-22 prior to 2040 and a lack of policies and measures for refrigeration emission control;

- lack of awareness of the potential savings of energy efficiency and of the available technologies;

- lack of tools and technical capacities for repairing and maintaining technologies other than the existing ones;

- refrigerants other than HCFC-22 require new systems that are comparatively costly, in addition to toxicity and flammability risks;

- financial barriers, e.g. low cost of HCFC-22 at present in the market compared to its alternatives and high cost of conversions to new equipment using low GWP refrigerants, particularly when compared to the cost of conversion to the extremely high GWP HFCs which are the standard HCFC-22 replacement.

Viet Nam's HCFC phase out management plan (HPMP) stage I states opportunities for synergies between ozone and climate protection, but it is focused on ODS emissions reduction, and does not address energy efficiency and GHG emissions reduction directly. Moreover, no direct phase out investment activities to be financed by the Multilateral Fund in the cold store sector were included in HPMP stage I.

The GEF/UNIDO project intended to be complementary to the limited number of activities affecting the cold storage sector that are included in the HPMP stage I, and set the baseline and pave the way to the inclusion in HPMP stage II of measures focusing on the conversion of cold storage facilities and on the introduction of policies to prevent any new HCFC installations in the fishery and fish processing industry.

2.2. Project summary

The project Reducing greenhouse gas and ODS Emissions through technology transfer in industrial refrigeration in Viet Nam, aims at reducing greenhouse gas emissions by creating an enabling environment for the use of hydrocarbon refrigerants (with a very low GWP) in cold storage facilities in Viet Nam that currently use HCFC-22 for servicing and maintenance purposes. The project uses a synergistic combination of technical assistance on policy and regulation, technology transfer, capacity building and awareness-raising. Instilling knowledge of new technologies through this project should contribute to preparing the cold storage industry in Viet Nam to select the best technologies in the conversion away from HCFC-22. From the point of view of the GEF and UNIDO the project can contribute to inform the possible development of large scale-up projects for Stage II of the HPMP (period 2016-2020) and the GEF 6.

The overall objective of the project is to reduce greenhouse gas emissions by creating an enabling environment for the use of hydrocarbon refrigerants (with a very low GWP) in cold storage facilities in Viet Nam that currently use HCFC-22 for servicing and maintenance purpose. The project includes three components with three outcomes outlined in the table below:

Table 1: Components and outcomes of the project

Project Component	Outcome
Policy and Regulatory Support	Policy, regulatory and legal measures are adopted by the government to support the adoption of low global-warming potential and energy efficient technology
Technology Transfer	Technology with low global-warming potential (hydrocarbon system) is demonstrated, replicated and deployed
Awareness Raising	Demand for low-GWP refrigerant systems that are more energy efficient than existing technologies is increased

Table 2 shows all relevant information as regards project costs and co-financing, donors, duration, implementing and executing agencies.

Table 2: Fact sheet of the project

Project title	Reducing greenhouse gas and ODS Emissions through technology transfer in industrial refrigeration	
UNIDO Project ID	120621	
GEF Project ID	5464	
Project implementation planned start date Actual start date	01/07/2013	
Project implementation Planned end date Revised end date	01/07/2017 31/12/2017	
Project Costs (in USD)	GEF grant:	290,000USD
	Co-funding UNIDO (grant) UNIDO (in-kind) Real UNIDO co-financing according to PAD? National Government (cash) National Government (in-kind) Vietnam Environmental Fund (soft loan) Private Sector (technology suppliers) Private Sector (Zanotti) Private Sector (Shecco)	 210,000USD 35,000USD 120,761USD[8] 80,000USD 120,000USD 900,000USD 150,000USD 50,000USD 310,000USD
	Total	2,145,000USD
Implementing agency: Executing partners:	UNIDO MONRE, Cleaner Production Center, MARD	
Mid - term review date	As the project was a Medium - size Project (MSP), a mid - term evaluation/review was not conducted.	

2.3. Project implementation arrangements and implementation modalities

UNIDO was the GEF implementing agency. The project has been implemented by MONRE, with the support of Cleaner Production Center of the Hanoi University of Technology (technical expert), and other stakeholders who participated of the workshops. There was no steering committee. it was considered sufficient to have an informal set up for the technical coordination and inter-ministerial communication, flowing normal Government/NOU of Viet Nam practice for projects of this budget.

The overall management of the project was done from UNIDO headquarters. The head of Viet Nam's National Ozone Unit served as Project Director (PD). The PD is responsible for executing the work programme and the day-to-day management, monitoring and evaluation of project activities as per the approved Annual Work Plan (AWP), agreed with UNIDO-HQ.

The company Zanotti provided technical expertise, services and equipment. Zanotti prepared the technical specifications of the supplied equipment, participated in the selection of the companies where pilot conversion was implemented and advised on technical and other responsibilities of those companies, supplied the equipment, and advised and supervised its installation. Zanotti also organized and implemented practical trainings for the technical personnel of the cold stores on operation, safety, handling and use of alternative technologies as well as on maintenance and best refrigeration practices of new equipment and ensured remote assistance during the first months of operation. One year after the installation of the

[8] In the Project Document this UNIDO grant amounts to 210,000 USD.

equipment, Zanotti did a second visit to Viet Nam to provide further training and to present and discuss the results of the monitoring of operation of the machines. The contract with Zanotti covered the cost for equipment, specifically the 25 units manufactured according to projects needs by Zanotti. The remaining activities were covered by co-financing from Zanotti.

The company Shecco participated with general input to the information and awareness campaigns, and direct marketing support on publishing articles about the project in several specialized media.

The main stakeholders of the project are listed below. Their involvement in the project varies, as depicted in the table below.

Table 3. Stakeholder Involvement

Stakeholder	Involvement
Ministry of Natural Resources and Environment (MONRE):	National Focal Point for the UNFCCC and the Kyoto Protocol. The National Ozone Unit (NOU) hosts the project PMU and also hosts the HPMP PMU.
Participating enterprises in which pilot conversions of cold storage facilities are being developed	*Cau Tre* company (Ho Chi Minh city) - A partial conversion in with 9 HC290 units for cold stores B, D2 and D3; *Dai An* company (Hanoi city) - A partial conversion In with 3 HC290 units for 45T and 20T cold stores; *Phu Minh Hung* company (Quang Ninh province) - A full conversion in with totally 9 HC290 units for 200T and 70T cold stores; *Animex Nghe An* (Vinh city) - A partial conversion in with 4 HC290 units for two 50T cold stores.
Hanoi University of Science and Technology - Institute for Environmental Science and Technology and Science and Technology - School of Heat engineering and refrigeration	The institute hosts the Cleaner Production Centre. The national technology expert was indicated by the Center. . Experts from School of Heat engineering and refrigeration provided support and guidance to the companies participating in the pilot projects.
Ministry of Industry and Trade (MOIT)	MOIT is in charge of the formulation of law, policies, development strategies, master plans and annual plans for the sectors under its remit, and submits them to the Prime Minister for approval. MOIT runs the National Energy Efficiency Programme (VNEEP).
Ministry of Agriculture and Rural Development (MARD)	The Agro Processing and Market Development Authority is a project implementing partner due to its role in the fish processing sector.
Ministry of Science and Technology	The Directorate of Standards, Metrology and Quality (STAMEQ) is the advisor on standards on industrial refrigeration.
Viet Nam Association of Seafood Processing and Export	This association, together with the Viet Nam Fisheries Association, cooperated with MARD to propose policy mechanisms and measures to encourage organizations and individuals to reorganize their production to ensure production efficiency, particularly of better design of commercial cold storage facilities to increase efficiency.

2.4. Major changes to project implementation

The project document indicated the implementation of conversions into low GWP refrigerants in two pilot facilities (Seaprodex Hai Phong in Hai Phong city and Tran Cong Thanh cold store in Hanoi), in a total of 34 units. The project ended up involving four pilot facilities and delivered 25 HC290 refrigeration units. The list of companies involved in the project was listed in Table 3.

The project design included the development by the Viet Nam Environmental Protection Fund (VEPF) of a soft loan scheme totalling USD 900,000 to be used by about 10 facilities purchase roughly 18 small cooling units each at market price. This component has not been developed and no companies showed interest on the soft loan. This also prevented the development of foreseen Business Support Centres and mobilization of local engineering companies supporting design of plants using non-ODS and very low GWP refrigerants interested to develop a projects pipeline for the use of the loan.

The decisions/guidelines of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol in 2016 (UNEP/OzL.Pro/ExCom/77/76), discouraged conversions. The scheme would have to be replaced from conversions to system improvements, focused on leakage reduction and energy efficiency.

The project design included the development of a Training and certification scheme on best refrigeration practices and safe handling of alternative refrigerants to 50% of the total number of close to 400 cold stores in the fisheries sector. Trainees would be certified to operate and maintain facilities using the alternative technologies covered in the course. This has been replaced by workshops in which entrepreneurs and technicians got a first contact with the technology.

2.5. Positioning of UNIDO project

This project replies to the interest of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol, that UNIDO's seeks co-financing to cover costs that are not eligible under the Multilateral Fund but that could generate climate benefits as the result of HCFC phase-out.

This project has strong synergies with the support to HCFC Phase-Out Management Plan (Stage I), which did not include direct phase out investment activities. This GEF/UNIDO project intended to be complementary to the limited number of activities affecting the cold storage sector that are included in the HPMP stage I, and set the baseline and pave the way to the inclusion in HPMP stage II of measures focusing on the conversion of cold storage facilities and on the introduction of policies to prevent any new HCFC installations in the fishery and fish processing industry.

The initiatives developed under this project add to the HPMP as they encourage better practices and raise awareness and knowledge, and prepare the refrigeration industry to select the best technologies for this market. The project has a holistic approach to create a policy and regulatory environment conducive to the adoption of new technologies; develop mechanisms for technology transfer and incentive mechanisms for owners/operators to carry out improvements; and implement targeted capacity building and awareness initiatives.

III. Project theory of change and progress to impact

The evaluation used theory of change (TOC) to assess the project's contributions to the conditions leading to the desired behavioral and technological transformations. Although the project document does not contain an explicit theory of change, the project document and the logical framework provided enough information to construct a theory of change indicating how the project was expected to help bring about conditions for the phase-out of HCFC. The ToC developed for this project is illustrated in Figure 1.

Figure 1 illustrates how the three project outcomes, and some outputs in particular could contribute to the preconditions for bringing about the behavioural and technological changes needed to phase out HCFC and reduce GHG emissions. To bring about the necessary behavioural changes, the incentives for change and capacities to carry out change would need to be in place.

Incentives to promote behavioural change derive from three main conditions:

i) the adoption of policy, legal, and regulatory measures (such as a quota on imports of HCFC equipment and tax incentives to the purchase of alternative refrigerants and equipment);

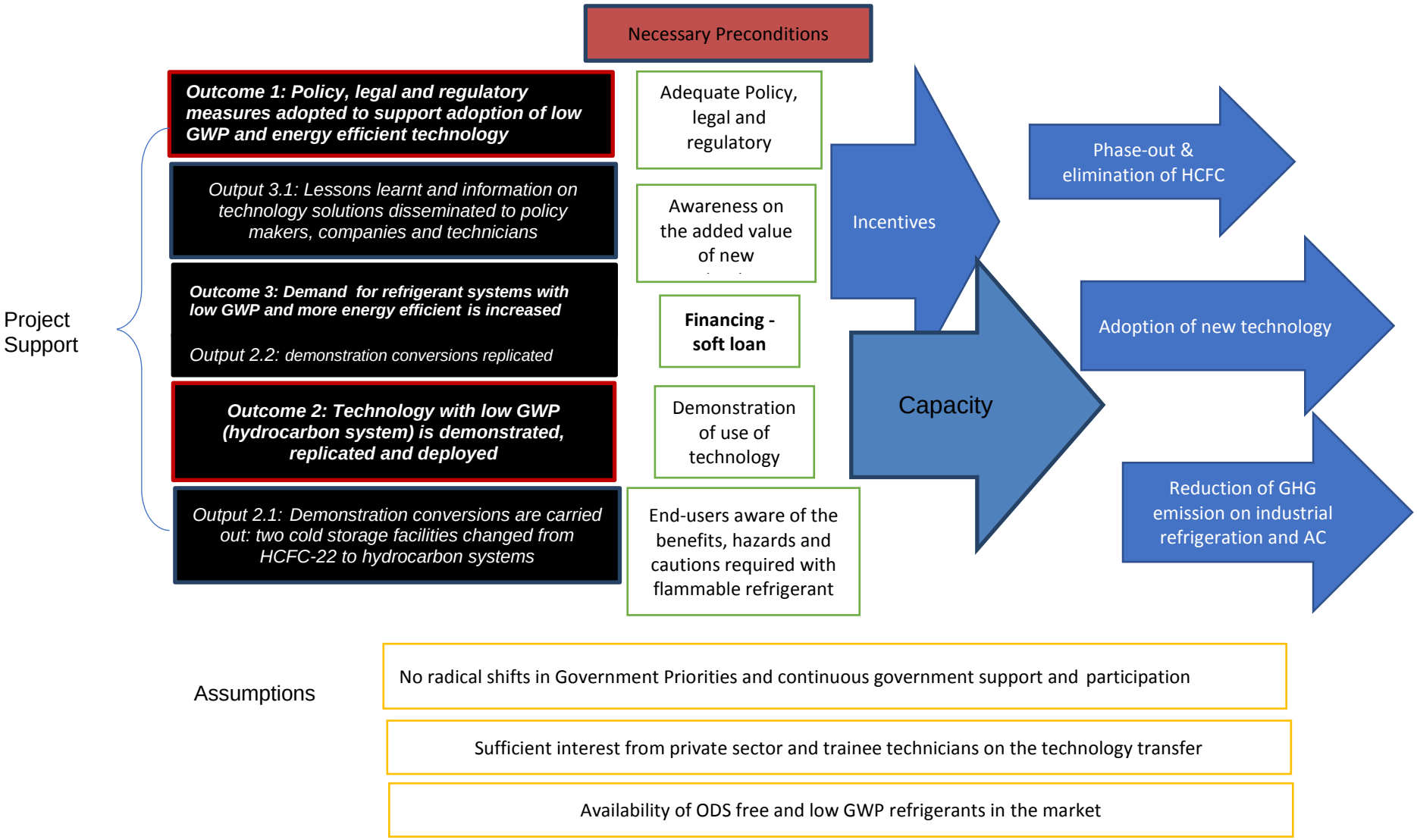
ii) the conscience of the added values (environmental, social and financial) of using low GWP and high-energy efficient equipment, and of decreasing gas leakages; and

iii) the existence of financial incentives to attract the change. Capacities to bring about change require: i) adaptation and demonstration of technologies and approaches to serve as models, enable learning and to prove the value of the alternative; and ii) the end-users knowledge on how to safely use flammable gas equipment so as to avoid accidents and a negative image of the technology.

