

Independent mid-term review

KINGDOM OF THAILAND

**Overcoming policy, market and technological barriers to support
technical innovation and south-south technology transfer:
The pilot case of ethanol production from cassava**

UNIDO SAP ID: 100264

GEF Project ID: 4037



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 2015

Distr. GENERAL

ODG/EVA/15/R.11

August 2015

Original: ENGLISH

This mid-term review was managed
by the responsible UNIDO project
manager with quality control by the
UNIDO Office for
Independent Evaluation

The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Mention of company names and commercial products does not imply the endorsement of UNIDO.

The views and opinions of the team do not necessarily reflect the views of the Governments and of UNIDO.

This document has not been formally edited.

Project Coordinator: Ms. Sooksiri Chamsuk

International Evaluation Consultant: Dr. Brahmanand Mohanty

The international evaluation consultant engaged to undertake the mid-term review of the UNIDO GEF project “Overcoming policy, market and technological barriers to support technological innovation and South-South technology transfer” would like to acknowledge and thank all partners, counterparts and UNIDO staff who contributed to the evaluation.

Special thanks are due to the staff at UNIDO Headquarters, Regional office in Bangkok as well as the offices in Hanoi and Vientiane for their precious time and the facilitation of the logistics during the evaluation mission conducted in Thailand, Vietnam and the Lao PDR from 2 to 13 March 2015.

Contents

Abbreviations and acronyms	7
Glossary of evaluation-related terms	9
Executive summary	10
Recommendations	12
1. Evaluation objectives, methodology & process	14
1.1. Information on the evaluation	14
1.2. Scope and objectives of the evaluation	15
1.3. Information sources and availability of information	16
1.4. Evaluation limitations and validity of the findings	16
2. Countries and Project Background	17
2.1. Brief countries context	17
2.1.1. An overview of the economy	17
2.1.2. ASEAN energy challenges	17
2.1.3. Development of bioenergy to counter the dependence on fossil fuels	18
2.1.4. Bioenergy technology status	19
2.1.5. Government policy to promote the production and usage of biofuels	20
2.2. Project summary	22
3. Project assessment	29
3.1 Project design	29
3.2 Project relevance	31
3.3 Effectiveness	33
3.4 Efficiency	37
3.5 Assessment of sustainability of project outcomes	41
3.5.1 Financial risks	41
3.5.2 Sociopolitical risks	41
3.5.3 Institutional framework and governance risks	42
3.5.4 Environmental risks	42
3.6 Assessment of monitoring and evaluation systems and project management	42
3.7 Monitoring of long-term changes	44
3.8 Assessment of processes affecting achievement of project results	44
3.8.1 Preparation and readiness	44
3.8.2 Country ownership / drivenness	45
3.8.3 Stakeholder involvement	45
3.8.4 Financial planning	46
3.8.5 UNIDO supervision and backstopping	46
3.8.6 Co-financing and project outcomes and sustainability	46
3.8.7 Delays and project outcomes and sustainability	47
3.8.8 Implementation approach	47

3.9	Project coordination and management	47
3.10	Assessment of gender mainstreaming	48
3.11	Procurement issues	49
4	CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED	49
4.1	Conclusions	49
4.2	Recommendations	51
4.3	Lessons learned	53
	Annex A: Terms of reference	56
I.	Project Background and Overview	58
II.	Scope and Purpose of the Evaluation	62
III.	Evaluation Approach and Methodology	63
IV.	Evaluation Team Composition	64
V.	Time Schedule and Deliverables	65
VI.	Project Evaluation Parameters	65
VII.	Reporting	73
VIII.	Quality Assurance	75
	Annex 1 - Outline of an In-Depth Project Evaluation Report	76
	Annex 2 - Overall ratings table	79
	Annex 3 - GEF Minimum Requirements for M&E	82
	Annex 4 – Required Project Identification and Financial Data	83
	Annex 5 – ToR -Job Descriptions	86
	Annex 6 – Project Results Framework OR Project Logical Framework	89
	Annex B: List of persons met (interviewees) and the meetings held	98
	Annex C: Schedule of the evaluation mission	100
	Annex D: Evaluation Matrix	101
	Annex E: Bibliography / Documents reviewed	109

Abbreviations and acronyms

ADB	Asian Development Bank
BAU	Business-as-usual
BOI	Board of Investment (Thailand)
CIAT	International Center for Tropical Agriculture
CO2	Carbon Dioxide
DEDE	Department of Alternative Energy Development and Efficiency (Thailand)
DoAE	Department of Agricultural Extension (Thailand)
E5 to E25	A fuel mixture of 5 to 25% anhydrous ethanol and 95-75% gasoline sometimes called gasohol
EE	Energy Efficiency
EPPO	Energy Policy and Planning Office (Thailand)
EVA	UNIDO Office of Independent Evaluation
FFV	Flex-Fuel Vehicle
FIRI	Food Industries Research Institute (Vietnam)
FSP	Full-scale Project
FSP	Full Size Project
GEF	Global Environment Facility
GHG	Greenhouse Gases
GMS	Greater Mekong Sub-region
HQ	Head Quarters
IA	Implementing Agency (UNIDO)
INV	Investment
KKS	Kaung Kyaw Say Group of Companies (Myanmar)
KMUTT	King Mongkut's University of Technology Thonburi
Lao PDR	Lao Peoples Democratic Republic
LCA	Life Cycle Analysis
LDO	Liquor Distillery Organization (Thailand)
LMV	Lao PDR, Myanmar and Vietnam
M&E	Monitoring and Evaluation
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MDGs	Millennium Development Goals

MEM	Ministry of Energy and Mines (Lao PDR)
MOIT	Ministry of Industry and Trade (Vietnam)
MTR	Mid-term review
PRF	Project Results Framework
UNIDO	United Nations Industrial Development Organization

Glossary of evaluation-related terms

Term	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.
Intervention	An external action to assist a national effort to achieve specific development goals.
Lessons 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, and impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results based management) principles.
Outcomes	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 the beneficiaries' requirements, country needs global priorities and partner's 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.

Executive summary

Introduction

This report presents findings of the Mid-term review (MTR) of the project “Overcoming policy, market and technological barriers to support technological innovation and South-South technology transfer: the pilot case of ethanol production from cassava”, implemented by UNIDO with financial grant from the Global Environment Facility (GEF).

An international evaluation consultant was engaged to conduct the mid-term review from mid-February to mid-May 2015. The evaluation covers the period from March 2012 to February 2015. The scope of the evaluation includes assessment of project performance and progress against relevance, effectiveness, efficiency, sustainability and impact. The key evaluation findings are summarized below.

Key findings

Design: The project design was weak as it was prepared without full and active participation of relevant national stakeholders and with a lack of insight regarding CO₂ emissions abatement. As a result, the Project Results Framework (PRF) and target indicators were not developed well enough to address the key barriers and the associated risks. The PRF needs to be revised in consultation with all key stakeholders in order to come up with more realistic and achievable outputs and target indicators. The revised PRF has to be approved by the Project Steering Committee (PSC) in close consultation with the GEF Coordination Unit and UNIDO Office for Independent Evaluation.

Relevance: The project is relevant to the national development and environmental priorities of the countries concerned. The project is in line with UNIDO’s mandate and is consistent with the GEF Climate Change focal area strategic program SP4: Promoting sustainable energy production from biomass.

Effectiveness: The project has so far achieved none of the planned outputs that would lead to the project outcomes. While a part of the delay in project execution can be attributed to reasons beyond UNIDO’s control, the inordinate delays and inadequate project performance are a result of poor quality of the work plan and insufficient tracking and monitoring of the project’s performance. Some partners have yet to be involved actively in the project.

Efficiency: The project implementation was delayed 2 years due to change in the main executing partner, political turmoil in Thailand and the delay in signing of sub-contract between UNIDO and the main executing partner. However, after the project got started, not enough efforts have been made by UNIDO and its main executing partner to ensure the project’s cost-effectiveness. Substantial GEF resources have been engaged but none of the outputs has been delivered and a very little confirmed co-financing has materialized.

Sustainability: The participating governments realize the importance of bio-ethanol development but the formulation of transparent policies and incentives requires coordination among key government agencies. Other key stakeholders are likely to fall in line when the government sends a strong policy signal. The project has limited impacts of sharing the Thai experience of bio-ethanol promotion initiatives with the neighboring countries. There are no identified potential risks to environmental sustainability.

M&E: The M&E was well designed but it was not followed during the project execution. Though the M&E design specified the adoption of SMART indicators for the implementation of the M&E plan, it is not reflected in the project monitoring and supervision scheme. Moreover, there is no comprehensive adaptive management strategy to cope with the delays

in project timeline and delivery of outputs. The work plan developed has not been set up in consultation with all project partners; the timeframes proposed are not precise and there is no clear indication of the milestones to be achieved and the sequence of activities for the timely delivery of outputs. The budget provided for M&E at the planning stage was sufficient.

Project management: Some deficits were observed in UNIDO supervision and backstopping. Well-structured project management unit (PMU), project work plan and M&E plan are a pre-requisite for a full-scale project with limited budget, involving multiple stakeholders from several countries. In view of the delays in project execution due to reasons beyond UNIDO's control, the PMU was expected to be more vigilant and proactive in monitoring the project performance and tracking the progress towards milestones instead of transferring such responsibilities to the main executing partner.

Key conclusions

The project document seems to have a few flaws. Firstly, too much importance is given to only one component of the technology package in the project components, i.e. improved fermentation process whose performance is yet to be tested and proven at the industrial scale in Thailand. Moreover, a careful observation leads to the conclusion that this particular process would contribute to only 5.6% reduction of the GHG emissions.

Another flaw in the project document is the assumption that the ethanol production can be sustained by providing assistance to the private sector without the need for dialogue with the government. This is in contradiction with the experience of Thailand where clarity and consistency in government policy and pricing transparency across all value chains of ethanol production have been key determinant to mobilize private sector involvement.

Yet another flaw is the inadequate involvement of all key partners of the concerned countries during the project development stage, which will hamper the smooth implementation of the project. In fact, "getting all stakeholders on board" is an important lesson learned from the success of Thailand's ethanol promotion program.

The project implementing team has not taken note of these flaws while implementing the project activities. The actual work plan was quite poorly prepared without consultation with all stakeholders, not providing a clear picture of the sequence of activities to be undertaken and the major milestones to be achieved while keeping in mind the budget and time limitations. So the project performance has been tracked and monitored inadequately with respect to each activity and output, time-bound achievement of project milestones.

Similarly, while the project document suggests the composition of the Project Management Unit (consisting of recruited administrative staff, project national experts, designed persons from the key executing agency and a project manager) and recognizes the important role it can play, this was not followed during the project execution. The PMU consists of only the National Project Officer as Project Manager and an assistant. Likewise, the project M&E has not been carried out in accordance with established UNIDO and GEF guidance and procedures. No project-monitoring scheme comprising SMART indicators has been adopted for the implementation of the M&E plan. There is no rigorous monitoring and timely tracking of progress towards project objectives.

UNIDO project team needs to be applauded for its perseverance in reviving the project which had hit an impasse after the project approval by GEF in March 2012 because NSTDA, the Thai government institution which had collaborated with UNIDO to develop the proposal decided not to take up the project execution. Upon the invitation of UNIDO, KMUTT was gracious and generous in accepting to collaborate with UNIDO and co-financing the project.

Not enough efforts have been made by UNIDO as well as its main executing partner to ensure project's cost-effectiveness. The co-financing materialized represents barely 10.26% of what was confirmed. About half of the GEF Funds has been engaged while the activities undertaken have not resulted in the delivery of outputs leading to the expected outcomes. All this is largely due to the lack of rigorous monitoring and timely tracking of project's progress.

Finally, the PSC does not include some of the key stakeholders identified in the project document. While the PSC is established to provide strategic guidance on the project implementation and facilitation of coordination of various government authorities, institutions and industry partners, the fact that a representative of the executing partner chairs the PSC does not serve the purpose well.

Recommendations

The recommendations are structured by addressees as follows: UNIDO, PMU, PSC, KMUTT and the government organizations.

Recommendations to UNIDO:

1. Request GEF for an extension of project up to mid-July 2017 in view of the delays incurred, the project's under-performance, and the need to restructure the PRF, the project management structure and review the activities to be undertaken to achieve the outputs in order to attain the outcome 3. This is crucial as the project budget will most likely be inadequate in the absence of committed co-financing.
2. Consider rectifying the flaws identified in the project document: (a) too much importance given to one component of the technology package; (b) attempting to assist the private sector for setting up ethanol production plants prior to evolving the policy and incentive mechanism at the institutional level; and (c) inadequate involvement of the main stakeholders from the beneficiary countries.
3. Create a formal PMU led by an experienced project manager/coordinator with full responsibility to continuously monitor the execution and performance of project activities and track the progress towards milestones. The PMU should include UNIDO staff from Hanoi and Vientiane who should be given more precise roles to facilitate the mobilization and coordination of key national partners and two-way flow of information needed to put the project work plan on track.
4. Learning from the Thai experience, accord high priority on ensuring government buy-in by anchoring activities within the national settings. Undertake vigorous exercise to initiate dialogue with national partners to identify the relevant stakeholders who should get on board so that the project can replicate the key success factors of ethanol promotion in Thailand. Invite these key national stakeholders to serve as members of the PSC.
5. Consult all partners to assess and reconfirm the co-financing that can be realistically expected. If necessary, explore the scope for expanding the source of co-financing (e.g. approach TICA to mobilize co-financing for training and capacity building).
6. Since the improved fermentation process to handle raw cassava is not yet tested and proven at the industrial scale and no funds have been used for the construction of the demonstration pilots, scrap the construction of the demonstration pilots. Allocate resources for detailed technical and financial feasibility of integrating the VHG-SSF process in the existing ethanol plants in Thailand and Vietnam. Provide incentives

(subject to availability of funds) to the ethanol plants so that they can incorporate the VHG-SSF process in their existing production lines.

Recommendations to PMU:

7. Take the lead and collaborate with all project partners for developing a well-structured work plan closely linked with the budget and the expected outputs and outcomes for the remaining duration of the project. Ensure that the work plan reflects well the importance of conducting on priority basis some activities that serve as pre-requisite for some other activities to be implemented in a sequential manner.
8. In addition to hiring international experts, mobilize key Thai players involved in formulating transparent policies and incentive mechanisms to hold high level policy dialogues with counterparts from Vietnam and Lao PDR to share the institutional experience and the success factors in promoting bio-ethanol (e.g. policies and pricing structures for promoting gasohol through revenue-neutral models).

Recommendations to PSC:

9. Review project implementation, to facilitate coordination among project stakeholders. Nominate either the GEF Focal point (Operations) or a senior Thai official with experience of implementing the ethanol promotion program as the chair of the PSC.

Recommendations to KMUTT

10. Mobilize an international expert to assist in designing the ethanol information hub institutional structure and developing a model for South-South technology transfer. Revamp the project website to create better project visibility. Develop story lines to narrate the success stories. Keep the website more focused and up-to-date in order to serve the main goals of the project, thus sharing information related to all aspects for the promotion of ethanol from cassava as the raw material.
11. Collaborate closely with international experts to revise the structure of the training and capacity building modules, manuals and toolkits that are delivered in partnership with relevant Thai and Vietnamese partners.
12. Collaborate with interested ethanol producing industries to carry out study to ascertain the technical and financial feasibility of adopting VHG-SSF process in Thailand and Vietnam. If the results are positive, assist the same units to adopt the technology and monitor their performances for disseminating the results widely.
13. If it is necessary to provide training on the VHG-SSF process and its technical performance, consider upgrading the laboratory ethanol production set-up to incorporate changes so that the VHG-SSF process can be demonstrated at KMUTT.

Recommendations to Government Organizations

14. Take it upon yourselves to play a more pro-active role in the PSC to assess the project's progress in an objective manner and provide all assistance to overcome the hurdles faced in the execution of the project activities that hamper achieving the required outputs and outcomes.
15. Learn from Thailand's holistic approach to promote sustainability of bio-ethanol and mobilize all institutional players needed to achieve transparency in policy formulation and pricing of bio-ethanol by adopting revenue-neutral mechanism so that bio-ethanol remains competitive with gasoline at all times. Mobilize the right private and civil society partners to promote the improved productivity of cassava roots.

1. Evaluation objectives, methodology & process

An independent Mid-term review (MTR) of the project “Overcoming Policy, Market and Technological Barriers to Support Technical Innovation and South-South Technology Transfer: The Pilot Case of Ethanol Production from Cassava” was carried out almost 3 years after the signing of the project document in March 2012.

1.1. Information on the evaluation

The mid-term review was carried out in accordance with the UNIDO Evaluation Policy, the UNIDO Guidelines for the Technical Cooperation Programmes and Projects, the GEF’s 2008 Guidelines for Implementing and Executing Agencies to Conduct Terminal Evaluations, the GEF Monitoring and Evaluation Policy from 2010 and the Recommended Minimum Fiduciary Standards for GEF Implementing and Executing Agencies.

The mid-term review covered the duration of the project from its starting date in March 2012 to the mid-term review date in February 2015. The scope of the evaluation included assessment of project performance and progress against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

It was conducted as an independent in-depth evaluation using a participatory approach whereby key parties associated with the project were informed and consulted throughout the evaluation. The international evaluation expert liaised with the key personnel of UNIDO managing the project to discuss the evaluation process and methodology to be adopted. Different methods were employed to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information, based on diverse sources: desk studies, literature review, individual interviews, focus group meetings, direct observation, debriefing session with the key project players and their feedback.

The methodology was based on the following:

1. A desk review of project documents and relevant country background information:
 - (a) The original project document, the inception phase report, monitoring reports (such as progress and financial reports to UNIDO and GEF annual Project Implementation Review (PIR) reports), project annual work plan, output reports and relevant correspondence.
 - (b) Notes from the meetings of the main executing agency as well as the committees involved in the project (e.g. project steering committee).
 - (c) Other project-related materials produced by the project.
2. Interviews with project management and technical support teams, including staff and management at UNIDO HQ and in the field (Bangkok, Hanoi and Vientiane), staff associated with the project’s administration. Annex B provides a complete list of persons met.
3. Interviews with project partners including Government counterparts and partners that have been selected for co-financing as shown in the corresponding sections of the project documents. Though an appointment had been fixed with the GEF focal point in Thailand, it was cancelled at the last moment because of the unavailability of the person concerned.

4. On-site observation of results achieved, and interviews with potential beneficiaries of improved bio-ethanol production technologies. The evaluation field mission included visits to three participating countries: Thailand, Lao PDR and Vietnam.
5. Interviews were conducted with the relevant stakeholders involved in project management at UNIDO Regional Office in Bangkok and some of the Project Steering Committee (PSC) members and the various national and sub-regional authorities dealing with project activities.

The evaluation activity involved the following steps:

1. An initial meeting was held with the UNIDO Regional Office team managing the project in Bangkok, which in turn organized a short meeting with the main project execution team. They were all briefed about the overall purpose and the methodology that would be adopted to conduct the mid-term review. The UNIDO Regional Office team shared all the relevant documents needed to conduct an in-depth desk review and assisted in the logistics of organizing meetings with the various stakeholders on the basis of the request made by the evaluation expert.
2. An inception report including details of the methodology to be used by the evaluation expert and the evaluation matrix was submitted prior to undertaking the field mission from 1 to 14 March 2015. The in-depth desk review allowed to compare the activities undertaken with that proposed in the project document.
3. At the end of the field mission, the evaluation expert made a presentation of the preliminary findings and recommendations to the Counterparts at the UNIDO Regional office.
4. The main findings of the evaluation mission were summarized and presented to the project manager, evaluation office staff and other relevant stakeholders at UNIDO Headquarters on 31st March 2015. During the ensuing discussion, it was pointed out that in view of the limited achievement of the project so far, it would not be very relevant to rate the large number of parameters described in the ToR. The consultant was instead asked to take into consideration the changes since the project was formulated and suggest measures to be taken in order to overcome some of the shortfalls identified in the manner in which the project has been implemented so far.
5. The evaluation report has been prepared with the main findings, conclusions and recommendations on on-going and future activities that will help to enhance project relevance, effectiveness, efficiency and sustainability.

It was initially planned to engage an evaluation team consisting of an international evaluation expert supported by a national evaluation expert. However, since the project had made much less progress than planned partly due to circumstances beyond the control of the project's key stakeholders, it was agreed that no national evaluation expert would be engaged for the task.

The evaluation expert received active and effective support from UNIDO HQ as well as UNIDO offices in Bangkok, Hanoi and Vientiane, government officials and all experts involved in the project.

1.2. Scope and objectives of the evaluation

The mid-term review covered the duration of the project from its starting date in March 2012 to the mid-term review date in February 2015. The scope of the evaluation includes assessment

of project performance and progress against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The overall objective of the evaluation is to assess to what extent the project is achieving the expected results at the time of the mid-term review, i.e. to what extent the project has removed barriers, and is creating conducive environment for promoting ethanol technology (bio-fuel) and South-South technology transfer in Lao PDR, Myanmar and Vietnam (LMV).

The specific objectives of the evaluation are:

- Verification of prospects for development impact and sustainability,
- An analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators,
- Re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters,
- Enhancement of project relevance, effectiveness, efficiency and sustainability by proposing a set of recommendations with a view to on-going and future activities until the end of project implementation,

1.3. Information sources and availability of information

The UNIDO Regional office in Bangkok shared relevant documents and reports produced by the project as well as the correspondences related to the project to be reviewed during the inception phase. Furthermore, relevant project documents were provided by the key project executing partner (KMUTT) as well as the government representatives from Thailand, Lao PDR and Vietnam in paper and/or electronic format in English during the evaluation field mission (List of Documents Reviewed is given in Annex D). Interviews with project stakeholders were held in Thailand, Lao PDR and Vietnam during the evaluation field mission (The mission schedule and the peoples met is provided in Annex C). Field visits included the Liquid Distillery Organization's bio-ethanol producing plant site in Bangkhla where the pilot demonstration plant in Thailand is intended to be installed, the Food Industries Research Institute's site which is expected to host the pilot demonstration plant in Vietnam, and the bio-ethanol production facility of Vietnam Central Biofuels JSC in the Quang Ngai province in Vietnam, which is keen to transfer the Thai know-how and technology to their plant.

1.4. Evaluation limitations and validity of the findings

No specific limitations to the evaluation were encountered except for the fact that the activities that were carried in the project had not yet led to concrete outputs because of the late start of the project due to unavoidable circumstances (change in the main executing agency and political turmoil in Thailand resulted in a delay of almost 2 years). Some of the project partners felt more at ease to communicate in their own languages but it did not really pose any serious challenge as their colleagues were helpful in facilitating the communication.

2. Countries and project background

2.1. Brief countries context

The UNIDO project concerns technical innovation and South-South technology transfer (transfer of technology from Thailand to neighboring countries, notably Lao PDR, Myanmar and Vietnam, referred to as LMV) to address the issue of the region's high dependence on fossil fuels for transportation. Hence it is important to have an understanding of the countries context, particularly as all the 4 countries form part of the Association of South-East Asian countries or the ASEAN.

2.1.1. An overview of the economy

ASEAN has embarked on the next stage of its dynamic development after four decades of regional cooperation to build the ASEAN Community in 2015. With various economic, cultural and demographic issues to overcome, the proximity of ASEAN countries brings a unique opportunity for all 10 members to benefit by working together.