It should be highlighted that the project has been designed prior to the Kigali Agreement, and therefore it is very innovative. At the beginning of implementation there was no strong international commitment that set targets on phasing out HFC, hence promoting the use of HC.

It should also be kept in mind that this was a demonstration project, and behavioural changes would require continued action. The next paragraphs present succinct analysis of the contributions of the project to all the five conditions identified by the TOC.

Figure 1: Theory of change



Adequate Policy, legal and regulatory measures. Despite the planned HCFC phase-out targets, there is an overall lack of policy and regulatory incentives to move away from HCFC-22 prior to 2040. There is also a lack of policies and measures for refrigeration emission control that would encourage cold storage facilities to consider lower-carbon, low-GWP alternatives in refrigeration. The project provided the technical support and helped facilitate the development of measures, including on fiscal and non-fiscal incentives for climate-friendly technologies, quotas for HCFC and HFC imports, standards/technical regulations/good practice guidelines, training and opportunities to be seized under HPMP stage II.

Awareness on the added value of the new technology. In the fishery sector, cold storage facilities are operated 24 hours per day, 365 days a year and only stop for maintenance and repair. It is thus quite a sensitive issue to implement changes in the systems, and owners and operators are reluctant to try new technologies (risks on reliability of equipment, existence of spare parts and consumable items, difficulties to find technical assistance). Moreover, many industrial enterprises do not consider energy efficiency a priority due to lack of awareness of the potential savings as well as of the available technologies. They tend to carry out minimal or low-cost energy efficiency measures while focusing on capacity expansion.

Through the various workshops targeting technicians and entrepreneurs, the project was able to develop widespread awareness and understanding among stakeholders of the benefits of adhering to energy efficient and climate-friendly technology. Entrepreneurs, especially those targeting international markets, are currently more aware of the phase out HCFC-22 and of the need to adopt new technologies and save money.

According to the representatives of the sector, entrepreneurs will be motivated to adhere to the new technology when equipment and refrigerants become commonly available, at a competitive price and technical assistance services exist. The project has more important impacts on awareness raising for the companies than the targeting policy-makers on the benefits of alternative refrigerants and on linking improvements in energy efficiency in the cold storage sector. MARD and MOIT representatives interviewed during the evaluation were not completely aware of the results of the project. Nevertheless, the project provides a good platform for Viet Nam to continue to expand its activities in environmental protection and phasing out ODS.

*Demonstration of technologies. Although most enter*prises have technical staff responsible for equipment operation and maintenance, most can only handle ordinary failure or refrigerant recharge. For major breakdowns, the enterprises have to hire specialists from the manufacturer or from electro-mechanical companies. From the companies visited/interviewed during the evaluation, the larger Cau Tre and *Animex Nghe An*, counted with experienced technicians who are satisfied with the conversion and confortable with the technology.

The smaller *Dai An* faced troubles and was in need of technical assistance. There are recognized energy efficiency gains, as monitored during 2015 and 2016, from 10% to 42% - average 28% (according to the technical document). Despite of efforts done by the evaluation team, the company *Phu Minh Hung* could not find a time to be interviewed, not even by phone, and monitoring data of power consumption of the HC290 equipment for 2016 is not ava*ilable. Zanotti has tried the*ir best to resolve the technical and maintenance problems remotely in the easiest and most effective manner. On the other hand, concerns prevail on the availability of refrigerant HC-290 in the local market and on technical assistance to the machines, as Zanotti is not present in the country. The demonstration in four companies were a limited number.

Financing to pay for the costs of transition. One of the main barriers to the introduction of alternatives to HCFC-22 with low GWP is the low cost of HCFC-22 at *present* in the market compared to its alternatives. Also, there is still lack of alternatives such as R-290 in the market, and the cost of conversions to new equipment using low GWP refrigerants is a deterrent for

end-users. The prepared soft loan requirements were similar *to other soft* loans from VEPF. But the soft loans did not attract entrepreneurs.

End-users aware of the benefits, hazards and cautions required with flammable refrigerant. Due to a lack of good servicing and maintenance practices, and the use of outdated equipment, the industrial refrigeration sector experiences inefficient energy use and significant refrigerant losses of up to 20 – 25% of the total refrigerant charge contained in the units. In most cases, enterprises are forced to recharge every 3 to 6 months because of these leaks. The message on the flammability of natural refrigerants was received with keen interest.

The project sparked discussions among government representatives, academia, entrepreneurs and technicians on the hazards and precautions to have in the use of HCs. The message was transmitted at project workshops by the project that the use of HC-290 is not so convenient for enterprises located in small areas in the residential zone, with unstable electric current. Zanotti corroborates that if equipment is charged with a threshold of 150gr of refrigerant, it can be installed anywhere but for a larger amount, we special attention is required due to the risk of explosion.

According to HUST representatives, currently there is a lack of legal framework, operators' capacity, standards for safety in relation to operation and maintenance of HC-290, namely maintenance. It exists, however, a the Vietnam National Standard TCVN 6104 which is equivalent to ISO 5149 and includes requirements on the classification, location and quantity of refrigerant used setting limits to the consumption of HC 290. HUST further informed that ISO 5149 is in the process of being reviewed including to set more limitations to the consumption of hydrocarbon. In summary, the stakeholders became aware that there is an ongoing process worldwide to increase safety requirements for the use of HC, and that Viet Nam is accompanying the process.

Longer-term impact

Through the project, entrepreneurs and technicians became aware of the benefits economic and or the environment using HCs, as well as of the possible problems and precautions to its use. The lack of demand for the soft loan indicates that the entrepreneurs feel it is still a premature change.

The remaining aspects still need further internalities (adoption of policy, legislation and regulation measures, component 1) and externalities (such as the availability of natural refrigerants and in the country) in order to promote change.

Catalytic or replication effect

The project has indeed supported demonstration of new refrigerant technology at four companies. The project has made efforts to set up and maintain a knowledge base on energy efficiency and environmental protection to support both management effectiveness and public awareness. Moreover, capacity of staff of those companies has been developed with project support through training modules, training materials and guidelines. The knowledge was shared with other managers and workers of food processing industry through workshops of presentation and discussion of results.

The conversions of equipment were implemented free of charge in the companies. One of the companies was reportedly moved to other facility by local authority and was not keen to

collaborate further. Another company is unsatisfied. From the two more satisfied companies, concerns exist on where to purchase HC-290. The companies state they will consider to invest in new equipment if some conditions are met, namely good after sale and O&M services, availability of spare parts in Vietnamese markets, high capacity of machines applicable for large cool storages.

In conclusion, it seems that the project can be replicated if the new equipment is provided free of charge. But if co-funding from companies is required, there can be less interest. Besides, conversions are discouraged by the decisions/guidelines of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol in 2016 (UNEP/OzL.Pro/ExCom/77/76). New projects would have to be focused on leakage reduction and energy efficiency of systems (as it is done in The Gambia), rather than on conversions.

This was a pilot project that explored replacement of HCFC directly by HC, circumventing the use of HFC. With the Kigali agreement HFCs will be phased out and entrepreneurs will be more and more invited and/or urged to convert away from HFC. The difficulties encountered by the project may function as lessons to design new projects.

IV. Project assessment

4.1 Design

The main purpose of the project was to inform companies in Viet Nam and worldwide, who face the common problem of having to procure future-proof plants that are affordable to run, to select the best technologies using alternative lower-ODS and lower-GWP refrigerants in the conversion away from HCFC-22 (which is already being phased out and will become not competitive). The project document contains relevant, precise, and concise information to achieve the project objective, which was to reduce greenhouse gas emission associated with industrial refrigeration and air-conditioning facilities in the Viet Nam.

The situation of HCFC use in Viet Nam was well documented and the project was developed taking into consideration the gaps, needs and priorities of the country. In particular, the Project Document identified the main barriers that need to be addressed to promote energy efficiency in the industrial refrigeration sector in Viet Nam, while using chemicals with lower GWP and minimizing the use of chemicals damaging to the ozone layer.

Stakeholders were satisfactory identified but the roles of some stakeholders in the project were not clearly described/referred in the project document. The actual implementation was delivered differently, and the involvement of the stakeholders in the project was mostly participation in the workshops. The two participating enterprises in which pilot conversions of cold storage facilities were planned in the project document were not the ones that actually participated in the project. However, the size of the companies that participated in the project are in line with the project document, as they include larger and very small enterprises.

Project potential risks have been identified and described and adequate mitigation measures have been proposed. However, the proposed mitigation measure for the Economic/market risks did not take into account factors that would have made a difference for entrepreneurs, as described in the last part of the previous chapter.

Part of the activities foreseen in Component 2 - related with output 2.2 - and the training aspects of component 3 were not performed. Arguably the project design was too ambitious taking into account the size of the country given the available funding.

The proposed monitoring and evaluation (M&E) plan and the costs associated with the M&E plan seem appropriate to effectively monitor progress of the overall project. Still on this subject, the project foresaw technical monitoring of the actual performance of the new technology using the indicators, monitoring forms and protocols and system for reporting the results of the M&E of the project. This has been partly achieved. On the contrary, there is no indication that the results of information and awareness interventions have been monitored to adjust Component 3.

A comprehensive Project Results Framework (PRF) (annex A of the project document) indicates the expected outcomes and outputs of the project. In general, the proposed indicators and sources of verification for the project development objective, outputs and outcomes therein are adequate to monitor progress. Most of the proposed indicators are smart and can be easily verified. Although some of the assumptions in the PRF are realistic and would allow achieving success, some key assumptions are missing. In fact the lack of availability of new refrigerants in the country was not taken into account. Moreover, no assumptions/risks were established for the soft loan.

The goal set as the overall objective of the project - Direct emission reduction: 9,000 tonnes of CO_2 equivalent - revealed too ambitious. It would have required adherence of companies to the soft loan and more units installed in the pilot companies.

Moreover, Sub-activity 3.1.3 training of technicians from 50% of the total number of close to 400 cold stores in the fisheries sector in Viet Nam, would have required significant budget to attract interest of participants. The activity, that potentially could have significant impact, has not been performed and questions remains on weather this activity has been adequately budgeted.

The rating on project design is Satisfactory.

4.2. Relevance

Relevance to the country and beneficiaries

This project is highly relevant as it adds up to Viet Nam's Hydrochlorofluorocarbon Phase-Out Management Plan (HPMP) that the country developed to comply with the commitment it assumed of phasing out HCFCs completely by 2040.

The project paves the way to the safe use of adequate alternative refrigerants that will be used more and more as the HCFC phase-out progresses worldwide. The project's relevance is increased by the fact that when it becomes necessary for equipment to be upgraded, owners are currently likely to favour the use of HFCs that have very high global warming potentials. HFC technology, specifically that using the refrigerant designated as R-404A (GWP[9] 3922), is currently the standard alternative to HCFC-22 in these types of applications. The technology is well known, relatively affordable and energy efficiency can be good. The R-290 (propane) is naturally occurring in nature, have zero ODS and has GWP of about 3. However, those refrigerants are highly flammable and care is needed on using and handling them.

The project was hosted at NOU within MONRE, who implemented the activities in a complementary and synergetic manner to other projects such as HPMP (Stage I). The Government of Viet Nam proposes is negotiating stage II of the HPMP. One of the activities proposed for stage II is conversion of cold-storage facilities plus a policy to prevent any new HCFC installations in the fishery and fish processing industry. The World Bank has estimated that the phase-out of 670 tonnes of HCFC-22 in the industrial refrigeration sector will cost USD10,190,700[10].

Moreover, MOIT is coordinating a USD100 million project funded by the World Bank on energy efficiency. The commercial banks lend (WB provided) money for companies to invest on energy efficiency. Included in the project is a roadmap for phasing out HCFC in the food processing industry. Reportedly synergies were not established between MOIT and MONRE on these two projects, but MOIT project constitutes an excellent opportunity to leverage the conversion into ODS free and low GWP equipment.

Relevance to GEF

The project is directly in line with the GEF 5 Focal Area Strategy for climate change mitigation, "to support developing countries and economies in transition toward a low-carbon development path", namely with objective 2 "Promote market transformation for energy efficiency in industry and the building sector". The project design is consistent with GEF strategy of building synergies across Conventions, namely by supporting the phase-out of hydrochlorofluorocarbons (HCFCs) used in industry and buildings such as chillers, air-conditioners, and refrigerators, and promote use of equipment that both operates more efficiently and uses chemicals with lower global warming potential. The outcomes of the project are in line with the outcomes proposed by GEF: i) Appropriate policy, legal and regulatory frameworks adopted and enforced; ii) Sustainable financing and delivery mechanisms established and operational; iii) GHG emissions avoided.

[9] Global Warming Potential (100 year), IPCC 4th Assessment Report, 2007. CO_2 = 1.
[10] http://www.multilateralfund.org/63/English%20Documents%20Lib/1/6355.pdf

The project is also consistent with GEF 5 Chemicals focal area "to promote the sound management of chemicals throughout their lifecycle in ways that lead to the minimization of significant adverse effects on human health and the environment" and in particular Objective 2 to "Phase out ODS and reduce ODS releases" . It also aligns with Outcome 2.1 "Country capacity built to meet Montreal protocol obligations and effectively phase out and reduce releases of ODS" and Outcome 2.2 to "ODS phased out and their releases reduced in a sustainable manner".

It should be emphasized that only with the Kigali agreement targets were set on when to reduce use of Hydrofluorocarbons (HFCs). This project design represents a step ahead, by promoting the use of HC gases with low ODS and GWP potential. This at a time in which, due to lack of alternatives, obligations to reduce HCFC R-22 could favour the use of HFCs that have very high global warming potentials thereby locking companies into these technologies for many years.

UNIDO's Comparative Advantages

UNIDO is implementing other projects in Viet Nam and else where which are related to this project under evaluation. For example, UNIDO with GEF funding is implementing the project 'Implementation of eco-industrial park initiative for sustainable industrial zones in Vietnam'. One of the 3 eco-industrial parks has food & seafood processing activities. MPI is the national governing, executing and lead agency of the project and the Department of Economic Zone Management is the responsible party. MONRE and MOIT are stakeholders. UNIDO is also implementing a project on promoting industrial energy efficiency through system optimization and energy management standards in Vietnam. That project is being implemented in close cooperation and coordination with MOIT and its Energy Efficiency and Conservation Office. It is complementary to several initiatives that have been developed by international cooperation (ADB, WB, UNDP) in Vietnam in the field of energy efficiency. Trainings are being given in collaboration with the International Finance Corporation.