Moving towards more integration through the creation of the ASEAN Economic Community – AEC – in 2015 will take ASEAN countries a step further into the right direction. If they succeed at uniting economically, ASEAN nations could claim a stronger political voice too, through the significant economy they will weigh in at negotiation tables, in terms of total GDP and, even more, as the world's third most populated market.

ASEAN is made up of different nations with different culture, history, language and religions. The region accounts for about 7.5% of the world's population and a rapidly growing share of world output. The economic achievements of the countries in this region over the past quarter century have little parallel. However, ASEAN is composed of uneven economies because 6 largest ASEAN countries make up for over 95% of ASEAN GDP, leaving Myanmar, Brunei, Cambodia and Lao PDR at the bottom.

The combined economies of ASEAN make it a major economic power, somewhere between India and Japan. The combined population of ASEAN creates the world's third largest market with more than 600 million people.

In much of the region, this rapid growth has also been accompanied by dramatic reductions in poverty. Thus, Malaysia has been able to virtually eliminate the incidence of poverty, while Indonesia and Thailand have also made substantial progress in this key area. An outstanding feature of the region's economic success has been exceptionally high saving and investment rates that have shown increasing disparity with the rest of the world. In addition, these countries have been able to tap successfully additional foreign savings to complement their already formidable domestic effort.

2.1.2. ASEAN energy challenges

In 2010, ASEAN remained an energy surplus region. The zone has substantial and diversified energy resources ranging from fossil fuels, hydropower, geothermal, bio-fuels and biomass and solar. Brunei, Indonesia, Malaysia, Myanmar and Viet Nam have significant oil and gas reserves. Cambodia has the geological potential for oil and gas reserves; total reserves remain however uncertain and production has been postponed several times and is

currently scheduled not before 2016. Similarly many areas offshore and onshore in Myanmar have not been explored yet, but hold good potential. Currently Myanmar's proven reserves are only half those of Viet Nam, with good potential to at least reach the level of Viet Nam of 0.6 trillion cubic meters of gas. There is also some possibility of oil or gas reserves in the South of Lao PDR.

Given its abundant water resources and large river basins, ASEAN has substantial hydropower capacity. The Greater Mekong region alone has a capacity of 250,000 MW, half of it feasible. The lower Mekong Basin has potential between 50,000 and 64,000 MW. Overall only 6000 MW have been built so far. Substantial potential also exists in Sarawak, Malaysia, Indonesia and the Philippines. While the potential for hydropower development in ASEAN remains huge, resistance by civil society related to environmental concerns has been growing in most ASEAN countries. Concerns are also rising as to the impact of changing weather patterns on hydropower availability. Hence a strategy of major reliance on hydropower for electricity generation is considered highly risky. ASEAN countries have good potential in other renewable energy sources, namely biomass, solar and geothermal. Lao PDR, Myanmar, Thailand and Viet Nam can also produce significant amount of bio-fuels without threatening food production.

While ASEAN is relatively well endowed in terms of energy resources, it is however an energy-thirsty region with low energy efficiency as its transport sector and its manufacturing industry are highly energy intensive. Over the past decade, most ASEAN countries except the Philippines and Singapore have experienced rapid growth in energy consumption per capita.

ASEAN has a fast growing energy demand driven by its economic and demographic growth. ASEAN's primary energy need is projected to triple between 2005 and 2030 by an average annual growth rate of 4%. Even under the most optimistic assumptions, ASEAN will face formidable challenges in securing the energy it will need over the next few decades to sustain its growth momentum. Many of ASEAN's current fossil fuel reserves will be exhausted or be far from sufficient to respond to the projected demand, including countries with relatively large current reserves such as Malaysia and Myanmar. Ensuring access to sufficient energy supply of the right type at affordable cost while mitigating the environmental impact of energy production will be a major challenge for ASEAN, not the least because it is itself surrounded by 2 massive economies also short of energy resources. To address this challenge, strong domestic and regional political leadership will be required.

2.1.3. Development of bioenergy to counter the dependence on fossil fuels

Renewable energy has received increasing attention because of worldwide effort to mitigate global warming and alleviate soaring oil price. In 2011, the contribution of renewable energy share in ASEAN power generation was 29.33%. Biomass is the second largest source of renewable energy resources after hydropower and accounts for 3.64% of total power generated.

Bioenergy is an important energy resource since it is renewable, widely available and carbon neutral. Using bioenergy as an alternative to fossil fuels – which are limited resources - is one way to reduce GHG emissions and improve energy security. Moreover, since bioenergy can be generated from energy crops, biomass residues as well as organic wastes, there is considerable potential for new sources of income along the whole value chain, from cultivation to harvest, processing and conversion into energy.

In ASEAN, energy from biomass represented about 12.4% of total renewable energy consumption in 2011. Wood and agricultural wastes are widely used as fuels in the domestic sector and small-scale industries for cooking and heating, while modern biomass systems including combined heat and power generation and large-scale power plants are also adopted in many countries such as Indonesia, Malaysia, Philippines and Thailand.

The raw materials used in ethanol and biodiesel production vary by resources of each country. Sugar-rich, starch-rich, and oil-rich plants have also been used as raw materials for bio-fuel production. Thailand uses sugarcane, molasses and cassava as feedstock for ethanol production, while Vietnam and Philippines use only molasses and cassava. For biodiesel, the raw materials used in ASEAN are crude palm and coconut oils. Crude palm oil is used in Thailand, Malaysia and Indonesia whereas coconut oil is used in the Philippines.

Nevertheless, energy production from biomass still has a significant potential since a large portion of biomass is still underutilized. Moreover, increasing potential of energy crops and development of plant yield improvement technology will extend the bioenergy potential even more.

Therefore, biomass is considered as a promising alternative energy source in future strategic energy planning in the national and regional context.

2.1.4. Bioenergy technology status

ASEAN has high capability for agricultural products. However, bioenergy production in ASEAN is presently still below the desired target. The lack of feedstock management and high price of raw materials make bioenergy production unattractive. **Approximately two-third of the production cost of bioethanol and biodiesel is the cost of raw materials.**

To improve the competitiveness, the productivity of energy crops per area has to be increased for economic achievement. Currently, technologies to increase yield include plant breeding technology, precision agriculture and mechanized agriculture.

Plant breeding technology is adopted to improve plant varieties such as higher yields, drought tolerance and nitrogen use efficiency. ASEAN countries have utilized conventional breeding and tissue culture in their agricultural activities. Currently, several biotechnologies are being used to speed up the process of plant improvement. Malaysia, Thailand, Philippines, and Vietnam are regarded as having high capability to improve plant varieties.

Precision agriculture is the use of technology to manage farm areas. Specific technologies in this group include resource management that improves efficiency of water and fertilizer use, drip irrigation as well as selection of suitable varieties in particular cultivation areas. Currently, the use of precision agriculture in ASEAN is in infancy stage of development. Many projects and initiatives are in the pilot or prototype stage. **Thailand is applying this technology in sugarcane and cassava farming in order to increase the efficiency of farm management and ability to select the suitable varieties for cultivation and production.**

Mechanized agriculture refers to the use of tools or machines in farm operation such as land preparation, planting, harvesting, processing and storage. Currently, mechanized agriculture has received high attention because of the on-farm labor shortage and increase of crop planting. In ASEAN, most mechanical equipment and machinery are imported. Vietnam, Indonesia, Philippines and Thailand have ability to develop equipment and machines for

land preparation, planting, and harvesting of sugarcane and cassava but most of the machines used in field are imported.

The liquid biofuel production in ASEAN consists of two distinct sectors, ethanol and biodiesel. In ASEAN, Indonesia, Malaysia, Philippines and Thailand have accelerated their attempts to develop the liquid biofuel industry. In Cambodia, Laos, Myanmar, and Vietnam, the biofuel projects are still in the small-scale plants, or in the demonstration phase.

2.1.5. Government policy to promote the production and usage of biofuels

The energy demand in ASEAN countries is expected to increase steadily in coming years. Most ASEAN countries have set their national renewable energy target and developed policy tools to promote the renewable energy production and utilization. Both short-term and long-term policies/plans have been endorsed.

With the high potential of bioenergy in many ASEAN countries, bioenergy has major roles and significant contributions in renewable energy share. Biofuels are an alternative to fossil fuels. Generally, sustainably-derived biofuels are considered carbon neutral because the carbon released from burning it is removed from the atmosphere by growing the plant. Moreover, the advantage of biofuels over fossil fuels is the possibility of making them carbon negative, and only carbon-negative fuel can reduce the build-up of carbon in the atmosphere and its greenhouse effect. Many countries have launched their own policy to develop bioenergy from biomass in order to promote energy security and strengthen their agricultural sector.

Thailand

In December 2011, the Government of Thailand modified its old 15-year Alternative Energy Development Plan (AEDP) (2008–2022) with the current 10-year AEDP (2012–2021) which targets the renewable energy share to increase from 7,413 kt in 2012 to 25,000 kt in 2021, *i.e.*, using renewable energy at 25% of total energy consumption by 2021, while biofuel is targeted to replace 44% of oil consumption in the transport sector by 2021. The driving force behind the AEDP was to reduce oil imports, strengthen energy security, enhance the development of alternative energy industries and conduct research and develop renewable energy technologies.

Based on the AEDP, the 15-year Ethanol Development Plan set production targets of bioethanol at 3.0, 6.2 and 9.0 million liters/day for the short-term (by 2011), medium-term (by 2016) and long-term (by 2022), respectively. To make the new plan operational, the government devised strategies and incentives at both the supply and demand sides, as follows:

- **On the production side**, the focus of the plan was on increasing the national average production of cassava and sugarcane by supporting R&D activities, and promoting other alternative feedstock commercially.
- **On the demand side**, the government plans included both legal and regulatory measures as well as pricing mechanisms:
 - Terminating the use of Octane 91 regular gasoline by the end of 2012;
 - Setting a 35% quota for cassava based ethanol to accommodate increasing demand of ethanol

- Subsidizing E20 gasohol from the State Oil Fund at 3.0 Baht/liter (36 US cents/gallon) cheaper than Octane 95 gasohol and encourage the extension of E20 service stations;
- Supporting the manufacturing of eco-cars and E85 cars in general, by reducing the excise tax to car makers by 50,000 Baht for each E85 car (about US\$ 1,600/vehicle) and 30,000 Baht (about US\$ 950/vehicle) for each eco-car;
- Supporting the manufacture of eco-cars (E20 vehicles) and flex-fuel vehicles (FFV), which are compatible with E85 gasohol, by reducing the excise tax for automobile manufacturers by 50,000 Baht/vehicle (about US\$ 1,600/vehicle) for FFV and 30,000 Baht/vehicle (about US\$ 950/vehicle) for eco-cars;
- Supporting research and development, and encouraging gasohol usage through public campaigns.

Vietnam

In Vietnam, the Decision No. 1885/QĐ-TTg was promulgated by the Prime Minister in December 2007 on the approval of the “Strategy on National Energy Development up to 2020, with vision to 2050”. The Government has affirmed the policy of renewable energy and has set a target to increase the share of renewable energy in total commercial primary energy from 3% in 2010 to 5% in 2020 and 11% in 2050.

In 2007, the Government of Vietnam issued the Decision No. 177/2007/QĐ-TTg on the “Scheme on Development of Biofuels up to 2015 with the Vision to 2025”. In accordance with the Decision, the overall objective of the Scheme is to develop biofuels as a new and renewable energy to partially replace conventional fossil fuels in order to assure energy security and environmental protection. Within the scope of the Scheme, biofuels are defined as liquid fuels such as ethanol, methanol, and biodiesel.