In addition, UNIDO is developing Projects in other countries – including The Gambia and one other country – to be presented for GEF funding. These projects explore a range of alternative ("natural") refrigerants, along with reduction of leaks of ozone depleting substances and implementation of energy efficiency solutions.

UNIDO designed this pilot / pioneer project at a time when discussions about HFC phase down to be included as amendment to the Montreal Protocol were ongoing. This project might have helped to advance the discussions showing a good example. The discussion led to the Kigali agreement by October 2016.

The project corresponds to UNIDO mandate and policies, as the project tackles climate change, energy efficiency in industry, and training of trainers. This project builds upon UNIDO's portfolio of climate change and energy efficiency, including the following:

- UNIDO programme on "Green Industry for a Low-Carbon Future", a strategy to support green industrial growth in the developing world. Based on European experience, the programme encompasses the development of policy instruments aimed at raising resource efficiency on the level of companies and products that foster economic growth and international competitiveness;
- UNIDO's Industrial Energy Efficiency (IEE) programme that builds on more than three decades of experience and unique expertise and provides policymaking technical assistance, institutional capacity-building and market transformation support instrumental to the adoption and implementation in industry of energy management standards.

The rating on relevance and ownership is Highly Satisfactory.

4.3. Effectiveness

Achievement of expected outcomes

As stated in the project document, 5 outputs, organized under three components, were expected to be delivered that would contribute to 3 outcomes (see table below). The following paragraphs discuss the achievement of outputs and outcomes during implementation.

Outcome	Output	Activities
Component 1: Policy, regulatory and legal measures are adopted by the government to support the adoption of low global-warming potential and energy efficient technology	1.1 Gap Analysis carried out in the national policy, legal and regulatory framework	Carry out a gap analysis of Vietnamese policy, legislation and safety regulations relevant to refrigeration in cold storage facilities and alternative refrigerants. To inform the next activities, examples representing international best practice, including best practice in safety standards, may be translated to Vietnamese
	1.2 Relevant recommendations drafted into the national laws/regulations/ guidance	Facilitate discussion with relevant stakeholders, such as officials and professional associations, to address policy, regulatory and enforcement needs for Viet Nam.
		Proposed policy(ies), regulations and standards for Viet Nam will be drafted.
		Stakeholders will be supported on the adoption and enforcement of the proposed policy(ies) and/or regulation(s) through the publication of a short review of recommended improvements to enforcement practices.
Component 2: Technology with low global-warming potential (hydrocarbon system) is demonstrated, replicated and deployed	2.1 Two pilot demonstration conversions are carried out: two cold storage facilities converted from HCFC-22 use to hydrocarbon systems	Selection of pilot project sites.
		Facility upgrades design for two pilot facilities in order to maximize energy savings (and subsequent GHG emission reductions) and learning opportunities
	2.2 The demonstration conversions are replicated in up to 10 facilities	Development of a pipeline of projects using very low GWP refrigerants
		Private sector involved in design of plants using non-ODS, very low GWP refrigerants and in project pipeline development, in order to engage local industry and develop engineering expertise.
		Introduce Business Support Centres

Outcome	Output	Activities
Component 3: Demand for low-GWP refrigerant systems that are more energy efficient than existing technologies is increased	3.1 Lessons learnt and information on technology solutions is disseminated to policy makers, companies and technicians	Information and awareness campaign targeted at cold storage facility management conducted to improve knowledge of alternative refrigerant systems (with a focus on hydrocarbon refrigerants) and to improve perception of the effectiveness and safety of these systems
		Targeted outreach provided to policy-makers on the benefits of alternative refrigerants and on linking improvements in energy efficiency in the cold storage sector with national industrial development priorities
		Technicians trained on best refrigeration practices and safe handling of alternative refrigerants: Short course for refrigeration technicians at cold-storage facilities to be coordinated by the Cleaner Production Centre under INEST.
		Lessons learned analysis from the project for scale-up and replication in other countries worldwide conducted

Outcome 1: Delivery of outputs for this outcome has been satisfactory. The gap analysis has been successfully performed and a roundtable with stakeholders from government, academia and industry has been organized to collect recommendations. However, the recommendations have not been adopted. According to MONRE there will be changes in the legislation to include the Kigali amendment to the Montreal Protocol and the recommendations will be incorporated at that time. No definitive timeframe for that inclusion has been provided.

Outcome 2: Delivery of outputs for this outcome have been moderately satisfactory. The project document established the installation of 34 HC-290 units in two enterprises. The project achieved to install 25 units in 4 enterprises. However, the project foresaw replication in 10 other companies, which was not achieved. In fact the VEPF soft loan scheme ended up not being finalized and used, and no mobilization of local technicians and technology suppliers has occurred. Reportedly[11], with the installation of 25 units of HC-290, the project was able to phase-out 25 kg of HCGC-22, reduce 450 tons CO_2 equivalent and achieve energy efficiency gains, as monitored during 2015 and 2016, from 10% to 42% - average 28% (according to the technical document).

Output 2.1: A total of 25 units have been purchased, delivered and installed at 4 facilities, located in different parts of the national territory[12]. Installation started in September 2015 and was completed in December 2015, with the supervision of Zanotti. Technical personnel of the cold stores received practical trainings from Zanotti on installation and operation as well as on maintenance and best refrigeration practices of new equipment. The training also covered safety, handling and use of alternative technologies, and knowledge and tools to monitor the energy performances of the new hydrocarbon units and to compare it to the previous R-22

[11] *The 23 years Journey of Viet Nam's Ratification and Implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer*, MONRE, 2017

[12] Animex Nghe An at Vinh city, Cau Tree at Ho Chi Minh city, Dai An at Hanoi, Phu Minh Hung at Quang Ninh province.

units. Zanotti ensured remote assistance during the first months of operation. In September 2016, Zanotti visited again the companies to provide further training and to conclude the first year of operation monitoring, and to present and discuss the results. Despite some non-major technical problems, Cow Tree and *Animex Nghe An*, count with experienced technicians are satisfied with the conversion and confortable with the technology. The smaller *Dai An*, is not very satisfied, as from the 3 machines, one is no longer in operation, another works but has problems, and only one is functioning properly. The company reports that they need technical assistance but do not know where to seek for it. The fourth company was not available to communicate with the evaluation team.

There is common opinion among the beneficiaries and related technical persons that Zanotti HC290 refrigeration unit BAS235 (5HP) is a well designed and manufactured. The machine is compact, light in weight, easy to install and could be mounted on the cold store wall panel without any additional support structure. Installation time is short and the cost of installation is low. Very small HC290 charge of 1.6 kg/unit reduces the fire risk. Energy efficiency is high, power saving is substantial. There are some technical problems but it is within the capacity of the technical staff to remedy them. There is some room for improvement, related to alarms, to the reduce tripping compressor during defrost and snow accumulation on the evaporation fan.

Output 2.2. The only activity undertaken for this output was the contact with VEPF, who has agreed to include the subject in their loans with preferential interest rate. However, no specific scheme was developed in the scope of this project. Related to the use of the soft loan, the project design included the establishment of Business Support Centres in one or more of the companies in which demonstration units had been implemented to provide technology demonstration and training to businesses and operators. Moreover, there should be a mobilization of local engineering companies supporting design of plants using non-ODS and very low GWP refrigerants interested to develop a projects pipeline for the use of the loan.

Outcome 3. Delivery of outputs for this outcome has been moderately unsatisfactory. The project organized a number of workshops, some providing contact of technicians with the technology (although were not trainings). However, there were significant activities and sub-activities planned in the project document that have not been implemented.

The *Targeted outreach provided to policy-makers on the benefits of alternative refrigerants and on linking improvements in energy efficiency in the cold storage sector with national industrial development priorities* has not been implemented[13]. Also, the *Short course for refrigeration technicians at cold-storage facilities to be coordinated by the Cleaner Production Centre* did not take place. This activity could have had a significant impact. The *Design and implement and annual competition to recognize the implementation of alternative refrigerants* was also not done.

Output 3.1: The Inception Workshop organized in Viet Nam provided opportunities to gather stakeholders from different Ministries, industry and media, and discuss relevant issues. Two workshops have been organized in Hanoi (84 participants) and Ho Chi Minh (about 100 participants) to create awareness about the results on the four successful pilots of new technology for reducing greenhouse gas and ozone depleting substances emissions through technology transfer in industrial refrigeration. These workshops were attended by representatives of more than 56 enterprises, besides industry associations, media, ministries' representatives and other projects. The Ho Chi Minh workshop was joined with the celebration of the National Ozone day, which conferred larger projection.

The above-mentioned workshops were also used to sensitize refrigeration technicians from fisheries industry on use of hydrocarbon technology. The evaluation team considers that these sensitization events are different in nature from the short-course foreseen in activity 3.1.3, which

[13] Ministries representatives were present in the workshops organized by the project, but these workshops were broad in scope and did not specifically target policy-makers.

stated that Trainees will be certified to operate and maintain facilities using the alternative technologies covered in the course.

Besides, the National Ozone Unit produced several informative materials and leaflets, and the project is included in the awareness material – booklet and video – produced to celebrate 23 years of Viet Nam's ratification and implementation of the Montreal Protocol on ODS. The project also had international projection. The awareness raising international consultant promoted the publishing in international media of articles related with the project.

For the reasons expressed above efficiency is rated Moderately Satisfactory.

4.4 Efficiency

The project started in April 2014. There were no significant delays registered in the activities that were carried out. In particular the demonstration projects were achieved in a timely manner enabling monitoring of about 2 years of activity. Other activities did not take place, as the reality did not evolve the way it was foreseen in the project document.

At the time of the evaluation the project had committed 99.2% and disbursed 93% of the available funding. As the enterprises did not express interest in the soft loan, about half of the project co-funding has not been materialized. Zanotti repots the materialization of co-financing of about USD233,000.

For the reasons expressed above efficiency is rated Moderately Satisfactory.

4.5 Sustainability of benefits

Financial risks – moderately unlikely – The project was not able to increase the demand for the soft loan mechanism and entrepreneurs are not yet ready to invest in alternative HC refrigerants (as R-290) for industry. It is common in Vietnam that the companies are unwilling to borrow money from green funding institutions, even if the charged interest rates are lower, because of the complicated loan procedures. The project did considerable efforts focusing on technical aspects of conversion to new refrigerant technology at firm level, but only limited effort (if any) has been devoted to the financial issue.

Socio-political risks – likely – The government of Viet Nam is committed to phasing out HCFCs up to 2040. Different stakeholders from industry associations and technical institutions do understand the benefits of using HC and their risks. There is now recommendations for the adoption of policy, legal and regulatory measures, that MONRE states will be incorporated when legislation will be changed. Reportedly, this will occur when Viet Nam adapts its legislation to the Kigali Amendment to the Montreal Protocol.

Institutional framework and governance risks – moderately likely – One of the mitigation measures established in the project document to avoid delays in the implementation of the policy and regulatory recommendations was the integration was the representation at the Project Steering Committee of representatives of different ministries. This would also contribute to establish synergies with other projects. However, there was no steering committee in this project and the ministries tend to run parallel initiatives without much communications between them. On the other hand, the project could benefit from the communication means and procedures of projects with similar focus taking place in parallel (e.g. HPMP, IS – institutional strengthening for Montreal Protocol). In this regard, the NOU had already a functioning communication flow with relevant authorities set up and could integrate an additional level for the project.

Environmental Risks - likely - The project is considered to be ecologically sound and

sustainable as it is building national capacity for the use of energy efficient and low GWP refrigerants and to avoid GHG emissions due to leakages

Regarding safety risks, service expertise has yet to be developed through intensive training and the certification of all service operators on safety procedures, as stated in the mitigation measure of the project document.

In conclusion, the rating on sustainability is Moderately Likely.

4.6 Gender mainstreaming

The project document recognized that "*providing support (GEF funded and co-financed) for educational activities on largely technical topics such as industrial refrigeration and air conditioning can help women access both the knowledge and skills needed to be active participants in the project and in the sector".*

The project took care of collecting data disaggregated by gender – for example in the two workshops for awareness raising on project benefits, the rate of men to women was respectively 49 men to 35 women at Hanoi and 79 men to 29 women in Ho Chi Minh. The National Ozone Unit, who served as Project Coordinator is a woman.

During the TE no evidence was provided that gender issues were included in the materials, analysis, company assessments, outcomes, nor is there evidence of gender related data gathering or analysis in the Monitoring and Evaluation activities. No further insights were obtained on the topic of gender aspects, as referenced in the UNIDO Guidelines on gender mainstreaming (2009, 2014),

Rating on gender mainstreaming is Moderately Unsatisfactory.

4.7 Assessment of monitoring and evaluation systems

The monitoring & evaluation (M&E) plan proposed in the project document is consistent with UNIDO's standard procedures. In general, the proposed indicators and sources of verification for the project development objective, outputs and outcomes therein are adequate to monitor progress. Most of the proposed indicators are smart and can be easily verified. Although some of the assumptions in the PRF are realistic and would allow achieving success, some key assumptions are missing. In fact, the lack of availability of new refrigerants in the country was not taken into account.

The proposed plan is adequate and allows for monitoring progress and results. Similarly, the overall approach to monitor progress and project evaluation in terms of activities and deliverables described in the project document (Part II Section C of project document) is adequate.

Some changes occurred during project that difficult implementation of the M&E plan. As stated previously no steering committee was established. No project reports from MONRE were made available to the evaluation team. The evaluation team was also not provided the Measurement of Means of Verification for Project Purpose Indicators that were supposed to be conducted at the Start, mid and end of project.

Annual progress reports as well as PIRs were timely submitted. The PIRs were shared with the evaluation team. The budget that could be adequate in theory ended up not being in line with the reality. Monitoring of long-term changes.

The project design did include several long-term monitoring systems: i) monitor actual performance of the new technology; ii) monitor of the energy efficiency of the equipment; ii)

Monitor results of information and awareness interventions and adjust the plan accordingly.

As stated previously, the national technical consultant performed the monitoring at the end of the installation of the new equipment. Also, Zanotti did a monitoring tour and further training one year after the equipment has been in operation. The latest energy efficiency monitoring report includes data up to May 2016. The project document also included as an activity monitoring results of information and awareness interventions. This is not being performed in a systematic way.

Rating on M&E is Moderately Satisfactory.

4.8 Project coordination and management

The project coordination and management was quite different from what is outlined in the project document. There was no steering committee and the project has been run from UNIDO-HQ with the support of a national project coordinator.

For the implementation of the project, a PM was nominated from the Department of Environment, UNIDO Head Quarters, Vienna. A full-time supporting staff assisted the PM. The guidance and supervision provided by PM was highly appreciated by the national counterparts[14]. The PM contributed to the successful support provided by Zanotti and Shecco to the project. PIRs were timely drafted and submitted to GEF.

At the national level, the project management and overall coordination was done by a project coordinator, the head of NOU. There have been 6 contracts between UNIDO and the Project Coordinator, with different durations each. In total, the contracts span April 2014 to September 2017.

Despite of the good quality of project management from UNIDO-HQ and the national project coordinator, in view of what was written in the project document, the rating on project coordination and management is Moderately unsatisfactory.

4.9 Assessment of processes affecting achievement of project results

As stated above, the project did not achieve the targets and goals expressed in the project document. Namely, the momentum foreseen in the project document with the establishment of the Business Support Centers, the use of the soft loan, the short training and certification of refrigeration technicians from 50% of the cold storage fisheries facilities in the country and setting the yearly competition to recognize implementation of alternative refrigerants, was not generated. On the other hand, the demonstration nature of the project was achieved with the installation of 25 HC-290 units, which are still running.

Quality at entry was satisfactory. For example, the project benefitted from Zanotti with recognized good quality equipment and competence in the trainings. The project has also benefited from Shecco, with general input to the information and awareness campaigns, and direct marketing support on publishing articles about the project. Moreover, the national entities responsible for the management of hazardous chemicals (NOU of NEA), the prestigious university HUST and representative associations actively participated and provided inputs to the project.

However, the project document included a too ambitious quantitative project objective, and it is always risky as well to set objectives on actual change of policies, laws and regulations, which are out of the control of the project and implementing entities.

[14] Interviews with national stakeholders

Given the above, preparation and readiness is considered satisfactory.

Country ownership / driven-ness

The project is highly relevant and involvement of NOU was very satisfactory. However, the project was considered a small project by MONRE, given its budget of USD290,000, therefore. Besides the project was mostly managed by UNIDO-HQ. As this is a demonstration project, involving the application of new, explosive and flammable technology, it is regarded with caution. The project did not attract much political support *per se.* The project coordinator tried to generate synergies with other ongoing projects, but part of the activities - that would depend on national ownership - was not implemented. Therefore, the rating is moderately satisfactory.

Financial Planning

A nearly full agency mode of execution was applied for the implementation of the project. UNIDO managed all the GEF funds and applied standard procedures for the disbursement of funds, sub-contracting, procurement of services or equipment, and for payment. All the consultants, both national and international, as well as service providers were directly contracted by UNIDO HQ, and payment was done upon submission of planned deliverables and/or report according to the terms of agreement of the respective contract. The main international service providers, Zanotti and Shecco, were already identified in the project document.

UNIDO did provide the budget execution until December 2017 in the ToR. The amount presented in the Budget overview corresponding to UNIDO's allocation is USD120,761 is significantly different from the Project Document (USD210,000 + USD35,000). This is explained by UNIDO[15]. From the USD290,000 GEF grant, USD287,013 are committed and about USD279,600 are disbursed. The pending disbursements are for national and international consultants and staff; probably this evaluation. The remaining about USD3000 of the GEF grant correspond to budget line Train/Fellowship/Study under project management.

The evaluation considers that financial planning was Satisfactory.

Other Aspects

Issues regarding UNIDO support, delays of project outcomes/outputs, and implementation approach are discussed in previous paragraphs. UNIDO support was appreciated. MONRE expressed interest that future projects can be more country driven.

The project document did acknowledge the risk of HCFC-22 release into the atmosphere when working with old systems and Safety risk due to improper serviceability of new technology or after- sales service knowledge. For these two risks, mitigation measures were identified: Select the proper contractor with expertise of HCFC handling, and development of after sales service expertise through intensive training and the certification of all service operators on safety procedures. The contractor fulfilled the first mitigation measure, but the certification of technicians is yet to be achieved.

[15] UNIDO has given contribution of USD 70,000 from the MLF funds approved within the grant "Mobilizing co-financing for Multilateral Fund funded projects based on the 'Monetization' of their climate benefits" for the concept preparation of the MSP project proposals (pilot projects) in Viet Nam and Gambia. The remaining of the co-financing was provided through the HPMP projects.

4.10 Overall project achievement

Table 4 below summarizes the evaluators' assessment of the project

Evaluation Criteria	Comments	Rating
Impact	This is a demonstration project. The most significant impact of the project has been the installation of 25 HC-290 units in four companies and two national workshops demonstrating the usefulness of the technology transfer. The recommendations for policy and legislation improvements may have an impact if it is adopted.	MS
Project design		S
Overall design	The project was adequate to address the problems, and consistent with the country and donors priorities. Stakeholder analysis was adequate, but some risks were not adequately addressed.	S
Logframe	The PRF was of good quality. However, the goals and results expected for the overall project objective, and for component 3 were too ambitious.	MS
Project performance		MS
Relevance	The project is highly consistent with Viet Nam phasing out of HCFC by 2040	HS
Effectiveness	Not all outputs were achieved and some are yet to be implemented. However, the results obtained have quality and contribute to the overall goal.	MS
Efficiency	There have not been significant delays in the implementation of the project. However some activities and outputs were not be implemented.	MS
Sustainability of benefits	There are financial and market risks regarding demand for low GWP refrigerants for cooling systems. Also Viet Nam may not adopt the recommendations of component 1 in the short term	Moderately Likely
Cross-cutting performance criteria		MS
Gender mainstreaming	The project did address gender mainstreaming, but women were not particularly targeted by the project.	MU
M&E design and implementation	M&E was well designed but not implemented according to the plan	MS
Results-based Management (RBM)	The approach agreed for the project was not followed. The project benefitted from experienced consultants and partners. Country ownership is satisfactory, but not leadership. Financial and backstopping support was satisfactory.	MS
Performance of		S

Evaluation Criteria	Comments	Rating
partners		
UNIDO	UNIDO PM provided adequate and timely supervision and backstopping to the project implementation, both in terms of technical guidance and administrative actions	S
National counterparts	The local partners adhered well to the project. National stakeholders expressed they would have liked the project to be more country-driven.	MS
Donor	GEF provided funds and comments to the project. The support from Zanotti and sheco was highly appreciated by the stakeholders.	HS
Overall assessment		S

Score		Definition	Category
6	Highly satisfactory	Level of achievement clearly exceeds expectations and there is no shortcoming.	SATISFACTORY
5	Satisfactory	Level of achievement meets expectations (indicatively, over 80-95 per cent) and there is no or minor shortcoming.	
4	Moderately satisfactory	Level of achievement more or less meets expectations (indicatively, 60 to 80 per cent) and there are some shortcomings.	
3	Moderately unsatisfactory	Level of achievement is somewhat lower than expected (indicatively, less than 60 per cent) and there are significant shortcomings.	UNSATISFACTORY
2	Unsatisfactory	Level of achievement is substantially lower than expected and there are major shortcomings.	
1	Highly unsatisfactory	Level of achievement is negligible and there are severe shortcomings.	

V. Conclusions, recommendations and lessons learned

5.1 Conclusions

This project is highly relevant as Viet Nam is committed to phase out HCFC by 2040 and implementing an HPMP. By removing barriers to increased energy efficiency and establishing the enabling environment for the introduction of low global warming potential (GWP) alternatives to HCFC- 22, the project adds up to the HPMP. GEF 5 Focal Area Strategy for climate change mitigation, “to support developing countries and economies in transition toward a low-carbon development path”, namely with objective 2 “Promote market transformation for energy efficiency in industry and the building sector”.

The project design is clear but ambitious, with outputs and achievements formulated on a broad range of topics and this requires time for consultation and consensus building.

Effectiveness of the project is considered Moderately satisfactory. Quality outputs have been delivered and national stakeholders are satisfied with the performance of the machines. However, the overall objective goal and components 2 and 3 outputs have not been fully achieved, while the result of component 1 is yet to be integrated into policies, laws and regulations. Efficiency was moderately satisfactory as there have not been significant delays in the implementation of the project, but some activities have not been implemented.

The approach originally agreed upon by stakeholders for the implementation was not followed, in particular there was no steering committee. It was considered sufficient to have an informal set up for the technical coordination and inter-ministerial communication, given the reduced budget of the project - the evaluation found a limited integration of this project with other related on-going projects run by other ministries. Overall project management, supervision and monitoring were satisfactorily provided by UNIDO HQ with adequate staffing. Active involvement of national stakeholders in all the project activities contributed to high ownership and quality of outputs delivered.

This was a demonstration/pilot project and its major achievement was to establish in the country foundations to the use of HC refrigerants, by working on policy/regulations (central level), and simultaneously implementing demonstration projects in different parts of the country to show the feasibility and benefits of the new technology.

Some risks have been identified, namely regarding the low penetration of HC in the country (except R-600a in refrigerators) and the uncertainty of the adoption by the government of the measures recommended in component 1. Therefore, likelihood for sustainability of benefits and continuous sustained impact of the project is considered moderately likely.

Sustainability of project outcomes from a financial and institutional point of view is not ensured. It must be noted that threats for environmental quality in Viet Nam are still very significant and that there are differences in the understanding of the importance and linkages between environmental protection and development. Continuation of support by stakeholders to consolidate key results of the project is recommended.

5.2 Recommendations

In order to maximize impact of the project, MONRE should take quick action to sensitize policy makers on the alternatives to HCFC and implement the policy/legal/institutional recommendations and guidance (produced by component 1). This includes sensitization to policy makers and decision-makers of several departments of the government and the national assembly. In particular, MONRE should seek increased communication and synergies with MOIT and the energy efficiency project supported by the World Bank, which includes HCFC phase out in industry.

MONRE should continue the process of mobilizing interest of enterprises for the use of HC in the refrigeration industry. This could be done by mainstreaming training and certification of refrigeration technicians on HC technology, and by improving conditions for the availability in the country of alternative refrigerants as well as of technical assistance to HC systems.

5.3 Lessons learned

The evaluation was affected by the very ambitious objective and goals set in the project document, namely regarding companies' adherence to the conversions and use of Viet Nam Environmental Fund, as well as establishment of Business Support Centers and private sector development of viable project pipelines. When designing future projects, it is preferable to set quantitative objectives and goals on issues the project can control to a certain extent, instead defining them on issues that depend solely/mostly on external factors.

All agencies involved in a project must have a common understanding of the extent to which the chosen issues and indicators represent changes in the real world, and about the limitations and factors affecting those changes. This is key for implementation partners/institutions to avoid taking up responsibilities that are out of reach given their capacities (for example existence of required staff) or mandate, unless the project itself has provisions to satisfy the requirements. Responsibilities of each participating institution should be fully owned through formal institutional commitment.

To change behavior on the refrigeration and AC industry it is an excellent idea to mobilize beneficiaries/stakeholders from industry and strengthen awareness to achieve stakeholder commitment. However, it is equally important to train RAC technicians (service providers) as they are at the forefront to sensitize the end-user.

Entrepreneurs are averse to the risk of having to stop activities and to uncertainty of supply of consumable goods required for the operation. Therefore, when introducing new technology, it is important to set conditions for the availability of consumable goods and technical assistance. Besides, the proposed solutions need to be perceived as being within reach of the targeted sectors (technologically and financially), useful (namely regarding competitiveness and compliance), and relevant (return of investment, added value).

Annexes

Annex I – Terms of Reference

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE

Independent terminal evaluation of

Reducing greenhouse gas and ODS Emissions through technology transfer in industrial refrigeration

UNIDO Project ID: 120621

GEF Project ID: 5464

July 2017

Contents

I. PROJECT BACKGROUND AND CONTEXT

1. Project factsheet[16]

Project title	Reducing greenhouse gas and ODS Emissions through technology transfer in industrial refrigeration
UNIDO Project ID	120621
GEF Project ID	5464
Region	Asia
Country(ies)	Viet Nam
Project donor(s)	GEF
Project implementation start date	01/07/2013
Expected duration	36 months
Expected implementation end date	31 December 2017
GEF Focal Areas and Operational Project	Climate Change
Implementing agency(ies)	UNIDO
Executing partners	MONRE, MARD, Cleaner Production Centre
UNIDO RBM code	
Donor funding	210,000 USD
Project GEF CEO endorsement / approval date	6/6/2013
UNIDO input (in kind and cash, USD)	245,000
Co-financing at CEO Endorsement, as applicable	1,855,000
Total project cost (USD)	2,145,000
Mid-term review date	As the project was a Medium-size Project (MSP), a mid-term evaluation/review was not conducted.
Planned terminal evaluation date	10/11/2017

(Source: Project document)

[16] Data to be validated by the Consultant

2. Project context

Viet Nam consumes HCFC-22 for servicing and maintenance purposes. The project focuses on synergies between the UNFCCC and the Montreal Protocol and aims at reducing ODS emissions. To reach this objective, the project uses a synergistic combination of technical assistance on policy and regulation, technology transfer, capacity building and awareness-raising.
The initiatives developed under this project help inform companies worldwide who face the common problem of having to procure future-proof plants that such plants are affordable to run. Instilling knowledge of new technologies through this project should contribute to preparing the cold storage industry in Viet Nam to select the best technologies in the conversion away from HCFC-22.
Equipment upgrades aim at greatly reducing the emission of ozone depleting substances (ODS) and greenhouse gases by replacing HCFC-22 with non-ODS refrigerants with very low global warming potentials. The demonstration projects are meant to serve as pilots for the conversion of other cold storage facilities in Viet Nam and elsewhere in both the choice of technology and project parameters. Hence, from the point of view of the GEF and UNIDO, the project can be seen as an initial step that can be used to inform the possible development of large scale-up projects for Stage II of the HPMP (period 2015-2020) and the GEF 6.
The key barriers to promoting energy efficiency in the cold storage sector in Viet Nam, while using chemicals with lower global warming potential (GWP) and minimizing the use of chemicals damaging to the ozone layer, include an overall lack of policy and regulatory incentives to move away from HCFC-22 prior to 2040 and a lack of policies and measures for refrigeration emission control; lack of awareness of the potential savings of energy efficiency and of the available technologies; lack of tools and technical capacities for repairing and maintaining technologies other than the existing ones; refrigerants other than HCFC-22 require new systems that are comparatively costly, in addition to toxicity and flammability risks; financial barriers, e.g. low cost of HCFC-22 at present in the market compared to its alternatives and high cost of conversions to new equipment using low GWP refrigerants, particularly when compared to the cost of conversion to the extremely high GWP HFCs which are the standard HCFC-22 replacement.

3. Project objective

The overall objective is to reduce greenhouse gas emissions by creating an enabling environment for the use of hydrocarbon refrigerants (with a very low GWP) in cold storage facilities in Viet Nam that currently use HCFC-22 for servicing and maintenance purposes.
The project includes three components with three outcomes:

Project component 1 - Policy and Regulatory Support

- Outcome 1: Policy, regulatory and legal measures are adopted by the government to support the adoption of low global-warming potential and energy efficient technology.