To facilitate the implementation of the Biofuel Development Scheme, the Ministry of Finance and Ministry of Industry and Trade promulgated Circular 147/2009/TTLT-BTC-BCT on the management and usage of the State’s budget in the implementation of the Scheme. On 17 July 2009, the Ministry of Industry and Trade promulgated Decision No. 3638/QĐ – BCT on establishing a Task force to develop standards and technical regulations on the production, storage, distribution and use of biofuels. On 30 September 2009, the Ministry of Science and Technology issued the Circular No. 20/2009/ TT-BKHCHN on the promulgation of the national technical regulation on gasoline, diesel fuel oils and biofuels following QCVN 1:2009/BKHCHN. On 25 March 2010, the Directorate for Standards, Metrology and Quality issued Decision No. 400/ QĐ-TDC on the guidelines for standard-compliance certification of gasoline, diesel and biofuels following QCVN 1:2009/BKHCHN.

The Decision No. 53/2012/QĐ-TTg of the Prime Minister dated 22 November 2012 promulgated a roadmap for applying a ratio for blending biofuels with traditional fuels. It specified that **E5 bio-fuel will be used for road motor vehicles in seven cities (Hanoi, Ho Chi Minh City, Hai Phong, Da Nang, Can Tho, Quang Ngai and Ba Ria-Vung Tau) from December 2014 and will be used in the whole country from 1st December 2015.** Following this Decision, the Ministry of Industry and Trade (MOIT) issued a roadmap of the implementation plan of applicable percentage of biofuel blended with traditional fuels (Decision No. 113/QĐ-BCT on 9th January 2013).

Circular No. 47/2012/TT-BCT dated 28 December 2012 issued by the MOIT (the national technical regulation on equipment, accessories and vehicles used in the preparation,

storage and transportation of ethanol and bio-diesel) has created favorable conditions for all stakeholders in ensuring the technical requirements of biofuel distribution.

Since the launching of the distribution of E5 bio-fuel in the 7 cities of Viet Nam in December, Vietnam has to deal with the challenge of the low oil prices in the international market. The Prime Minister of Viet Nam agreed in 2015 to use stabilizing funds to lower E5 petrol prices so as to widen the gap between E5 and RON 92 from VND300/l to VND500/l in order to encourage E5 consumption. The Prime Minister has assigned the Ministry of Finance to study and report to the Congress and Standing Committee of the National Assembly to consider, amend and supplement regulations on environmental protection tax on gasoline and bio-fuel to encourage the use of biofuels. The Ministry of Finance is expected to issue guidelines to implement the provisions of special taxes on mineral gasoline and E5 petrol as soon as the amended and supplemented law on Special Consumption Tax takes effect. The Prime Minister assigned the Ministry of Finance to adjust export tax on ethanol and encourage the use of cassava as raw material for biofuel production in Vietnam.

Lao PDR

In Lao PDR, the Government aims to increase the share of renewable energies to 30% of the total energy consumption in 2025. The Government has outlined a tentative vision to reduce the import of fossil fuels and biofuels are expected to account for about 10% of the total transport energy consumption. However, this target may be revised on the basis of the feedback from studies, lessons learned from on-going implementation activities, and international technological developments in the field of renewable energy.

In order to meet the set target, the Government intends to issue a Biofuels Decree that provides an overall legal framework, stipulates specific development goals, defines incentives, support and obligations of private investors including small-scale producers which are committed to produce exclusively for the domestic market. The Government also intends to establish institutional arrangement for the promotion and development of biofuels. Exports will be allowed in case of oversupply of biofuels but no incentives or subsidies will be given to investors.

There is a plan to establish and strengthen the capacity of the agency responsible for the promotion and development of biofuels as well as setting their reference price.

2.2. Project summary

In response to GEF call for support under its climate change window, UNIDO and NSTDA (Thailand) collaborated to develop a concept note seeking an opportunity for GEF support to transfer Thailand's bioethanol technologies to neighboring countries. The project concept note was approved by GEF Council in 2009 for funding through Poznan's Specific Fund for Technology Transfer. The Project Preparatory Grant (PPG) was approved by GEF and the project document was subsequently submitted at the end of 2011 to be approved for implementation at the end of March 2012. It was designed as a four-year full-size project (FSP) as a part of the GEF-4 Technology Transfer Pilot (TT-Pilot) project. An overview of the Project is given in the form of a Project Fact Sheet in Table 2.

Table 2. Project fact sheet

General Information	Project Title	Overcoming policy, market and technological barriers to support technological innovation and South-South technology transfer: The pilot case of ethanol production from cassava
	GEF ID	4037
	UNIDO ID (SAP Grant Number)	GFTHA12001
	Region	EAP
	Country(ies)	Thailand
	GEF Focal Area(s)	Climate Change (Climate Change Mitigation)
	Implementing Agency(ies)	UNIDO
	Project Executing Partners	KMUTT
	Project Size (FSP, MSP, EA)	FSP
Milestone Dates	Project CEO Endorsement/Approval Date	28 March 2012
	Project Implementation Start Date (PAD Issuance Date)	6 June 2012
	Original Expected Implementation End Date (indicated in CEO Endorsement/Approval document)	31 January 2016
	Revised Expected Implementation End Date (if any)	5 December 2016
Funding	GEF Grant (USD)	US\$ 2,600,000
	GEF PPG (USD) (if any)	US\$ 100,000
	Total GEF Grant Disbursements at the time of MTR (USD) Total Expenditures = Commitments + Payments)	US\$ 1,321,854
	Co-financing (USD) at CEO Endorsement	US\$ 31,623,000
	Materialized Co-financing at the time of MTR (USD):	US\$ 722,501
	Total Project Cost (USD) (GEF Grant + Co-financing at CEO Endorsement)	US\$ 34,223,000
Evaluations	Mid-term review Date	February 2015 (Planned for February 2014)
	Planned Terminal Evaluation Date	October 2015

UNIDO, with a funding grant from GEF, is the Implementing Agency (IA) for the project “Overcoming policy, market and technological barriers to support technological innovation and South-South technology transfer: The pilot case of ethanol production from cassava” with the main objective for preparing Thailand to serve as the regional hub on ethanol production from cassava and for South-South technology transfer on ethanol production from cassava.

Deadlines and milestones

Table 3 summarizes the information on the main project dates and milestones.

Table 3. Milestones and main dates for the GEF-4 CC (CCM) project in Thailand

Milestone	Expected Date	Actual Date
Project CEO Endorsement/Approval Date	December 2011	March 2012
Project Implementation Start Date (PAD Issuance Date)	February 2012	June 2012
Original Expected Implementation End Date (indicated in CEO Endorsement/Approval document)	January 2016	January 2016
Revised Expected Implementation End Date (if any)		5 December 2016
Mid-term review completion	February 2014	May 2015
Terminal Evaluation Date	October 2015	October 2016

The GEF CEO endorsement was delayed by about 3 months. The official launching of the project was further delayed because NSTDA was unable to execute the project due to other pressing organizational priorities of national importance. Following the official letter of NSTDA declining to take part in the project at the end of January 2013, UNIDO approached KMUTT to take up the role of executive partner and KMUTT responded favorably in June 2013. However, it took another 3 months for KMUTT to submit the necessary documents, including the proposed work plan and letter of co-financing. The Terms of Reference for Service and Work was ready in December 2013, hence no concrete project activities had started 20 months after the official GEF CEO approval of the project. The first Project Steering Committee was held in December 2013. Further the contract between UNIDO and KMUTT was signed in June 2014 though KMUTT had started the project activities prior to the signing of the contract. Because of the above facts, the project was lagging in achieving its targets by the time of mid-term review.

Based on interviews with stakeholders, the project was developed with limited participation of and consultation with the relevant stakeholders from the beneficiary countries.

According to the Project Manager (PM), a request had been sent by UNIDO to GEF for extending the project duration by one year and this has been approved. Hence the original expected implementation end date (January 2016) has been revised to December 2016.

Project stakeholders

According to the sources involved in the project design stage, a limited number of stakeholders were consulted during the project design. Table 4 below lists the main stakeholders identified, showing in detail their role in project preparation and implementation.

Table 4. Project stakeholders identified for project execution and co-financing

Key Project Stakeholders	Status	Role	
		Execution	Co-financing
NSTDA (later replaced by KMUTT)	National Government (replaced by academic institution)	Executing agency	Cash and in-kind
LDO, Thailand	National Government	Project partner (pilot ethanol plant)	Cash and in-kind
MOIT	National Government	Project partner	In-kind
FIRI, Vietnam	National Government	Project partner (pilot ethanol plant)	Cash and in-kind
KKS, Myanmar	Private sector	Ethanol plant	Cash
UNIDO	International Organization	Implementing Agency	Cash and in-kind

It should be noted that though the technology transfer involved three countries, notably Lao PDR, Myanmar and Vietnam, there were no institutional partners' involvement from the first two countries in the project development phase. At the time of mid-term review, co-financing for the project had only materialized from KMUTT and UNIDO. The major share of co-financing from the private company in Myanmar is not going to materialize as the company decided not to go ahead with the ethanol production plant due to the lack of policy support from Myanmar government.

Though the project had foreseen coordination with other related initiatives to create greater synergy, there has been no/limited involvement of these entities. They include:

- Department of Agricultural Extension (DoAE), under the Ministry of Agriculture and Cooperatives (MOAC), Thailand
- The Ministry of Industry (Mol), Thailand
- The Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy (MoE), Thailand
- The Energy Planning and Policy Office (EPPO), Ministry of Energy (MoE), Thailand
- Thailand Tapioca Development Institute (TTDI), Thailand
- Thailand Ethanol Producers Association, Thailand
- Science and Technology Postgraduate Education and Research Development Office (PERDO), Faculty of Science of Mahidol university, Thailand
- Office of Small and Medium Enterprise Promotion (OSMEP), Thailand
- Department of Agricultural Extension and Rural Development, Vietnam
- Faculty of Agriculture-Forestry-Fishery, Vietnam

Project Implementation Arrangements

UNIDO is the GEF Implementing Agency for this project. UNIDO is responsible for implementing the project, delivering the planned outputs and achieving the expected outcomes. UNIDO is executing the project in collaboration with the concerned Government Ministries of respective governments, KMUTT, FIRI, LDO and the private stakeholders.

Being the implementing agency (IA) of the project, UNIDO takes the full responsibility of releasing the GEF funds at appropriate periods. UNIDO also has the responsibility of

selecting experts, project briefing, approval of contracts for the implementation activities, procurement, initial operations, monitoring and reporting, etc.

UNIDO is also providing assistance on formal GEF procedures that apply to the project execution, including reporting issues and formal channel of correspondence between the project and the GEF secretariat. The GEF specialist is providing technical backstopping to the project as deemed necessary. The responsibilities assigned to the key stakeholders of the project are described below.

UNIDO will be responsible for:

- General management and monitoring of the project;
- Reporting on the project performance to GEF;
- Procuring the international expertise needed for delivering the planned outputs under the four project components;
- Coordinating with the project steering committee to review the project every 2 months during the project implementation period;
- Providing administrative support and financial budgetary follow up required for the execution of the project;
- Annual auditing of the project by following GEF procedures;
- Managing, supervising and monitoring the work of the international teams and for ensuring that the deliverables are technically sound and consistent with the project requirements.