Project components 2 - Technology Transfer

- Outcome 2: Technology with low global-warming potential (hydrocarbon system) is demonstrated, replicated and deployed.

Project component 3 - Awareness Raising

- Outcome 3: Demand for low-GWP refrigerant systems that are more energy efficient than existing technologies is increased.

The Project is further structured into a total of eight outputs as illustrated in following figure. The full logical framework is included as annex 1.

4. Project implementation arrangements

The project is coordinated through a two-tiered system, consisting of a Project Steering Committee (PSC) and a Project Management Unit (PMU).

Project Steering Committee

The Project Steering Committee (PSC) is composed by the representatives of the main Government stakeholders and UNIDO. It is responsible for providing overall guidance and making policy decisions for the project, e.g. reviewing project plans, providing advice on strategic approaches and solutions to ensure that project objectives are achieved; ensuring required resources are committed; arbitrate any conflicts within the project and negotiate a solution to any problems with external bodies.

The PSC is chaired by MONRE and meets annually. At its meetings it considers the Annual Work Plan presented by the Project Director, give guidance and suggestions for its improvement and approve the final version.

The PSC includes representatives from the Cleaner Production Centre, MONRE, MOIT, MARD and the Ministry of Science and Technology. The PSC, on a need basis, can decide to invite other stakeholders (e.g. regulators, industry actors, research institutes, etc.) while taking care that the PSC remains operational by its size. Coordination with other initiatives in Viet Nam is facilitated by involvement of stakeholders from those initiatives in the PSC.

The Project Coordinator, representing MONRE, is the Convener Secretary of the PSC.

Project Management Unit (PMU)

The PMU consists of a Project Director (PD), supported by a Deputy Project Director and an Administrative Assistant. The Project Director is field extension of the Management Unit and leads the PMU. The Director is responsible for executing the work programme and the day-to-day management, monitoring and evaluation of project activities as per the approved Annual Work Plan (AWP).

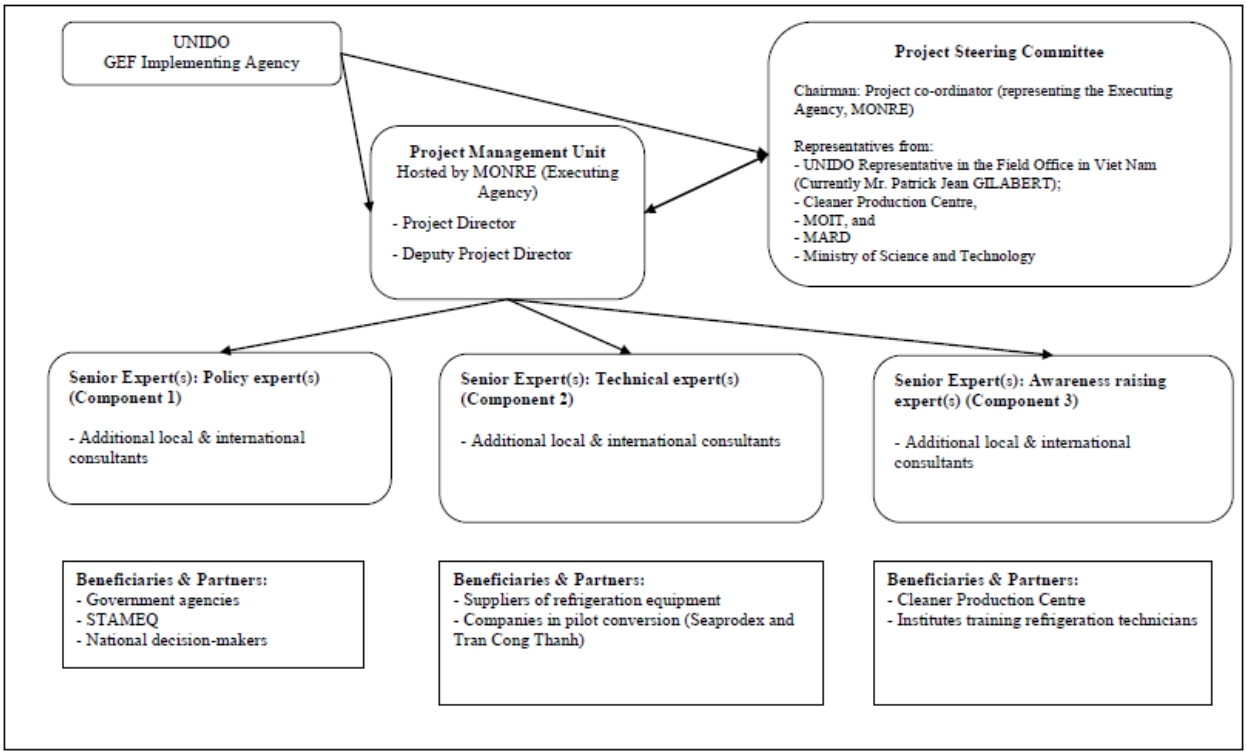
All field staff are hired as per UNIDO recruitment rules. The PMU is hosted at the National Ozone Unit, Viet Nam. During the entire implementation period of the project, UNIDO provides the PMU with the necessary management and monitoring support.

The PD prepares the AWP, as per UNIDO rules and regulations, and presents it for consideration to the PSC one month before the end of every calendar year. Based on the approved AWP, quarterly plans are prepared by the PD and accordingly executed by the Project Management Unit (PMU).

The PMU is responsible for the overall operational and financial management in accordance with rules and regulations imposed by UNIDO/GEF for directly executed projects. It prepares progress reports, financial reports etc. which are submitted to UNIDO-HQ and the PSC. It produces annual progress reports, at least two weeks before the annual meetings.

At the end of the project, the PMU will produce the terminal report, which is to be submitted to the Project Steering Committee at least two weeks before the Terminal meeting.

The overall project management structure is outlined in the diagram below.



*UNIDO representative from Field Office in Viet Nam is Ms. Thi Thanh Thao LE as of April 2017.

Stakeholders

Key stakeholders are the following:

- Ministry of Natural Resources and Environment (MONRE): National Focal Point for the UNFCCC and the Kyoto Protocol. The National Ozone Unit (NOU) is a stakeholder in this project in view of the focus of this project on synergies between the UNFCCC and the Montreal Protocol.
- Participating enterprises in which pilot conversions of cold storage facilities are being developed:
  - Seaprodex Hai Phong [17] (HaiPhong Factory for Transfer Aquatic for Export), specializes in producing and processing agricultural and aquatic products and food for export and for domestic consumption. It has 22 employees and about 5,2 billion VND gross annual revenue.
  - Tran Cong Thanh cold storage, Thach Bich Village – Bich Hoa Commune – Thanh Oai Dist. - Hanoi. Privately owned. Five employees, about 4,5 billion VND annual gross revenue.
- Ministry of Industry and Trade (MOIT): runs the National Energy Efficiency Programme (VNEEP). The MOIT was formed after the merger of the Ministry of Industry and the Ministry of Trade. MOIT is in charge of activities related to the energy sector and other industries, in accordance with Decree 189/2007/ND-CP issued by the Prime Minister on 27 December 2007. MOIT is in charge of the formulation of law, policies, development strategies, master plans and annual plans for the sectors under its remit, and submits them to the Prime Minister for approval.
- The Department of Processing and Trade for Agro-Forestry-Fisheries Products and Salt Production, Ministry of Agriculture and Rural Development (MARD) is a project implementing partner due to its role in the fish processing sector.
- Viet Nam HPMP PMU (set up by the NOU).

[17] Seaprodex (Vietnam National Seaproducts Corporation) is majority owned by the Vietnamese government. The cold store in Hai Phong is run as an independent entity; however, major decisions have to be made at the headquarters in Hanoi.

- STAMEQ as advisor on standards on industrial refrigeration.
- Vietnam Community of Heating, Ventilating, Air Conditioning & Refrigeration Engineers.
- Vietnam Society of Refrigeration and Air Conditioning (VSRAE) (landhkk.com.vn).
- Vietnam Association of Seafood Processing and Export: This association, together with the Vietnam Fisheries Association, cooperated with MARD to propose policy mechanisms and measures to encourage organizations and individuals to reorganize their production to ensure production efficiency, particularly of better design of commercial cold storage facilities to increase efficiency. These proposals were developed in the context of the Prime Minister's Decision on the approval of the Strategy of Vietnam's Fisheries Development for the Period 2011 – 2020 (No. 1690/QD-TTg).
- Cleaner Production Centre: located at the Hanoi University of Technology, under its host organization: Institute for Environmental Science and Technology, INEST.

5. Budget information

Table 1. Financing plan summary

USD	***Project Preparation***	***Project***	***Total (USD)***
Financing (GEF / others)	Click here to enter text.	290,000	290,000
Co-financing (Cash and In-kind)	Click here to enter text.	1,855,000	1,855,000
Total (USD)	***200,000****	**2,145,000**	**2,145,000**

Source: Project document / Progress report

*The project preparation was supported by the MP Multilateral Fund for 3 countries, Viet Nam, Gambia and Morocco for USD200,000 (excl. support costs).

Table 2. Financing plan summary - Outcome breakdown[18]

Project outcomes	**Donor (GEF/other) (USD)**	**Co-Financing (USD)**	**Total (USD)**
1. Policy, regulatory and legal measures are adopted by the government to support the adoption of low global-warming potential and energy efficient technology.	54000	130000	**184,000**
2. Technology with low global-warming potential (hydrocarbon system) is demonstrated, replicated and deployed	152000	1190000	**1,342,000**
3. Demand for low-GWP refrigerant systems that are more energy efficient than existing technologies is increased	69000	360000	**429,000**
Project management structure and project M&E mechanism	15000	175000	**190,000**
Total (USD)	**290,000**	**1,855,000**	**2,145,000**

Source: CEO endorsement document

[18] Source: Project document.

Table 3. Co-Financing source breakdown

Name of Co-financier (source)	Classification	Type	Total Amount (USD)
UNIDO	Implementing Agency	In kind	35,000
UNIDO	Implementing Agency	Cash	210,000
Government of VN	Counterpart	Cash	80,000
Government of VN	Counterpart	In kind	120,000
Shecco (Marketing & Communication experts)	Counterpart	In kind	310,000
Zanotti (Technology supplier)	Counterpart	Cash	50,000
Technology suppliers (TA)	Counterpart	Cash	150,000
Vietnam Environmental Protection Fund	Counterpart	Soft loan	900,000
Total co-financing (USD)			**1,855,000**

Source : CEO endorsement document

Table 4. UNIDO budget execution (4000376 XP and 2000002517 GEF Grants)

Item	2014	2015	2016	2017	Total Expenditures (USD)
Contractual Services	28,458	110,822	2,417	-	141,697
Equipment	-	7,677	-	-	7,677
International Meetings	-	-	-	-	-
Local travel	6,366	9,987	4,760	995	22,108
Nat.Consult./Staff	14,252	33,691	29,897	27,054	104,892
Other Direct Costs	1,334	5,794	1,026	-	8,153
Staff & Intern Consultants	6,443	10,869	17,246	-	34,558
Staff Travel	240	6,036	5,381	-	11,657
Train/Fellowship/Study	7,361	(1,281)	47,195	-	53,275
Total	**64,453**	**183,593**	**107,922**	**28,048**	**384,016***

* Expenditures recorded under XP grant were converted to USD by using the current UN exchange rate, July 2017
Source: SAP database

II. Scope and purpose of the evaluation

The terminal evaluation (TE) will cover the whole duration of the project from its starting date in 01/07/2013 to the estimated completion date in 31/12/2017. It will assess project performance against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The TE has an additional purpose of drawing lessons and developing recommendations for UNIDO and the GEF that may help for improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion. The TE report should include examples of good practices for other projects in the focal area, country, or region.

The TE should provide an analysis of the attainment of the project objective and the corresponding technical outputs and outcomes. Through its assessments, the Evaluation Team (ET) should enable the Government, counterparts, UNIDO and the GEF and other stakeholders and donors to verify prospects for development impact and sustainability, providing an analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators. The assessment shall include re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters defined in chapter VI.

The key question of the TE is whether the project has achieved or is likely to achieve its main objective, i.e. to reduce greenhouse gas emissions by creating an enabling environment for the use of hydrocarbon refrigerants (with a very low GWP) in cold storage facilities in Viet Nam that currently use HCFC-22 for servicing and maintenance purposes.

The evaluation has three specific objectives:

(i) Assess the project performance in terms of relevance, effectiveness, efficiency, sustainability and progress to impact;
(ii) Identify key learning to feed into the design and implementation of the forthcoming projects; and
(ii) Develop a series of findings, lessons and recommendations for enhancing the design of new and implementation of ongoing projects by UNIDO.

III. Evaluation approach and methodology

The TE will be conducted in accordance with the UNIDO Evaluation Policy[19] and the UNIDO Guidelines for the Technical Cooperation Project and Project Cycle[20]. In addition, the GEF Guidelines for GEF Agencies in Conducting Terminal Evaluations, the GEF Monitoring and Evaluation Policy and the GEF Minimum Fiduciary Standards for GEF Implementing and Executing Agencies.
The evaluation will be carried out as an independent in-depth evaluation using a participatory approach whereby all key parties associated with the project will be informed and consulted throughout the evaluation. The evaluation team leader will liaise with the UNIDO Independent Evaluation Division (ODG/EVQ/IEV) on the conduct of the evaluation and methodological issues.

In line with its objectives, the evaluation will have two main components. The first component focuses on an overall **assessment of performance** of the project, whereas the second one focuses on the **learning** from the successful and unsuccessful practices in project design and implementation. The evaluation will use a theory of change approach and mixed methods to collect data and information from a range of sources and informants. It will pay attention to triangulating the data and information collected before forming its assessment. This is essential to ensure an evidence-based and credible evaluation, with robust analytical underpinning.

The theory of change will identify causal and transformational pathways from the project outputs to outcomes and longer-term impacts, and drivers as well as barriers to achieve them. The learning from this analysis will be useful to feed into the design of the future projects so that the management team can effectively manage them based on results.

1. Data collection methods

The main instruments for data collection are the following:

(a) **Desk and literature review** of documents related to the project, including but not limited to:
- The original project document, monitoring reports (such as progress and financial reports, mid-term review report, output reports, back-to-office mission report(s), end-of-contract report(s) and relevant correspondence.
- Notes from the meetings of committees involved in the project.

(b) **Stakeholder consultations** will be conducted through structured and semi-structured interviews and focus group discussion. Key stakeholders to be interviewed include:
- UNIDO Management and staff involved in the project; and
- Representatives of donors and counterparts.