NSTDA (replaced by KMUTT, Thailand) will be responsible for:

- Establishing the information hub in Thailand
- Packaging of the bio-ethanol technology package for transfer
- Preparation of manuals, toolkits and structured training programs for technology transfer
- Operation and maintenance of the ethanol technology database
- Conduct of regional workshops on bio-ethanol production
- Coordination of the study tour for LMV countries participants
- Various trainings to farmers, technicians, entrepreneurs, researchers and scientists
- Assisting FIRI in the establishment of a technical centre in Vietnam
- Establishing the 200 l/d demonstration plant in Thailand
- Assisting FIRI in the establishing the 50 l/d demonstration plant in Vietnam
- Facilitating the technical services and technology transfer for establishing the 400,000 l/d plant in Myanmar

FIRI (Vietnam) will be responsible for:

- Establishing of a technical centre in Vietnam
- Establishing of 50 l/d demonstration plant in Vietnam
- Conducting several policy forums in Vietnam
- Providing technical and expert advisory service to ethanol producers and investors in Vietnam for commercialization of the technology

LDO (Thailand) will be responsible for:

- Hosting the 200 l/d demonstration unit on its industrial site in Bangkla, Thailand

MOIT (Vietnam) will be responsible for:

- Implementing the 50 l/d demonstration unit at Hanoi, Vietnam

KKS (Myanmar) will be responsible for:

- Implementing the 400,000 l/d commercial plant in Myanmar.

According to the project document, UNIDO would establish a Project Management Unit (PMU) in UNIDO Regional Office, Bangkok with close collaboration with UNIDO Country Office in Vietnam. PMU would consist of recruited administrative staff, project national experts, designated NSTDA persons and a Project Manager. The responsibilities of PMU would be as follows:

- Project coordination within the project and with other project stakeholders including experts and government agencies;
- Day-to-day project operations including management, monitoring and evaluation of activities as stipulated in the project work plan; and
- Assisting NSTDA, MOIT and FIRI to organize training activities, study tours and others as shown in the work plan.

Since support from UNIDO and its technical experts is crucial to ensure smooth and effective operations, the PMU would collaborate closely with UNIDO. Major changes in the project activities would be subjected to official approval from UNIDO and the PMU would report the delay or problems encountered that require joint consultation and decisions of key stakeholders.

Throughout the period of project implementation, the PMU would receive the necessary management and monitoring support from UNIDO and the monetary support from GEF and counterparts. Figure 1 presents a summary of the project implementation arrangement.

A Project Steering Committee (PSC) has been established. According to the project document, the role of the PSC would be to review the progress in project implementation, facilitate co-ordination among project shareholders and maintain transparency in ensuring ownership and to extend support for the sustainability of the project. The PSC would have a balanced representation from key stakeholders including NSTDA, MOIT, MoF, DEDE under MoE, the Energy Planning and Policy Office (EEPO), concerned agencies and institutions, representatives from local agencies related to bio-ethanol and UNIDO. The committee will be chaired by the GEF Focal point (Operations). The final composition of the PSC would be defined during the project implementation start-up phase. The PSC would meet twice a year.

According to the Project Document, UNIDO will collaborate with NSTDA, MOIT and a team of international experts to develop the detailed work plan for the entire duration of the project. This work plan would be used as a management tool, based on which a specific detailed monitoring plan would be developed and it will be reviewed on biannual basis, unless and otherwise required.

Project financial framework

In the Project document, the GEF financing was estimated as US\$ 2,600,000. At the time of the Mid-term review, the total Executed Budget (A Term for Disbursements in UNIDO SAP) of the GEF Grant as being presented in the MTR GEF Reporting was US\$1,321,854.

The co-financing planned in the project document amounted US\$31,623,000. At the time of the mid-term review, the materialized amount of co-financing was US\$722,501, which is 2.28 percent of the planned co-financing. The materialized co-financing to date is rather low, mainly due to the decision of the private company of Myanmar not to invest in the ethanol production facility.

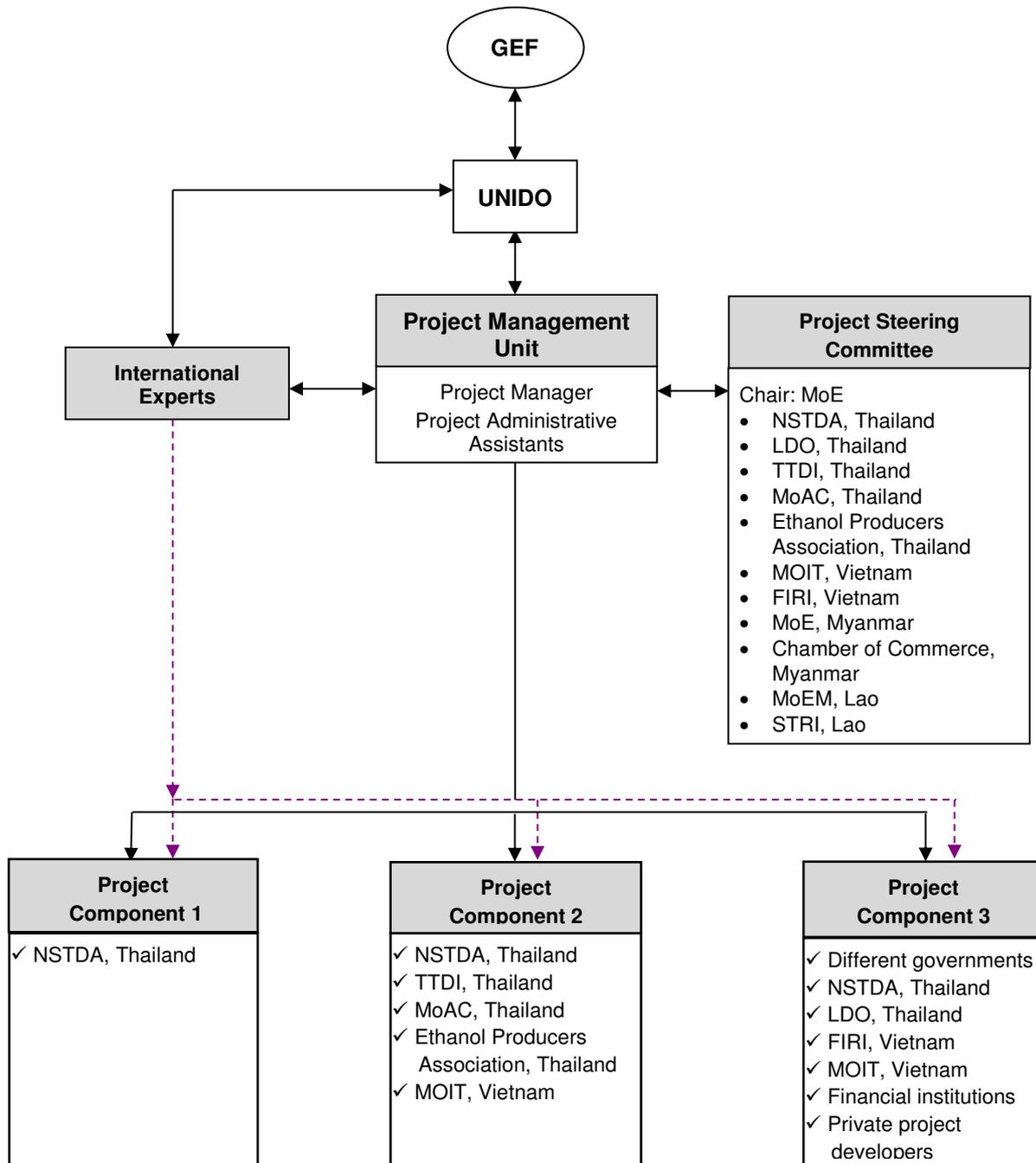


Figure 1. Diagram of project implementation arrangement

3. Project assessment

Project design

The project document has been prepared on the basis of the assessment of the various barriers that hinder the development of bio-ethanol in the Greater Mekong sub-region which is faced with challenges such as the *high cost of fossil fuel imports, over-reliance on fossil fuels and the resulting high greenhouse gas emissions*. The key barriers identified are the **lack of policy and price incentives for the promotion of bio-ethanol, low technical efficiency in processing ethanol, lack of advanced technological know-how by the private sector, and poor access to information**.

During the project formulation stage, it was recognized that the new bioethanol production technology package developed by NSTDA in Thailand could be transferred to the neighboring countries as it consists of *know-how to increase the yield of cassava and the fermentation technology to increase the ethanol plant-level efficiency*.

By considering sustainability of the project as one of the most crucial considerations, UNIDO has incorporated capacity building and institutional strengthening as a part of the overall strategy; moreover, UNIDO has opted to rigorously pursue cross-border cooperation in order to promote technology transfer and remove the existing barriers in the countries included in the project. UNIDO has also capitalized on its past “success” in the region to lend support for the project formulation and share lessons learned as guidance during the implementation stages. The overall project design is therefore relevant to address the challenges being faced by the participating countries.

The project was formulated based on the project results framework approach. The project results framework with its outcomes and outputs, and target indicators is adequately developed:

- By enhancing the capacity of KMUTT, the project can lend suitable support to the region, ensuring higher income generation opportunity for cassava farmers and bio-ethanol producers.
- By creating conducive environment to promote bio-ethanol technology and strengthened policies to promote ethanol for replacing conventional fuels, the project can help in lowering the cost of bio-ethanol production from cassava through enhanced farm productivity and efficient industrial process.
- Finally, by strengthening technological and technical cross-border cooperation and improved investment climate in Thailand and LMV, the project can accelerate the use of ethanol as transport fuel in Thailand and LMV countries.
-

These outcomes will lead to the achievement of the ultimate objectives of the project, namely *reduced GHG emissions and better air quality, increased market competitiveness of bio-ethanol with fossil fuels, creation of direct and indirect jobs in rural areas, and reduced import bill of oil products*.

The project is consistent with the GEF Climate Change focal area Strategic programme as it aims to *promote sustainable production and commercialization of ethanol production from cassava*. The proposed project will contribute positively to the renewable energy market transformation process, leading to reduced fossil fuel use and GHG emissions.

Table 5. Technology package highlighted in the project

Technology package conceived by the project

- *Improved productivity of cassava root*
 - Increase from 19 to 47 t/h without changing cassava variety
 - Adoption of new soil conservation practices
- *Improved in-factory raw material management and pre-fermentation practices*
 - Increased flexibility for factory supply management
 - Reduced water, energy and resource consumption
 - Lowered average cost of bio-ethanol production
- *Improved fermentation process*
 - Increased ethanol concentration using VHG-SSF technology
 - Shortened process and fermentation time
 - Reduced time and energy usage in distillation

The GHG emission reduction of the project amounts to 211.93 tons of CO₂ equivalent per 100,000 liters of bio-ethanol, as depicted in Figure 2. As one can observe, while the *switch from gasoline use to bio-ethanol would allow a reduction of 150 tons CO₂ equivalent per 100,000 liters of bio-ethanol (70.8% CO₂ reduction)*, the technology package promoted by the project would assist in further abatement of emissions by 61.93 tons of CO₂ equivalent per 100,000 liters of bio-ethanol (*with as much as 50.06 tons of CO₂ equivalent per 100,000 liters of bio-ethanol from improved farm productivity, or 23.6% CO₂ reduction*).