(c) **Field visit** to Viet Nam.

2. Evaluation key questions and criteria

The key evaluation questions are the following:

(b) What are the key drivers and barriers to achieve the long-term objectives? To what extent has the project helped put in place the conditions likely to address the drivers, overcome barriers and contribute to the long-term objectives?

(c) How well has the project performed? Has the project done the right things? Has the project done things right, with good value for money?

[19] UNIDO. (2015). Director General's Bulletin: Evaluation Policy (UNIDO/DGB/(M).98/Rev.1)

[20] UNIDO. (2006). Director-General's Administrative Instruction No. 17/Rev.1: Guidelines for the Technical Cooperation Programme and Project Cycle (DGAI.17/Rev.1, 24 August 2006)

(d) What have been the project's key results (outputs, outcome and impact)? To what extent have the expected results been achieved or are likely to be achieved? To what extent the achieved results will sustain after the completion of the project?
(e) What lessons can be drawn from the successful and unsuccessful practices in designing, implementing and managing the project?

The evaluation will assess the likelihood of sustainability of the project results after the project completion. The assessment will identify key risks (e.g. in terms of financial, socio-political, institutional and environmental risks) and explain how these risks may affect the continuation of results after the project ends. Table 5 below provides the key evaluation criteria to be assessed by the evaluation. The details questions to assess each evaluation criterion are in Annex 2.

Table 5. Project evaluation criteria

#	Evaluation criteria	Mandatory rating
A	**Impact**	**Yes**
B	**Project design**	**Yes**
1	• Overall design	Yes
2	• Logframe	Yes
C	**Project performance**	**Yes**
1	• Relevance	Yes
2	• Effectiveness	Yes
3	• Efficiency	Yes
4	• Sustainability of benefits	Yes
D	**Cross-cutting performance criteria**	
1	• Gender mainstreaming	Yes
2	• M&E: ✓ M&E design ✓ M&E implementation	Yes
3	• Results-based Management (RBM)	Yes
E	**Performance of partners**	
1	• UNIDO	Yes
2	• National counterparts	Yes
3	• Donor	Yes
F	**Overall assessment**	Yes

3. Rating system

In line with the practice adopted by many development agencies, the UNIDO ODG/EVQ/IEV uses a six-point rating system, where 6 is the highest score (highly satisfactory) and 1 is the lowest (highly unsatisfactory) as per Table 6.

IV. Evaluation process

The evaluation will be conducted from August to September 2017. The evaluation will be implemented in five phases which are not strictly sequential, but in many cases iterative, conducted in parallel and partly overlapping:

i. Inception phase: The evaluation team will prepare the inception report providing details on the methodology for the evaluation and include an evaluation matrix with specific issues for the evaluation;
ii. Desk review and data analysis;
iii. Interviews, survey and literature review;
iv. Country visit;
v. Data analysis and report writing.

Table 6. Project rating criteria

Score		Definition	Category
6	Highly satisfactory	Level of achievement clearly exceeds expectations and there is no shortcoming.	SATISFACTORY
5	Satisfactory	Level of achievement meets expectations (indicatively, over 80-95 per cent) and there is no or minor shortcoming.	
4	Moderately satisfactory	Level of achievement more or less meets expectations (indicatively, 60 to 80 per cent) and there are some shortcomings.	
3	Moderately unsatisfactory	Level of achievement is somewhat lower than expected (indicatively, less than 60 per cent) and there are significant shortcomings.	UNSATISFACTORY
2	Unsatisfactory	Level of achievement is substantially lower than expected and there are major shortcomings.	
1	Highly unsatisfactory	Level of achievement is negligible and there are severe shortcomings.	

V. Time schedule and deliverables

The evaluation took place from 14/08/2017 to 29/09/2017. The evaluation field mission is tentatively planned for 11-17 September 2017. At the end of the field mission, there will be a presentation of the preliminary findings for all stakeholders involved in this project in Viet Nam. After the evaluation field mission, the evaluation team leader will visit UNIDO HQ for debriefing and presentation of the preliminary findings of the terminal evaluation. The draft TE report will be submitted 4 to 6 weeks after the end of the mission. The draft TE report is to be shared with the UNIDO PM, UNIDO ODG/EVQ/IEV, the UNIDO GEF Coordinator and GEF OFP AND other stakeholders for receipt of comments. The ET leader is expected to revise the draft TE report based on the comments received, edit the language and form and submit the final version of the TE report in accordance with UNIDO ODG/EVQ/IEV standards.

Timelines	Tasks
14 -31 August 2017	Desk review and writing of inception report
11 –17 September 2017	Field visit to Viet Nam
18-20 September 2017	Debriefing and presentation of preliminary findings and recommendations
20- 25 September 2017	Preparation of first draft evaluation report
25-26 September 2017	Internal peer review of the report by UNIDO ODG/EVQ/IEV / stakeholder comments to draft evaluation report
30 September 2017	Final evaluation report

VI. Evaluation team composition

The evaluation team will be composed of one international evaluation consultant acting as the team leader and one national evaluation consultant. The evaluation team members will possess relevant strong experience and skills on evaluation management and conduct together with expertise and experience in the use of hydrocarbons with very low global warming potential (GWP). Both consultants will be contracted by UNIDO.

The tasks of each team member are specified in the job descriptions annexed to these terms of reference. The ET is required to provide information relevant for follow-up studies,

including terminal evaluation verification on request to the GEF partnership up to three years after completion of the terminal evaluation.

According to UNIDO Evaluation Policy, members of the evaluation team must not have been directly involved in the design and/or implementation of the project under evaluation.

The project team in Viet Nam will support the evaluation team. The UNIDO GEF Coordinator and GEF OFP(s) will be briefed on the evaluation and provide support to its conduct. GEF OFP(s) will, where applicable and feasible, also be briefed and debriefed at the start and end of the evaluation mission.

An evaluation manager from UNIDO ODG/EVQ/IEV will provide technical backstopping to the evaluation team and ensure the quality of the evaluation. The UNIDO Project Manager and national project teams will act as resourced persons and provide support to the evaluation team and the evaluation manager.

VII. Reporting

Inception report

This Terms of Reference (ToR) provides some information on the evaluation methodology, but this should not be regarded as exhaustive. After reviewing the project documentation and initial interviews with the project manager, the International Evaluation Consultant will prepare, in collaboration with the national consultant, a short inception report that will operationalize the ToR relating to the evaluation questions and provide information on what type of and how the evidence will be collected (methodology). It will be discussed with and approved by the responsible UNIDO Evaluation Manager.

The Inception Report will focus on the following elements: preliminary project theory model(s); elaboration of evaluation methodology including quantitative and qualitative approaches through an evaluation framework ("evaluation matrix"); division of work between the International Evaluation Consultant and national consultant; mission plan, including places to be visited, people to be interviewed and possible surveys to be conducted and a debriefing and reporting timetable[21].

Evaluation report format and review procedures

The draft report will be delivered to UNIDO ODG/EVQ/IEV (the suggested report outline is provided in Annex 4) and circulated to UNIDO staff and national stakeholders associated with the project for factual validation and comments. Any comments or responses, or feedback on any errors of fact to the draft report provided by the stakeholders will be sent to UNIDO Independent Evaluation Division (ODG/EVQ/IEV) for collation and onward transmission to the project evaluation team who will be advised of any necessary revisions. On the basis of this feedback, and taking into consideration the comments received, the evaluation team will prepare the final version of the terminal evaluation report.

The ET will present its preliminary findings to the local stakeholders at the end of the field visit and take into account their feed-back in preparing the evaluation report. A presentation of preliminary findings will take place at UNIDO HQ after the field mission.

The TE report should be brief, to the point and easy to understand. It must explain the purpose of the evaluation, exactly what was evaluated, and the methods used. The report must highlight any methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should provide information on when the evaluation took place, the places visited, who was involved and be presented in a way that makes the information accessible and comprehensible. The report should include an

[21] The evaluator will be provided with a Guide on how to prepare an evaluation inception report prepared by the UNIDO ODG/EVQ/IEV.

executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.
Findings, conclusions and recommendations should be presented in a complete, logical and balanced manner. The evaluation report shall be written in English and follow the outline given in Annex 4.

VIII. Quality assurance

All UNIDO evaluations are subject to quality assessments by the UNIDO ODG/EVQ/IEV. Quality assurance and control is exercised in different ways throughout the evaluation process (briefing of consultants on methodology and process of UNIDO ODG/EVQ/IEV, providing inputs regarding findings, lessons learned and recommendations from other UNIDO evaluations, review of inception report and evaluation report by ODG/EVQ/IEV).
The quality of the evaluation report will be assessed and rated against the criteria set forth in the Checklist on evaluation report quality, attached as Annex 5. The applied evaluation quality assessment criteria are used as a tool to provide structured feedback. UNIDO ODG/EVQ/IEV should ensure that the evaluation report is useful for UNIDO in terms of organizational learning (recommendations and lessons learned) and is compliant with UNIDO's evaluation policy and these terms of reference. The draft and final evaluation report are reviewed by UNIDO ODG/EVQ/IEV, which will submit the final report to the GEF Evaluation Office and circulate it within UNIDO together with a management response sheet.

Annex 1: Project Logical Framework

Project Narrative	Indicator	Sources of Verification	
Project Objective Reduction of greenhouse gas emission in the cold storage sector in Viet Nam.	*Direct emission reduction:* **9,000 tonnes of CO_2 equivalent** This is the result of emission reduction of 25,000 tonnes of CO_2 equivalent (with the elimination of HCFC-22, with global-warming potential of 1,810), minus the reduction of less than 16,000 tonnes CO_2eq. that would result from the use of HFC-404a. *Indirect emission reduction:* GEF bottom-up methodology – Indirect emissions reduction of 100,000 tonnes of CO_2 equivalent through all the activities, or 38,000 tonnes when compared to replacement by R404. GEF top-down methodology – 115,000 tonnes of CO_2 equivalent through all the activities, or 64,000 tonnes when compared to replacement by R404.	Reports from MONRE during and after the duration of the project.	
Component 1: Policy and Regulatory Support			
Outcome	**Indicator**	**Sources of Verification**	**Assumptions/Risks (see section A.4)**
Policy, regulatory and legal measures are adopted by the government to support the adoption of low global-warming potential and energy efficient technology.	Number of national policies changed or adopted in favour of the use of alternative technologies with low global-warming potential.	Public records such as government websites and publications in the national gazette.	Assumes no radical shifts in Government priorities.
Outputs	**Indicator**	**Sources of Verification**	**Assumptions/Risks (see section 4)**
1.1 Gap analysis carried out in the national policy, legal and	Availability of gap analysis report.	Project progress report	Continuous government support and participation.

regulatory frameworks. 1.2 Relevant recommendations drafted into the national laws/regulations/guidance.	Number of laws/regulations/guidance (new or amended) in favour of low global-warming technologies promulgated.	UNIDO project progress report.	
Component 2: Technology Transfer			
Outcome	**Indicator**	**Sources of Verification**	**Assumptions/Risks (see section 4)**
Technology with low global-warming potential (hydrocarbon system) is demonstrated, replicated and deployed.	Up to 25,000 tonnes of CO2 emission reduced (vs. 16,000 if HFC-404a were used), by enterprise/facility Energy efficiency gain in percentage, by enterprise/facility Technicians of 12 enterprises/facilities reported that they can operate the new technology independently	Records of each enterprise/facility to the National Cleaner Production Centre Validation reports from MONRE Reports from the Viet Nam Environmental Protection Fund (VEPF).	The companies want and can proceed with the conversion process.
Outputs	**Indicators**	**Sources of Verification**	**Assumptions/Risks (see section 4)**
2.1 Two pilot demonstration conversions are carried out: 2 cold storage facilities converted from HCFC-22 use to hydrocarbon systems. 2.2 The demonstration conversions are replicated in up to 10 facilities.	Technology designs are available and demonstrated No of. technicians from each facility trained (disaggregated by gender) Monitoring of the results is continuous for minimum 12 months. Reduced emission of	Records of each enterprise/facility to MONRE Validation reports from MONRE Reports of the Viet Nam Environmental Protection Fund (VEPF).	The initial two pilot projects are successful. There is sufficient interest from private sector and trainee technicians. The companies are able to use and maintain the new technology. Trainees value the information provided

	greenhouse gases and improved energy efficiency are verified. Up to 900,000 USD from the Viet Nam Environmental Protection Fund will cover the costs from the new equipment in these 10 companies.	UNIDO project report.	and are able to use it in their day to day activities.
Component 3: Awareness raising			
Outcome	**Indicators**	**Sources of Verification**	**Assumptions/Risks (see section 4)**
Demand for low-GWP refrigerant systems that are more energy efficient than existing technologies is increased.	At least 20 firm inquiries indicating intent to use hydrocarbon refrigerants made to MONRE	Report from MONRE indicates their interest towards the technology.	Continuous support and participation from national authorities and companies.
Outputs	**Indicators**	**Sources of Verification**	**Assumptions/Risks (see section 4)**
3.1 Lessons learnt and information on technology solutions is disseminated to policy makers, companies, and technicians.	Written materials delivered to 50 policy-makers by month 18 (disaggregated by gender). Up to 10 bilateral meetings carried out by month 24. Up to 100 attendees at stakeholder meeting (disaggregated by gender) Training of technicians completed	Market survey at the end of the project: demand for replicating the technology in other sectors. Monitoring reports on events and activities.	Assumes the ability to gain media attraction on the issues. Continuous government support and participation.

Annex 2: Detailed questions to assess evaluation criteria

The evaluation team will assess the project performance guided by the questions below.