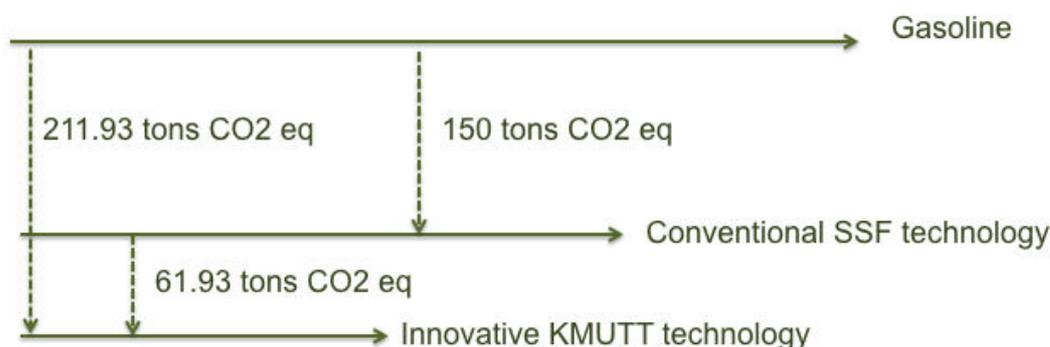


Figure 2. GHG reduction potential from the project (per 100,000 liters of bio-ethanol)

A critical assessment of the innovative technology package

If GHG emission reduction is one of the key objectives of the project, then the neighboring countries can gain the main benefit by promoting the switch from gasoline to bio-ethanol. It goes hand in hand with the need to improve farm productivity in order to reap dual benefits: the farmer will be encouraged to grow cassava as a higher profitability is guaranteed through improved productivity; higher productivity will be translated into a lower cost of feedstock for ethanol production, thus making it more cost-competitive with gasoline. The improved fermentation process would then represent the “**icing on the cake**” as it would contribute to further decrease in ethanol production cost and **5.6% reduction of CO₂ equivalent per 100,000 liters of bio-ethanol**. *It should also be noted that the improved fermentation process has not yet been tested and proven at the industrial scale.*

A number of risks associated with the development of biofuels were identified in the project document. However, the mitigation measures proposed are not always convincing. For example, while addressing regional cooperation risk in terms of collaboration with Myanmar, it is pointed out that the project does not involve any of the Myanmar government agencies and their funding. On the other hand, the private sector is involved in the project and is providing co-financing for the commercialization of the technology. This is in contradiction with one of the project outcomes: creation of conducive environment to promote bio-ethanol technology and strengthening of policies to promote ethanol for replacing conventional fuels.

An area of weakness of the project is its preparation without full and active participation of relevant national stakeholders (from government, industries and the civil society) and/or target beneficiaries. As a result, the project has so far not been able to involve all the key national counterparts from the participating countries during its execution. Another area of weakness of the project is its over-emphasis on the improved fermentation process which, as described earlier, is yet to be tested and proven at the industrial scale and can at the most be considered as “icing on the cake”.

Based on the above analysis, the project design is found to be weak. The participation of local stakeholders in project identification was perceived to be inadequate, and there is an over-emphasis on the improved fermentation process in the technology package. Also, while a number of risks associated with the project have been identified, the proposed risk management measures are not always convincing.

As a result, the Project Results Framework (PRF) and target indicators were not developed well enough to address the key barriers and the associated risks. The PRF needs to be revised in consultation with all key stakeholders in order to come up with more realistic and achievable outputs and target indicators. Greater emphasis needs to be put in the project component 2, especially in aspects related to improvement of pricing practices and policy environment. The training activities under the component 2 need to be more focused, especially those aimed at improving the farming practices as there can be perceptible changes in the farming practices within the timeframe of project implementation. As for the output 3, more emphasis can be put on working with industrial partners who are willing to adopt the VHG-SSF technology.

The revised PRF has to be approved by the Project Steering Committee (PSC) in close consultation with the GEF Coordination Unit and UNIDO Office for Independent Evaluation.

Project relevance

The project is relevant to the national development and environmental priorities of Thailand and the other neighboring countries. The policies adopted to promote the development of biofuels in general and ethanol in particular by the countries participating in the project have been presented in Section 2.15.

The 15-year Renewable Energy Master Plan of Thailand (2008-2022) aims at promoting and supporting renewable energy in all forms in order to lower the dependence on imported oil, improve energy security, promote community production of green energy, develop indigenous renewable energy industry and favor R&D in renewable energy. The ethanol development plan forms part of this Master Plan and includes the promotion of ethanol production from molasses and cassava, development of ethanol transport system for better efficiency, promotion of all types of gasohol by incentive measures and pricing mechanisms, integrated ethanol management to stabilize the ethanol industry from upstream to

downstream and human resource development to sustain the initiatives. Thailand has strengthened its ethanol policy to smoothen the oil price shocks by phasing out the sale of gasoline and promoting mandatory blending of ethanol with gasoline.

The key success factors of ethanol promotion in Thailand can be summarized as follows:

- *Clarity and consistency in policy,*
- *Getting all key stakeholders on board, and*
- *Pricing transparency across the value chain, and*
- *Ensuring the availability of raw material for ethanol production.*

Vietnam has limited oil reserve and the domestic supply continues to decline proportional to the total supply and the oil import has been steadily increasing. To face with the energy security challenges, Vietnam is also keen on diversifying its energy sources and biofuel is considered as one of the alternatives. Way back in November 2007, the Government of Vietnam adopted the biofuel development vision and strategy. The policy provided a plan for biofuel development by creating a legal framework and a favorable environment to initiate and expand the domestic biofuel industry. As stated in Section 2.1.5, since 2007 several initiatives have been taken by the government to ensure scientific research, technology development and demonstration programs for biofuel production to achieve industrial status.

The government of Lao PDR has also adopted a policy to promote biofuel production in order to reduce the import of fossil fuels and biofuels are expected to account for about 10% of the total transport energy consumption by 2025. In order to meet the set target, the Government intends to issue a Biofuels Decree that provides an overall legal framework, stipulates specific development goals, defines incentives, support and obligations of private investors including small-scale producers which are committed to produce exclusively for the domestic market. The Government also intends to establish institutional arrangement for the promotion and development of biofuels. Exports will be allowed in case of oversupply of biofuels but no incentives or subsidies will be given to investors.

The project aims to support sustainable energy and industrial development of the countries in the Mekong region in order to *reduce the environmental pressure on economic growth while increasing productivity, creating more jobs in rural areas and reducing the vulnerability of the countries to future oil price hikes*. It is designed to address the key barriers to the sustainable development of ethanol from cassava, namely *poor access to information and lack of policy and price incentives for the healthy development of indigenous ethanol production, low technical efficiency in processing ethanol, and lack of advanced technological know-how by the private sector*. The project has very specific components to strengthen the institutional capacity for technology dissemination, South-South technology transfer, capacity building and policy dialogue with key institutional stakeholders, demonstration and commercialization of technology and enhancing private sector's role in GHG mitigation efforts.

From the above, it is evident that the project is in line with all the mentioned government policies and decisions and also fits well within the national priorities of biofuel development.

The project is consistent with the GEF Climate Change focal area Strategic Program SP4: Promoting sustainable energy production from biomass, because it aims to promote sustainable production and commercialization of ethanol production from cassava. The project is conceived to contribute positively to the renewable energy market transformation process, resulting in reduced dependence on fossil fuels and abatement of GHG emissions. Moreover, the funding from Poznan's Specific Fund for Technology Transfer is justified if one were to consider the offer from Thailand as a whole package of technology transfer

since the transfer of technology (consisting of improved productivity of cassava root production and improved fermentation process) alone will not guarantee sustainable indigenous bio-ethanol production in the absence of transparent policies and pricing incentives.

The project is in line with UNIDO's mandate, core competences and can benefit from UNIDO's comparative advantage as GEF's implementing agency in the renewable energy and climate change domain. UNIDO has a mandate to support sustainable energy and industrial development in developing countries and emerging economies in order to reduce the environmental pressure on economic growth while ensuring higher productivity. As a GEF implementing agency, UNIDO is pursuing the goal of delivering comprehensive capacity building to institutions and enterprises. UNIDO is also striving to promote technology at a regional level, strengthening existing institutional, policy and regulatory frameworks for supporting and enhancing private sector's role in GHG mitigation efforts.

The relevance of the project has not diminished with the passage of time. In fact, *the role of the project has become even more relevant in the present context of the very low oil prices in the international market, highlighting the strong need for government policy and incentives for the sustainability of biofuel growth in the participating countries.* In view of the delay in the implementation of the project and the dropping out of the key private enterprise from Myanmar from the project, there appears to be a need to reformulate the project design as far as the Outcome 3 is concerned.

Based on the assessment of project relevance to local and national energy priorities, policies and strategy of the participating countries, to GEF's strategic priorities and objectives, and to the GEF focal area of climate change and SP4 - Promoting sustainable energy production from biomass, and to UNIDO's mandate, overall project is considered to be highly relevant.

Effectiveness

Though the project's official implementation date is June 2012, the project activities could not start in time due to circumstances beyond the control of UNIDO. It is only when KMUTT agreed to substitute NSTDA as the key project partner that the project could be initiated at the end of 2013 with the holding of the first Project Steering Committee (PSC) Meeting. Further delays were encountered due to time taken for the signing of contract between UNIDO and KMUTT in June 2014 though KMUTT had already started the project activities after the PSC meeting. The mid-term review was undertaken approximately a year after the project activities got started.

The project has achieved very limited results so far as a result of which none of the expected outputs has so far been achieved. Table 6 presents an assessment of the project status in terms of project activities, outputs and outcomes at the time of evaluation.

Table 6. Assessment of the project status at the time of evaluation

Project Outcome	Outputs	Indicator(s)	Target	Status at the time of evaluation
Components 1: Institutional capacity strengthening for VHG-SSF technology dissemination				
Outcome 1: Enhanced capacity of KMUTT to lend sustainable support to the region	Output 1.1: Information hub established for disseminating and supporting the South-South technology transfer	<ul style="list-style-type: none"> - Information hub established - South-South technology transfer model developed 	KMUTT developed to serve as Ethanol clearing house	While an information hub is established, it does not appear to be created as a project component as the information is not focused on the participating countries
	Output 1.2: Ethanol technology package finalized for dissemination	VHG-SSF ethanol production technology developed as package	KMUTT's new ethanol production technology is developed for dissemination	The technology package is not yet ready for dissemination
	Output 1.3: Manuals, toolkits and structured training programs developed for technology transfer	<ul style="list-style-type: none"> - Technology training module developed - Training programs developed - Follow-up tools and procedures developed for monitoring 	Manuals, toolkits and training programs developed for technology transfer	Manuals, toolkits and training programs for technology transfer are not yet available
	Output 1.4: Database on ethanol technology developed and maintained by ethanol information hub	Database developed, tested, launched and operated	Ethanol database developed, operated and maintained	No ethanol database developed, operated and maintained though some general information is available on cassava
Components 2: South-South technology transfer: Capacity building and policy dialogue with participants from LMV				
Outcome 2: Conducive environment to promote bio-ethanol technology and strengthened policies to promote ethanol for	Output 2.1: Regional awareness created for the new technology package	<ul style="list-style-type: none"> - No. of regional workshops conducted in Thailand - No. of national workshops conducted in Thailand and Vietnam - No. of study tours organized 	Sufficient awareness created about the new technology	No awareness focused around the new technology. One focus group meeting held in August 2014, with exposure to traditional ethanol production plants
	Output 2.2: Trainings conducted in Thailand for farmers, entrepreneurs and technicians	<ul style="list-style-type: none"> - Training materials prepared - No. of farmers, entrepreneurs and technicians trained 	At least 150 farmers, 30 entrepreneurs and 30 technicians trained for the promotion of new ethanol production technology	No training offered so far
	Output 2.3: Trainings	- Training	At least 40	No training offered so

Project Outcome	Outputs	Indicator(s)	Target	Status at the time of evaluation
replacing conventional fuels	conducted in Thailand for engineers, scientists and researchers	materials prepared - No. of engineers, scientists and researchers trained	engineers, scientists and researchers trained for the promotion of new bio-ethanol production technology	far
	Output 2.4: Pricing practices and pricing environment improved	- Assessment report on policy needs - No. of experts trained in pricing and policy requirements for bio-ethanol - Policy intervention tools created	Adequate policy environment and pricing practices are in place	No concrete initiatives taken so far to address the issue and achieve the expected output
Components 3: Technology transfer, commercialization of the new technology and private sector development				
Outcome 3: Strengthened technological and technical cross-border cooperation and improved investment climate in Thailand and LMV	Output 3.1: A demonstration plant established in Thailand with ethanol production capacity of 200 liters/day	Capacity of the demonstration plant and operation of the plant	A 200 l/d demonstration project is implemented and operated in Thailand	No MoU signed so far for the demonstration plant
	Output 3.2: Training center established at FIRI to disseminate and provide training on the new technology package	- Training center established at FIRI - Operation of the training center - KMUTT Toolkits and manuals adjusted for local conditions	The center is established and operated sustainably	No activities initiated to establish the training center
	Output 3.3: A demonstration plant established in Vietnam with ethanol production capacity of 50 l/d	Capacity of the demonstration plant and operation of the plant	A 50 l/d demonstration project is implemented and operated in Vietnam	No activity has been started in this regard
	Output 3.4: Financing opportunities improved to finance the new technology	Percentage increase in financing for new ethanol technology by the financing institutions	Financial institutions ready to finance the new bio-ethanol production technology	A very general study on the banking sector has been conducted, with limited relevance to the project
	Output 3.5: Private sector assisted in project development for replicating the project	- No. of interested entities identified - At least 5 replication projects developed in Thailand and LMV countries	Interested private project developers identified and at least 5 replicable projects developed	2-3 private project developers identified in Thailand and Vietnam with interest to adopt the new improved ethanol production process

Project Outcome	Outputs	Indicator(s)	Target	Status at the time of evaluation
	Output 3.6: Bio-ethanol production technology commercialized with the establishment of 400,000 l/d plant in Myanmar	Capacity of the commercial plant and its operation in Myanmar	The project implemented and operated in Myanmar	The potential investor has backed out due to the absence of transparent policy and incentives for bio-ethanol in Myanmar
	Output 3.7: Demonstration projects evaluated, lessons learned and information widely disseminated	<ul style="list-style-type: none"> - Plant performance study reports - Full Scale Demonstration site visits and seminars - Dissemination leaflets - Website 	Performance assessment report, Full scale demonstration site visits and seminar, website and project leaflet	Too early to carry out this activity

As it can be seen in the above table, no real outcomes from the project have been attained and the project activities have so far not resulted in sufficient outputs and outcomes commensurate with the project objectives. Though some activities have been initiated, none have progressed sufficiently to achieve the planned outputs that may lead to the expected outcomes. One of the main reasons for this appears to be *the quality of the work plan itself and the inadequate tracking and monitoring of project performance with respect to each project activity and output, time-bound achievement of project milestones, and progress towards the attainment of the set project outputs.*

As far as the outcome 3 is concerned, based on the project performance so far and the feedback received from the private sector, the project would not result in the realization of some of the planned outputs. For example, during the discussion held with the existing ethanol producers in Thailand and Vietnam, it was evident that *when government policies are conducive, a private player would need typically 3 years for setting up an ethanol production facility, considering the time needed to conduct a complete feasibility study that includes the sourcing of raw materials, concluding the financial agreement, placing order for the plant, preparing the infrastructure and commissioning the production facility.* So it would be premature to expect that the plants will be operational within the project lifetime in the absence of any national policy environment and incentive mechanisms needed to address the international oil price uncertainties.

Moreover, some of the outputs may not be that relevant for achieving the expected outcome. For example, while the proposed pilot plants in Thailand and Vietnam are supposed to showcase the improved ethanol production technology, it should be kept in mind that the plant adopting such technique needs to also be equipped to operate as a conventional ethanol production unit as fresh cassava would not be available as raw material throughout the year. *Moreover, as the technology developed by KMUTT at the laboratory scale has not been adopted and its cost-effective performance confirmed at the industrial level, it would be more appropriate to first showcase the improved technique in an existing ethanol producing plant in Thailand for imparting confidence to potential adopters of the improved ethanol production technique in the neighboring countries.*

There is another important point that needs to take into consideration. The life cycle analysis of ethanol production and CO₂ emission shows that *the improved productivity of cassava root production would help to reduce the emission by 50.06 ton CO₂ per 100,000 liter of ethanol whereas the improved fermentation process in bio-ethanol production would contribute to only 11.87 ton CO₂ per 100,000 liters of ethanol.* Moreover, improved farm productivity would also help to increase the income of the farmer and bring down the cost of raw materials needed for ethanol production, thus enhancing its competitiveness. Hence it would seem *more relevant to draw attention to the importance of improved productivity of cassava roots in the project component 3 involving technology transfer, commercialization of the new technology and private sector development.*

As the activities done so far are rather limited, the stakeholders are not in a position to judge the quality of outputs. During the mid-term review, stakeholders from Lao PDR and Vietnam expressed their wish to be more actively engaged in the project. So it goes without saying that the results achieved so far have not made any tangible impacts on the assisted institutions.

As far as the potential longer-term impacts are concerned, the Thai experience shows that there are *4 key success factors for the promotion of bioethanol from cassava, namely clarity and consistency in policy, pricing transparency across the value chain, getting all key stakeholders on board, and ensuring the availability of raw material for ethanol production.* The impacts to be reported in future could be based on the assessment of these 4 key success factors in Thailand's neighboring countries. Hence *the catalytic or replication action that the project could carry out would be ensuring that these success factors are replicated* by taking the local specificities into consideration.

The two critical aspects to consider for achieving potential long-term impacts are: **(1) an improved policy environment that is all-inclusive, in order to result in win-win solutions covering all stakeholders;** **(2) Pricing practices that are revenue neutral to get wider acceptance by adopting "polluter payer" principles.** Impacts should therefore be recorded such that they indicate how the different stakeholders are benefitting well from the project outcomes.

Considering that none of the project output has been delivered so far in the project, by taking into consideration the delay in initiating the project activities due to reasons beyond the control of UNIDO, the Project effectiveness is not satisfactory at the time of the mid-term review. As mentioned earlier, there is a need to bring changes in the PRF by taking into consideration the remaining budget and time for the completion of the project. The PMU needs to work more actively with the main executing partner as well as the other national stakeholders to ensure that the planned outputs are delivered in a timely manner and within the available budget

Efficiency

In order to assess the efficiency of the project, the progress reports were analyzed. These reports do not unfortunately indicate precisely the progress of the project against the planned time line of targets. Table 6 showed the status of the project at the time of the mid-term review. It is evident that the project has not produced the results (outputs and outcomes) within the expected time frame, thus affecting the project's cost-effectiveness.

Table 7 presents the overall project cost and the financing as it was planned for in the project document, including co-financing that includes grant, soft loan, guarantee, in kind, cash, etc.

Table 7. Disbursement - overall cost and financing (including co-financing)

Project Components	GEF Financing (US\$)	Co-financing (US\$)	Total (US\$)
1. Institutional capacity strengthening for very VHG-SSF technology dissemination	330,500	1,187,000	1,517,500
2. South-South technology transfer: capacity building and policy dialogue with participants from Lao PDR, Myanmar and Vietnam	757,500	1,253,000	2,010,500
3. Demonstration and commercialization of the technology and private sector development	1,262,000	28,492,000	29,754,000
Project Management	250,000	691,000	941,000
TOTAL	2,600,000	31,623,000	34,223,000

Source: Project Document

In the Project document, the GEF financing was planned to be US\$ 2,600,000. At the time of the Mid-term review, the total Executed Budget (A Term for Disbursements in UNIDO SAP) of the GEF Grant as presented in the ToR was US\$1,282,617, as shown in Table 8.

Two sub-contracts were signed with the project partners KMUTT and MOIT, respectively. According to the sub-contract signed between UNIDO and KMUTT for a total amount of US\$1,225,000, about half of the amount has so far been disbursed by UNIDO in two installments. And according to the sub-contract signed between UNIDO and MOIT for a total amount of US\$40,000, only US\$12,000 has been disbursed upon the signing of contract but no concrete activities have been undertaken so far.

Table 8. UNIDO budget execution (GEF funding excluding agency support cost in USD)

Sponsored Class	Amount GEF Grant Execution (US\$)		
	Executed in 2013	Executed in 2014	Total Expenditure
1100 – International Experts	-	17,389.19	17,389.19
1500 – Project Travel	8,734.36	9,228.77	17,963.13
1700 – National Experts	11,628.25	12,012.17	23,640.42
2100 – Sub-contracts	380,000	827,419.97	1,207,419.97
3000 – Training/Fellowships/Study Tour			
3500 – International Meetings	5,460.41	8,493.92	13,954.33
4500 – Equipment			
5100 – Sundries	889.37	1,360.73	2,250.10
TOTAL	406,712	875,905	1,282,617

Source: ToR (as of 20/01/2015)

As for KMUTT, UNIDO was supposed to make a first installment for the period 15th November to 31st March 2014, worth US\$380,000 upon signing the contract. However, the contract was officially signed between UNIDO and KMUTT only in June 2014 after the submission of the Inception Report cum 1st Progress Report.

The second installment for the period 1st April to 31st December 2014, worth US\$239,000 was to be paid upon submission of a progress report on pilot plant construction, draft version of modules, a draft report containing information hub established for disseminating and supporting South-South technology transfer and a progress report containing summary of all

activities done during the contractual period. The second progress report was submitted at the end of June 2014, barely a month after the submission of the first report. In this report, it was mentioned that the blueprint of the ethanol plant was ready, the MoU of demonstration plant between KMUTT and the Thai Liquor Distillery Organization (TLDO) was signed, and the construction of the pilot plant was on-going. However, during the mid-term review mission, neither the blueprint nor the MoU was available, and during the field visit of the TLDO site, there was no trace of any construction work of the demonstration project. According to the contract, the second payment could be released upon the submission and approval of the draft version of modules for South-South technology transfer, training for farmers and training module for technicians and entrepreneurs. However, the second progress report only contained the topics and not the draft contents of the training modules. During the mid-term review mission conducted more than 8 months after the submission of the second progress report, the draft modules were still not available with KMUTT or UNIDO. Table 9 shows the planned budget for the work plan of the year 2015.

As far as the co-financing is concerned, the budget breakdown indicates the sourcing of the co-financing for the different project components but there are no details provided on the co-financing needed for the yearly operations. The effectiveness of project implementation is an important function of the co-financing as confirmed by the Project partners prior to its implementation. The actual amount of co-financing realized, as reported in the MTR, is presented in Table 10.