#	Evaluation criteria
A	**Progress to impact** ✓ Mainstreaming: To what extent information, lessons or specific results of the project are incorporated into broader stakeholder mandates and initiatives such as laws, policies, regulations and project? ✓ Replication: To what extent the project's specific results (e.g. methodology, technology, lessons, etc.) are reproduced or adopted ✓ Scaling-up: To what extent the project's initiatives and results are implemented at larger geographical scale? ✓ What difference has the project made to the beneficiaries? ✓ What is the change attributable to the project? To what extent? ✓ What are the social, economic, environmental and other effects, either short-, medium- or long-term, on a micro- or macro-level? ✓ What effects are intended or unintended, positive or negative? The three UNIDO impact dimensions are: ✓ Safeguarding environment: To what extent the project contributes to changes in the status of environment. ✓ Economic performance: To what extent the project contributes to changes in the economic performance (e.g. finances, income, costs saving, expenditure) of individuals, groups and entities? ✓ Social inclusiveness: To what extent the project contributes to changes in capacity and capability of individuals, groups and entities in society, such as employment, education, and training?
B	**Project design**
1	• Overall design ✓ The project design was adequate to address the problems at hand? ✓ Is the project consistent with the Country's priorities, in the work plan of the lead national counterpart? Does it meet the needs of the target group? Is it consistent with UNIDO's Inclusive and Sustainable Industrial Development? Does it adequately reflect lessons learnt from past projects? Is it in line with the donor's priorities and policies? ✓ Is the applied project approach sound and appropriate? Is the design technically feasible and beased on best practices? Does UNIDO have in-house technical expertise and experience for this type of intervention? ✓ To what extent the project design (in terms of funding, institutional arrangement, implementation arrangements…) as foreseen in the project document still valid and relevant? ✓ Does the project document include a M&E plan? Does the M&E plan specify what, who and how frequent monitoring, review, evaluations and data collection will take place? Does it allocate budget for each exercise? Is the M&E budget adequately allocated and consistent with the logframe (especially indicators and sources of verification)? ✓ Risk managment: Are critical risks related to financial, social-political, institutional, environmental and implementation aspects identified with specific risk ratings? Are their mitigation measures identified? Where possible, are the mitigation measures included in project activities/outputs and monitored under the M&E plan?
2	• Logframe ✓ Expected results: Is the expected result-chain (impact, outcomes and outputs) clear and logical? Does impact describe a desired long-term benefit to a society or community (not as a mean or process), do outcomes describe change in target group's behaviour/performance or system/institutional performance, do outputs describe deliverables that project will produce to achieve outcomes? Are the expected results realistic, measurable and not

#	Evaluation criteria
	a reformulation or summary of lower level results? Do outputs plus assumptions lead to outcomes, do outcomes plus assumptions lead to impact? Can all outputs be delivered by the project, are outcomes outside UNIDO's control but within its influence? ✓ Indicators: Do indicators describe and specify expected results (impact, outcomes and outputs) in terms of quantity, quality and time? Do indicators change at each level of results and independent from indicators at higher and lower levels? Do indicators not restate expected results and not cause them? Are indicators necessary and sufficient and do they provide enough triangulation (cross-checking)? Are they indicators sex-diaggregated, if applicable? ✓ Sources of verification: Are the sources of verification/data able to verify status of indicators, are they cost-effective and reliable? Are the sources of verification/data able to verify status of output and outcome indicators before project completion?
C	**Project performance**
1	• Relevance ✓ How does the project fulfil the urgent target group needs? ✓ To what extent is the project aligned with the development priorities of the country (national poverty reduction strategy, sector development strategy)? ✓ How does project reflect donor policies and priorities? ✓ Is the project a technically adequate solution to the development problem? Does it eliminate the cause of the problem? ✓ To what extent does the project correspond to UNIDO's comparative advantages? ✓ Are the original project objectives (expected results) still valid and pertinent to the target groups? If not, have they been revised? Are the revised objectives still valid in today's context?
2	• Effectiveness ✓ What are the main results (mainly outputs and outcomes) of the project? What have been the quantifiable results of the project? ✓ To what extent did the project achieve their objectives (outputs and outcomes), against the original/revised target(s)? ✓ What are the reasons for the achievement/non-achievement of the project objectives? ✓ What is the quality of the results? How do the stakeholders perceive them? What is the feedback of the beneficiaries and the stakeholders on the project effectiveness? ✓ To what extent is the identified progress result of the project rather than external factors? ✓ What can be done to make the project more effective? ✓ Were the right target groups reached?
3	• Efficiency ✓ How economically are the project resources/inputs (concerning funding, expertise, time…) being used to produce results? ✓ To what extent were expected results achieved within the original budget? If no, please explain why. ✓ Are the results being achieved at an acceptable cost? Would alternative approaches accomplish the same results at less cost? ✓ What measures have been taken during planning and implementation to ensure that resources are efficiently used? Were the project expenditures in line with budgets? ✓ To what extent did the expected co-financing materialize, in cash or in-kind, grants or loan? Was co-financing administered by the project management or by some other organization? Did short fall in co-financing or materialization of greater than expected co-financing affected project results?

#	Evaluation criteria
	✓ Could more have been achieved with the same input? ✓ Could the same have been achieved with less input? ✓ How timely was the project in producing outputs and outcomes? Comment on the delay or acceleration of the project's implementation period. ✓ To what extent were the project's activities in line with the schedule of activities as defined by the Project Team and annual Work Plans? ✓ Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet the requirements?
4	• Sustainability of benefits ✓ Will the project results and benefits be sustained after the end of donor funding? ✓ Does the project have an exit strategy? *Financial risks:* ✓ What is the likelihood of financial and economic resources not being available once the project ends? *Socio-political risks:* ✓ Are there any social or political risks that may jeopardize the sustainability of project outcomes? ✓ What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? ✓ Do the various key stakeholders see that it is in their interest that project benefits continue to flow? ✓ Is there sufficient public/stakeholder awareness in support of the project's long-term objectives? *Institutional framework and governance risks:* ✓ Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize the sustainability of project benefits? ✓ Are requisite systems for accountability and transparency and required technical know-how in place? *Environmental risks:* ✓ Are there any environmental risks that may jeopardize the sustainability of project outcomes? ✓ Are there any project outputs or higher-level results that are likely to have adverse environmental impacts, which, in turn, might affect the sustainability of project benefits?
5	• Progress to impact ✓ Is there any evidence of progress towards impact? ✓ To what extent do the key assumptions of the project's theory of change hold? ✓ Is there qualitative and quantitative evidence on environmental stress reduction (e.g. GHG emission reduction, reduction of waste discharge, etc.) and environmental status change? ✓ To what extent observed changes in capacities (awareness, knowledge, skills) or in infrastructure and legislation are attributable to the project?
D	**Cross-cutting performance criteria**
1	• Gender mainstreaming ✓ Did the project design adequately consider the gender dimensions in its interventions? Was the gender marker assigned correctly at entry? ✓ Was a gender analysis included in a baseline study or needs assessment (if any)? Were there gender-related project indicators?

#	Evaluation criteria
	✓ Are women/gender-focused groups, associations or gender units in partner organizations consulted/ included in the project? ✓ How gender-balanced was the composition of the project management team, the Steering Committee, experts and consultants and the beneficiaries? ✓ Do the results affect women and men differently? If so, why and how? How are the results likely to affect gender relations (e.g., division of labour, decision-making authority)? ✓ To what extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions?
2	• M&E: ✓ ***M&E design*** o Was the M&E plan at the point of project approval practical and sufficient? o Did it include baseline data and specify clear targets and appropriate indicators to track environmental, gender, and socio economic results? o Did it include a proper M&E methodological approach; specify practical organization and logistics of the M&E activities including schedule and responsibilities for data collection; o Did it include budget adequate funds for M&E activities? ✓ ***M&E implementation*** o How was the information from M&E system used during the project implementation? Was an M&E system in place and did it facilitate timely tracking of progress toward project results by collecting information on selected indicators continually throughout the project implementation period? Did project team and manager make decisions and corrective actions based on analysis from M&E system and based on results achieved? o Are annual/progress project reports complete and accurate? o Was the information provided by the M&E system used to improve performance and adapt to changing needs? Was information on project performance and results achievement being presented to the Project Steering Committee to make decisions and corrective actions? Do the Project team and managers and PSC regularly ask for performance and results information? o Are monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impact in the logframe? Do performance monitoring and reviews take place regularly? o Were resources for M&E sufficient? o How has the logframe been used for Monitoring and Evaluation purposes (developing M&E plan, setting M&E system, determining baseline and targets, annual implementation review by the Project Steering Committee…) to monitor progress towards expected outputs and outcomes? o How well have risks outlined the project document and in the logframe been monitored and managed? How often have risks been reviewed and updated? Has a risk management mechanism been put in place?

#	Evaluation criteria
3	• Project management ✓ Review overall effectiveness of project management as outlined in the Project Document. Have changes been made and are they effective? Are responsibilities and reporting lines clear? Is decision-making transparent and undertaken in a timely manner? Recommend areas for improvement. ✓ Review whether the national management and overall coordination mechanisms have been efficient and effective? Did each partner have assigned roles and responsibilities from the beginning? Did each partner fulfil its role and responsibilities (e.g. providing strategic support, monitoring and reviewing performance, allocating funds, providing technical support, following up agreed/corrective actions)? ✓ The UNIDO HQ-based management, coordination, monitoring, quality control and technical inputs have been efficient, timely and effective (e.g. problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits)?
E	**Performance of partners**
1	• UNIDO ✓ ***Design*** o Mobilization of adequate technical expertise for project design o Inclusiveness of project design (with national counterparts) o Previous evaluative evidence shaping project design o Planning for M&E and ensuring sufficient M&E budget ✓ ***Implementation*** o Timely recruitment of project staff o Appropriate use of funds, procurement and contracting of goods and services o Project modifications following changes in context or after the Mid-Term Review o Follow-up to address implementation bottlenecks o Role of UNIDO country presence (if applicable) supporting the project o Engagement in policy dialogue to ensure up-scaling of innovations o Coordination function o Exit strategy, planned together with the government
2	• National counterparts ✓ ***Design*** o Responsiveness to UNIDO's invitation for engagement in designing the project ✓ ***Implementation*** o Ownership of the project o Support to the project, based on actions and policies o Counterpart funding o Internal government coordination o Exit strategy, planned together with UNIDO, or arrangements for continued funding of certain activities o Facilitation of the participation of Non-Governmental Organizations(NGOs), civil society and the private sector where appropriate o Suitable procurement procedures for timely project implementation o Engagement with UNIDO in policy dialogue to promote the up-scaling or replication of innovations

#	Evaluation criteria
3	• Donor ✓ Timely disbursement of project funds ✓ Feedback to progress reports, including Mid-Term Evaluation ✓ Support by the donor's country presence (if applicable) supporting the project for example through engagement in policy dialogue
F	**Overall project achievement** ✓ Overarching assessment of the project, drawing upon the analysis made under Project performance and Progress to Impact criteria above but not an average of ratings.

Annex 3: Job descriptions

Post title: Senior International Evaluator (Team Leader)

Duration: 27 working days

Date required: 14 August – 30 September 2017

Duty station: Home-base with one briefing in Vienna and field mission to Viet Nam

Under the direct supervision of the UNIDO Evaluation Manager, in cooperation with the national consultant, and with the support of the Project Manager, the Senior International Evaluation Expert is responsible to carry out the following tasks:

Tasks	Expected Duration	Expected results
Undertake desk review of management, activity, output and related documents of the Project	5 working days (home base)	Key questions and notes to prepare the inception report and field visits
Prepare an inception report which streamlines the specific questions to address the key issues in the TOR, specific methods that will be used and data to collect in the field visits, detailed evaluation methodology confirmed, draft theory of change, and tentative agenda for field work.	3 working days (home base)	The inception report. Submitted to evaluation manager on or before 29 September 2017
Undertake fact finding field missions to consult field project partners and beneficiaries to verify and complete preliminary evaluation findings from desk review and assess the institutional capacities of the recipient country.	10 working days	Completed data collection on or before 17 September
Debriefing mission – presentation of preliminary evaluation findings and recommendations to the project stakeholders for factual validation	1 working day (Vienna)	Factual validation of evaluation report concluded, additional data obtained
Prepare and submit draft report of evaluation, including evaluation findings and recommendations and lessons learned	6 working days	Draft evaluation report submitted to evaluation manager for review on or before 25 September 2017. 2 pages summary of take-away message from the evaluation.
Finalize evaluation report, on basis of comments and suggestions received through the evaluation manager	2 working days (home base)	Final evaluation report submitted to evaluation manager on 30 September 2017

Requirements
Relevant university degree; over 10 years' experience with environmental management projects as well as project evaluation experience; excellent oral and written communication skills in English; Knowledge of French and national languages is an asset.

Absence of Conflict of Interest:
According to UNIDO rules, the consultant must not have been involved in the design and/or implementation, supervision and coordination of and/or have benefited from the project/project (or theme) under evaluation. The consultant will be requested to sign a declaration that none of the above situations exists and that the consultants will not seek assignments with the manager/s in charge of the project before or shortly after the completion of her/his contract with UNIDO ODG/EVQ/IEV.

Job description

Post title: National consultant

Duration: 21 working days

Date required: 14 August – 30 September 2017

Duty station: Home-base and a field mission within Viet Nam

Under the direct supervision of the UNIDO Headquarters Evaluation Manager, in consultation with and under the guidance of the Team Leader and with the support of the Project Managers, the national consultant is responsible to carry out the following tasks:

Tasks	Expected Duration	Expected results
Desk review Review and analyze project documentation and relevant country background information; in cooperation with the team leader, determine key data to collect in the field and prepare key instruments in Vietnamese if deemed necessary (questionnaires, logic models); If need be, recommend adjustments to the tools in order to ensure their understanding in the local context; Coordinate and lead interviews in local language and assist the team leader with translation where necessary; Analyze and assess the adequacy of legislative and regulatory framework, specifically in the context of the project's objectives and targets.	3 working days (home base)	Evaluation questions, questionnaires/interview guide, logic models adjusted to ensure understanding in the national context; A stakeholder mapping; A brief assessment of the adequacy of the country's legislative and regulatory framework in the context of the project.
Coordinate the evaluation mission agenda, ensuring and setting up the required meetings with project partners and government counterparts, and organize and lead site visits, in close cooperation with project staff in the field. Assist and provide detailed analysis and inputs to the team leader in the preparation of the inception report.	3 working days (home base)	Detailed evaluation schedule List of stakeholders to interview during the field missions.
Participation in interviews during field missions	10 working days	Interview notes.
Prepare inputs and analysis to the evaluation report according to TOR and as agreed with the team leader. Revise the draft project evaluation report based on comments from UNIDO IEV and stakeholders and edit the language and form of the final version according to UNIDO standards.	3 working days	Draft evaluation report submitted to evaluation manager for review.
Finalize evaluation report, on basis of comments and suggestions received through the evaluation manager	2 working days (home base)	Final evaluation report submitted to evaluation manager

Requirements
Relevant university degree; over 5 years' experience in planning, implementation, monitoring and/or evaluation of technical assistance projects; excellent oral and written communication skills in English; demonstrated familiarity with procedures and practices of international technical cooperation.

Absence of Conflict of Interest:
According to UNIDO rules, the consultant must not have been involved in the design and/or implementation, supervision and coordination of and/or have benefited from the project/project (or theme) under evaluation. The consultant will be requested to sign a declaration that none of the above situations exists and that the consultants will not seek assignments with the manager/s in charge of the project before or shortly after the completion of her/his contract with UNIDO ODG/EVQ/IEV.

Annex 4- Outline of an in-depth project evaluation report

Executive summary

- Must provide a synopsis of the storyline which includes the main evaluation findings and recommendations
- Must present strengths and weaknesses of the project
- Must be self-explanatory and should be maximum 3-4 pages in length

I. Evaluation objectives, methodology and process

- Information on the evaluation: why, when, by whom, etc.
- Scope and objectives of the evaluation, main questions to be addressed
- Information sources and availability of information
- Methodological remarks, limitations encountered and validity of the findings

II. Country and project background

- Brief country context: an overview of the economy, the environment, institutional development, demographic and other data of relevance to the project
- Sector-specific issues of concern to the project[22] and important developments during the project implementation period
- Project summary:
  - Fact sheet of the project: including project objectives and structure, donors and counterparts, project timing and duration, project costs and co-financing
  - Brief description including history and previous cooperation
  - Project implementation arrangements and implementation modalities, institutions involved, major changes to project implementation
  - Positioning of the UNIDO project (other initiatives of government, other donors, private sector, etc.)
  - Counterpart organization(s)

III. Project assessment

This is the key chapter of the report and should address all evaluation criteria and questions outlined in the TOR (see section VI Project Evaluation Parameters). Assessment must be based on factual evidence collected and analyzed from different sources. The evaluators' assessment can be broken into the following sections:

A. Project design

B. Implementation performance

- Ownership and relevance (Report on the relevance of project vis-à-vis the country and project beneficiaries, country ownership, stakeholder involvement)
- Effectiveness (The extent to which the development intervention's objectives, outcomes and deliverables were achieved, or are expected to be achieved, taking into account their relative importance)
- Efficiency (Report on the overall cost-benefit of the project and partner country's contribution to the achievement of project objectives)
- Likelihood of sustainability of project outcomes (Report on the risks and vulnerability of the project, considering the likely effects of sociopolitical and institutional changes in the partner country, and its impact on continuation of benefits after the project ends, specifically the financial, sociopolitical, institutional framework and governance, and environmental risks)

[22] Explicit and implicit assumptions in the logical framework of the project can provide insights into key-issues of concern (e.g. relevant legislation, enforcement capacities, government initiatives, etc.)

- Project coordination and management (Report project management conditions and achievements, and partner country's commitment)
- Assessment of monitoring and evaluation systems (Report on M&E design, M&E plan implementation, and budgeting and funding for M&E activities)
- Monitoring of long-term changes
- Assessment of processes affecting achievement of project results (Report on preparation and readiness / quality at entry, financial planning, UNIDO support, co-financing, delays of project outcomes/outputs, and implementation approach)

C. Gender mainstreaming

At the end of this chapter, an overall project achievement rating should be developed as required in Annex 2. The overall rating table should be presented here.

IV. Conclusions, recommendations and lessons learned

This chapter can be divided into three sections:

A. Conclusions

This section should include a storyline of the main evaluation conclusions related to the project's achievements and shortfalls. It is important to avoid providing a summary based on each and every evaluation criterion. The main conclusions should be cross-referenced to relevant sections of the evaluation report.

B. Recommendations

This section should be succinct and contain few key recommendations. They should:

- be based on evaluation findings
- be realistic and feasible within a project context
- indicate institution(s) responsible for implementation (addressed to a specific officer, group or entity who can act on it) and have a proposed timeline for implementation if possible
- be commensurate with the available capacities of project team and partners
- take resource requirements into account.

Recommendations should be structured by addressees:

- UNIDO
- Government and/or Counterpart Organizations
- Donor

C. Lessons learned

- Lessons learned must be of wider applicability beyond the evaluated project but must be based on findings and conclusions of the evaluation
- For each lesson, the context from which they are derived should be briefly stated

Annexes should include the evaluation TOR, list of interviewees, documents reviewed, a summary of project identification and financial data, including an updated table of expenditures to date, and other detailed quantitative information. Dissident views or management responses to the evaluation findings may later be appended in an Annex.

Annex 5: Checklist on evaluation report quality

Project Title:
UNIDO Project ID:
Evaluation team:
Quality review done by: Date:

Report quality criteria	UNIDO IEV assessment notes	Rating
a. Was the report well-structured and properly written? (Clear language, correct grammar, clear and logical structure)		
b. Was the evaluation objective clearly stated and the methodology appropriately defined?		
c. Did the report present an assessment of relevant outcomes and achievement of project objectives?		
d. Was the report consistent with the ToR and was the evidence complete and convincing?		
e. Did the report present a sound assessment of sustainability of outcomes or did it explain why this is not (yet) possible? (Including assessment of assumptions, risks and impact drivers)		
f. Did the evidence presented support the lessons and recommendations? Are these directly based on findings?		
g. Did the report include the actual project costs (total, per activity, per source)?		
h. Did the report include an assessment of the quality of both the M&E plan at entry and the system used during the implementation? Was the M&E sufficiently budgeted for during preparation and properly funded during implementation?		
i. Quality of the lessons: were lessons readily applicable in other contexts? Did they suggest prescriptive action?		
j. Quality of the recommendations: did recommendations specify the actions necessary to correct existing conditions or improve operations ('who?' 'what?' 'where?' 'when?'). Can these be immediately implemented with current resources?		
k. Are the main cross-cutting issues, such as gender, human rights and environment, appropriately covered?		
l. Was the report delivered in a timely manner? (Observance of deadlines)		

Rating system for quality of evaluation reports
A rating scale of 1-6 is used for each criterion: Highly satisfactory = 6, Satisfactory = 5, Moderately satisfactory = 4, Moderately unsatisfactory = 3, Unsatisfactory = 2, Highly unsatisfactory = 1, and unable to assess = 0.

Annex 6: Guidance on integrating gender in evaluations of UNIDO projects and programmes

A. Introduction

Gender equality is internationally recognized as a goal of development and is fundamental to sustainable growth and poverty reduction. The UNIDO Policy on gender equality and the empowerment of women and its addendum, issued respectively in April 2009 and May 2010 (UNIDO/DGB(M).110 and UNIDO/DGB(M).110/Add.1), provides the overall guidelines for establishing a gender mainstreaming strategy and action plans to guide the process of addressing gender issues in the Organization's industrial development interventions.

According to the UNIDO Policy on gender equality and the empowerment of women:

Gender equality refers to the equal rights, responsibilities and opportunities of women and men and girls and boys. Equality does not suggest that women and men become 'the same' but that women's and men's rights, responsibilities and opportunities do not depend on whether they are born male or female. Gender equality implies that the interests, needs and priorities of both women and men are taken into consideration, recognizing the diversity of different groups of women and men. It is therefore not a 'women's issues'. On the contrary, it concerns and should fully engage both men and women and is a precondition for, and an indicator of sustainable people-centered development.

Empowerment of women signifies women gaining power and control over their own lives. It involves awareness-raising, building of self-confidence, expansion of choices, increased access to and control over resources and actions to transform the structures and institutions which reinforce and perpetuate gender discriminations and inequality.

Gender parity signifies equal numbers of men and women at all levels of an institution or organization, particularly at senior and decision-making levels.

The UNIDO projects/projects can be divided into two categories: 1) those where promotion of gender equality is one of the key aspects of the project/project; and 2) those where there is limited or no attempted integration of gender. Evaluation managers/evaluators should select relevant questions depending on the type of interventions.

B. Gender responsive evaluation questions

The questions below will help evaluation managers/evaluators to mainstream gender issues in their evaluations.

B.1. Design

- Is the project/project in line with the UNIDO and national policies on gender equality and the empowerment of women?
- Were gender issues identified at the design stage?
- Did the project/project design adequately consider the gender dimensions in its interventions? If so, how?
- Were adequate resources (e.g., funds, staff time, methodology, experts) allocated to address gender concerns?
- To what extent were the needs and priorities of women, girls, boys and men reflected in the design?
- Was a gender analysis included in a baseline study or needs assessment (if any)?
- If the project/project is people-centered, were target beneficiaries clearly identified and disaggregated by sex, age, race, ethnicity and socio-economic group?

- If the project/project promotes gender equality and/or women's empowerment, was gender equality reflected in its objective/s? To what extent are output/outcome indicators gender disaggregated?

B.2. Implementation management

- Did project monitoring and self-evaluation collect and analyze gender disaggregated data?
- Were decisions and recommendations based on the analyses? If so, how?
- Were gender concerns reflected in the criteria to select beneficiaries? If so, how?
- How gender-balanced was the composition of the project management team, the Steering Committee, experts and consultants and the beneficiaries?
- If the project/project promotes gender equality and/or women's empowerment, did the project/project monitor, assess and report on its gender related objective/s?

B.3. Results

- Have women and men benefited equally from the project's interventions? Do the results affect women and men differently? If so, why and how? How are the results likely to affect gender relations (e.g., division of labour, decision making authority)?
- In the case of a project/project with gender related objective/s, to what extent has the project/project achieved the objective/s? To what extent has the project/project reduced gender disparities and enhanced women's empowerment?

Annex II: List of interviewees

List of Interviewees

Date	Time	Activity	Note
Mon, 11 Sep 2017	9:00 - 10:00	Briefing with **MONRE and PMU** *4th Floor, Block A, 10 Ton That Thuyet*	- Mr. Pham Van Tan, Deputy Director General, Department of Climate Change (DCC) - Ms. Nguyen Thi My Hoang, National Ozone Coordinator, National Ozone Unit, DCC
	10:30 - 11:30	Meeting with **MARD, Agro Processing and Market Development Authority** *Department Office, 10 Nguyen Cong Hoan, Ba Dinh, Hanoi*	- Mr. Ngo Quang Tu, Director of Division of Agro Processing and Preservation - Mr. Dao Trong Hieu, Deputy Director Davison of Fishery market Development
	14:00 - 16:30	Meeting with **Dai An Company** *109 Truong Chinh street, Hanoi*	- Mr. Nguyen Duy Nguyen Director of Dai An Company
	17:00	Briefing with **UNIDO CO** *The Green One UN House, 304 Kim Ma, Hanoi*	- Ms. Le Thanh Thao
Tue, 12 Sep 2017	9:00 - 10:00	Meeting with **School of Heat engineering and refrigeration, HUST** *School of Heat engineering and refrigeration, C7 building, Room 204*	- Mr. Nguyen Viet Dung, School Director - Mr. Le Duc Dung, School Vice Director
	10:30 - 11:30	Meeting with **MOIT, Energy Efficiency and Sustainable Development Department** *MOIT Office, Meeting room 3, 21 Ngo Quyen, Hanoi*	- Mr. Trinh Quoc Vu, Director of the Department - Ms. Pham Thi Nga, National project Coordinator, Project: Promotion of energy efficient industrial boiler adoption and operating practices in Vietnam
	14:30 - 15:30	Meeting with **Vietnam Society of Refrigeration and Air Conditioning (VSRAE)** *At VSREA Office, Room 302, Block A3, 10 Nguyen Cong Hoan, Ha Noi*	- Mr. Nguyen Xuan Tien, Vice Chairman - Mr. Nguyen Luyen Chi, Head of General Department of VSRAE

Date	Time	Activity	Note
Wed, 13 Sep 2017	9:00	Depart Hanoi for **Ho Chi Minh City**	
	14:00 - 16:30	Meeting with **Cau Tre Company** *Luong The Vinh, Tan Phu district, Ho Chi Minh city*	- Mr. Vo Quang Vinh, Vice Director - Ms. Le Thi Be Sau, Director of M&E Department - Mr. Hien, M&E Department
Thu, 14 Sep 2017	9:00 - 10:00	Meeting with **Vietnam Association of Seafood Processing and Export (VASEP)** *218 Nguyen Qui Canh, An Phu-An Khanh Urban area, An Phu ward, District No. 2. Ho Chi Minh city*	- Mr. Truong Dinh Hoe, General Secretary
	17:00	Depart HCMC for Da Nang	
	19:00	Meeting (dinner) with stakeholders**, PMU and UNIDO** *Muong Thanh Hoi An Hotel, Cua Dai, Hoi An city, Quang Nam province*	
Fri, 15 Sep 2017	8:00 - 13:00	Attending **the International day for preservation of the Ozone layer** *Muong Thanh Hoi An Hotel*	CANCEL
	13.30 - 14:30	Wrap-up meeting & presentation of initial findings	
	17:20	Depart Da Nang for **Hanoi**	

Annex III: Project financial overview as on 12.12.2017

Grant	UNIDO Budget Line		PAD value	Total Expenditure	Disbursement	To be disbursed	Funds Available
UNIDO grant (in EUR)	11	Staff & Intern Consultants		20,520	20,520	-	
	15	Local travel		8,098	8,098	-	
	17	Nat.Consult./Staff		9,170	9,170	-	
	21	Contractual Services*		43,216	43,216	-	
		***Contract with ZANOTTI**		**45,718**	**45,718**	**-**	
	30	Train/Fellowship/Study		14,442	14,442	-	
	45	Equipment		2,059	2,059	-	
	51	Other Direct Costs		4,834	4,834	-	
		Total	USD 120,761.20				
		Total	€ 102,340.20	€ 102,340.00	€ 102,340.00	€ -	€ 0.20
GEF grant (in USD)	11	Staff & Intern Consultants		25,782	23,652	2,129	
	15	Local travel		17,025	17,025	0	
	16	Staff Travel		-		-	
	17	Nat.Consult./Staff		107,231	102,508	4,723	
	21	Contractual Services*		92,014	92,014	-	
		***Contract with ZANOTTI**		**90,013**	**90,013**	**-**	
		*Other contracts		2,001	2,001	-	
	30	Train/Fellowship/Study		35,956	35,408	548	
	35	International Meetings		-		-	
	45	Equipment		6,588	6,588	-	
	51	Other Direct Costs		2,418	2,418	(0)	
		Total	USD 290,000.00	USD 287,013.42	USD 279,613.88	USD 7,399.54	USD 2,986.58
		Total project**	USD 410,761.20	USD 407,774.62	USD 400,375.08	USD 7,399.54	USD 2,986.82

Annex IV: List of key documents reviewed

Project leaflet

1. Project Document
2. National Experts
   - Reports from the national consultant on visiting the beneficiary plants
   - Final report on HC290 installation by the national consultant
   - Job descriptions of the national project coordinator - 6 periods
   - Report on power consumption (before and after conversion) by the National project Coordinator

3. Missions and field visits
   - Reports from UNIDO on field visits: at inception phase, to beneficiary companies while the project was being implemented
   - Workshops reports
   - Report of the International Expert on gap analysis
   - Report of the International Expert on awareness-raising

4. Sub-contracts
   - Progress reports and final report of Zanotti technology manufacturer
   - TOR to the international technology supplier

5. PIR
   Yearly Project Implementation Reports from UNIDO to GEF

6. Pictures
   Pictures related to the project as setting up the equipment and other technical issues

7. Financial Reports
   UNIDO's financial reports on the project