From Table 10, one can observe that the co-financing materialized so far accounts for a paltry 2.25% of the amount confirmed by the project partners. Since the private enterprise has declined to go ahead with the installation of the bio-ethanol plant in Myanmar, one can disregard the co-financing of US\$25 million confirmed for this activity. Even then, the co-financing materialized so far is only 10.26% of what was confirmed. Since the realization of Project Components 1 and 2 is heavily dependent on co-financing (the ratio of co-financing to GEF funding is of the order of 3 to 1), the project outcomes are going to be seriously jeopardized if the co-financing does not materialize in a timely manner. Here again, the work plan does not show clearly what type of co-financing is essential for each of the project's activities on a yearly basis. *In the absence of such a detailed work plan, it is difficult for the project management team to track and monitor the project performance accurately.*

Table 9. The planned budget for the work plan of the year 2015

Project's expected outputs	Responsible parties	Planned budget (US\$)
Component 1: Institutional capacity strengthening for VHG-SSF technology dissemination		88,000
Output 1.1 Information hub established for disseminating and supporting the South-South technology transfer	KMUTT	34,500
Output 1.2 Ethanol technology package finalized for dissemination	KMUTT	28,000
Output 1.3 Manuals, toolkits and structured training programs developed for technology transfer	KMUTT	9,800
Output 1.4 Database on ethanol technology developed and maintained by ethanol information hub	KMUTT	16,000

Project's expected outputs	Responsible parties	Planned budget (US\$)
Component 1: Institutional capacity strengthening for VHG-SSF technology dissemination		88,000
Output 1.1 Information hub established for disseminating and supporting the South-South technology transfer	KMUTT	34,500
Output 1.2 Ethanol technology package finalized for dissemination	KMUTT	28,000
Output 1.3 Manuals, toolkits and structured training programs developed for technology transfer	KMUTT	9,800
Output 1.4 Database on ethanol technology developed and maintained by ethanol information hub	KMUTT	16,000
Component 2: South-South technology transfer: Capacity building and policy dialogue with participants from LMV		237,000
Output 2.1 Regional awareness-raising for the technology package	UNIDO	29,000
Output 2.2 Training organized for at least 150 farmers, 30 technicians, 30 entrepreneurs from LMV on new technologies	KMUTT	107,000
Output 2.3 Training programs organized in Thailand, and at least total 40 engineers, researchers and scientists trained from LMV	KMUTT	26,000
Output 2.4 Improved pricing practices and policy environment	MOIT	75,000
Component 3: Demonstration, commercialization of the technology and private sector development		771,500
Output 3.1 A demonstration plant established in Thailand with ethanol production capacity of 200 l/d	KMUTT	297,500
Output 3.2 Training center established at FIRI	FIRI	32,000
Output 3.3 A demonstration plant established in Vietnam with ethanol production capacity of 50 l/d	UNIDO, KMUTT and FIRI	372,000
Output 3.6 Bio-ethanol production technology commercialized with the establishment of plant in Myanmar, proposed to add Cambodia, Lao PDR and other potential target countries	UNIDO	70,000
Component 4: Project management and support activities		50,500
Output 4.1 Project management structure established	UNIDO	30,000
Output 4.2 An M&E framework designed and implemented according to GEF M&E procedures		
TOTAL		1,147,000

Source: KMUTT

Table 10 Co-financing materialized until July 2014 versus the co-financing confirmed

Name of co-financier	Co-financing confirmed at the start		Co-financing materialized at mid-term	
	Cash (US\$)	In-kind (US\$)	Cash (US\$)	In-kind (US\$)
KMUTT, Thailand	758,000	2,612,000	160,061	458,240
LDO, Thailand	1,500,000	630,000		
MOIT, Vietnam		375,000		
FIRI, Vietnam	722,000	250,000		
KKS, Myanmar	25,000,000			
UNIDO	80,000	111,000		
IREP (MOEM), Lao PDR			30,500	73,700
TOTAL	28,060,000	3,978,000	190,561	531,940

Source: MTR, GEF FY2014

The fact that none of the project outputs has been achieved and very little co-financing has been realized so far in spite of engaging a substantial amount of GEF funds should be a matter of serious concern for the project management.

There is no concrete proof of coordination with other UNIDO and other donors' project, seeking to gain synergetic effects. For example, the project document mentions the Indochina Fund provided by Thailand for strengthening the technical capacity of a recipient country through South-South cooperation. UNIDO and its main executing partner have not approached the Thailand International Cooperation Agency (TICA) to support some of the training and capacity building activities.

Based on the information made available during the mid-term review, it appears that not enough efforts have been made by UNIDO as well as its main executing partner to ensure project's cost-effectiveness. It should also be a matter of concern that substantial amount of GEF funds have been engaged while only a very small share of the co-financing has materialized. The implementation period of the project will obviously have to be extended to take into consideration the delay in the starting of the project and further delays in achieving the expected outputs. *Unless the project is carefully managed and further co-financing materializes, the project outputs are likely to be seriously compromised.*

Assessment of sustainability of project outcomes

3.1.1 Financial risks

Since a substantial amount of GEF funds have been engaged while a limited amount of co-financing has materialized and none of the project outputs has been delivered, there are considerable financial risks that may jeopardize the sustainability of project outcomes. In the absence of a detailed work plan aligned with the budget as well as a poor tracking and monitoring mechanism in place, it appears that the project is too heavily dependent on GEF grant for carrying out the project activities. The project has not been very successful in identifying and co-financing needed for the successful completion of the expected outputs.

If one were to replicate the successful approach adopted by the Thai government in supporting the healthy growth of bio-ethanol as an alternative to fossil fuel, then the sustainability of project outcomes depends primarily on the policy and incentive measures adopted by the governments of the participating countries. **In the absence of strong government policy and incentives, there is little likelihood of the private sector investing in ethanol producing facilities or the farmers cultivating cassava for ethanol production.** Moreover, the revenue-neutral model adopted by the Thai Government for favoring the use of bio-ethanol shows that governments do not have to mobilize or divert financial resources for this purpose.

Unless this is understood and action is taken to share the experience of Thailand with the governments of the neighboring countries as a priority, there is strong likelihood that the financial risks will jeopardize sustainability of project outcomes.

Based on the mid-term review there are significant financial risks to the project's sustainability.

3.1.2 Sociopolitical risks

The governments of the countries participating in the project realize the importance of developing bio-ethanol as an alternative to fossil fuels. The project has the potential to assist

them in getting a good grasp of the key success factors that they need to adopt for the project outcomes to be sustained. However, *there is a lack of coordination among key government agencies in the formulation of policies and their effective implementation as well as the absence of some of the stakeholders who can have impact on improved farm productivity.*

The other key stakeholders are more likely to develop a strong sense of ownership in the project when the government sends the right signal about its earnestness to promote bio-ethanol sustainably.

Since the project activities have been rather limited, it has not been able to impress upon the various stakeholders that it is in their interest that project benefits continue to flow. As not much awareness activities have been undertaken, it is early to judge if there is sufficient public/stakeholder awareness in support of the project's long-term objectives.

Judging the status of the project at this stage, there is moderate likelihood of the project achieving socio-political sustainability.

3.1.3 Institutional framework and governance risks

The vision, policies and roadmaps that are being developed by the governments of Vietnam and Lao PDR show their concerns for addressing the critical issues and finding long-term solutions to lower the dependence on oil as transportation fuel. However, they seem to lack the legal framework, the governance structures and processes as well as the technical know-how to realize the benefits. The project was designed to address these issues by sharing the experience of Thailand in terms of accountability, transparency and technical know-how with its neighboring countries. However, based on the initiatives taken so far, there is no indication of the project having the expected impacts in sharing the Thai experience.

Hence, judging by the institutional framework and governance risks, and unless appropriate corrective measures are adopted, it is quite unlikely that the project outcomes would be sustained.

3.1.4 Environmental risks

Since two of the project outcomes lead to positive environmental benefits, namely abatement of CO₂ emissions and improvement in urban air quality, there are no environmental risks foreseen in the project which could affect its sustainability. Hence, one can conclude that the environmental sustainability is **Likely (L)** to be achieved.

Based on GEF evaluation policies and procedures, the overall rating for sustainability cannot be higher than the lowest rating for any of the individual components. Based on the assessment at the time of the mid-term review there are significant risks that are likely to affect the dimension of project sustainability.

Assessment of monitoring and evaluation systems and project management

This section assesses the M&E systems in place for the project. The M&E plan describes how the whole M&E system for the project works and includes the indicators who is

responsible for collecting them, what forms/tools will be used, and reporting schedules. The M&E plan includes the project results framework (or the logical framework), baseline reports, periodic reports, and other documentation such as minutes of meetings, documentation of activities etc.

M&E design

The project document mentions that project M&E will be carried out in accordance with established UNIDO and GEF guidance and procedure in order to ensure successful and quality implementation of the project. It would:

- Track and review the execution of the project activities and the actual accomplishments,
- Provide visibility into progress as the project proceeds so that corrective actions can be taken by the implementation team if performance deviates significantly from the original plans; and
- Adjust and update project strategy and implementation plan to reflect possible changes on the ground results achieved and the corrective actions taken.

The project document further states that a detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the Project Management Unit (PMU) and project partners at the beginning of project implementation and then will be updated periodically.

It was also stated that the project manager will take the responsibility to track and monitor the project. Budget was allocated for undertaking both mid-term and final evaluations.

Based on these facts, the M&E for this project seems to be well designed.

M&E plan implementation

The project document stated that a detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the Project Management Unit (PMU) and project partners at the beginning of project implementation and then will be updated periodically. However, this does not seem to have been the case in reality as there does not appear to be any project monitoring and supervision scheme adopted comprising SMART indicators to be used for the implementation of the M&E plan. The organizational set-up for M&E is not in operation and there is no timely tracking of progress towards project objectives as well as budgets being spent as planned. The Project Implementation Review (PIR) is **not very accurate and objective** as the rating is given not by UNIDO but its executing partner.

Moreover, there does not appear to be any comprehensive adaptive management strategy to cope with the delays in project timeline and delivery of outputs. As an example, while the construction of the demonstration plant in Thailand was considered a priority in the project, no concrete work had been initiated even at the time of mid-term review to make it a reality even after the sub-contract was signed and GEF funds were available for disbursement.

A work plan was developed by the key project partner, outlining the responsible parties, budgets and timeframes. However, this does not seem to have been set up in consultation with the other project partners. The timeframes proposed are not precise and there is no clear indications of the milestones to be achieved and the sequences of activities to be

undertaken to produce the outputs. Also, there is no detailed monitoring plan in place for tracking the project performance.

A couple of examples are cited here to corroborate this fact. A contract was signed with MOIT and the scope of the contracted service included hiring of an expert to document Thai campaign and come up with a roadmap to promote E5 in Vietnam. A good work plan would have taken into consideration the fact that the Vietnamese government was mandating the sale of E5 in 7 major cities by December 2014, hence the activities under this sub-contract should have been taken up in all earnestness before the enforcement of the government mandate in Vietnam. However, the signing of sub-contract was delayed and no initiatives have been taken so far for sharing the Thai experience with the Vietnamese counterpart. Another example is the disbursement of the second installment to KMUTT without proper verification of the deliveries as outlined in the sub-contract. **Proper M&E and regular update of more precise work plan could help in minimizing the delays in the execution of the project.**

Ironically there is no specific budget allocated for the M&E plan in the revised work plan for 2015 though the mid-term review was scheduled to be conducted in February 2015.

Budgeting and funding for M&E activities

The budget provided for M&E of US\$80,000 at the planning stage was sufficient. Budget has been made available for undertaking the mid-term review. As the mid-term review was intended to be internal and accordingly, the budget allocated for the mid-term review is limited to cover the cost of an international as well as a national evaluation consultant. The aspect of funding M&E is found to be satisfactory.

Monitoring of long-term changes

As the project implementation is at quite an early stage and no output has been delivered so far, it may be too early to comment on monitoring of long-term changes at this stage.

Assessment of processes affecting achievement of project results

3.1.5 Preparation and readiness

In hindsight, the project's objectives and components were not practicable and feasible within its time frame. Thailand's experience shows that it takes typically about 3 years for a private player to commission a bio-ethanol plant when all conditions are favorable and the government policies and incentive mechanisms are in place. It seems impractical to expect the two demonstration pilots to be completed in Thailand and Vietnam and commission the bio-ethanol plant in Myanmar, all within a span of 4 years.

While the co-financing was secured from the project partners, the project management unit (PMU) was not formally created to manage the project with the staffing needed to manage the project, as it was perceived in the project document (a national project coordinator using GEF resources, a project administrative assistant and a junior project administrative assistant using co-financing resources, project national experts and designated KMUTT persons). In reality, the project is managed by the Project National Officer as the Project Manager supported by a Project Assistant.

The capacities of the project executing institution were properly considered when the project was designed, however the executing institution decided not to take part in the project. As a result, a new executing partner was selected but not necessarily with the same stature and capacities as the initial executing institution.

The partnership arrangement was fairly well identified but not all key players were involved for suitably negotiating the roles and responsibilities. For example, the Thai experience highlighted the fact that a number of stakeholders had to come on board to be able to announce a coherent ethanol promotion policy. The Ministry of Energy of Thailand had to work closely with the Ministry of Agriculture and Ministry of Finance to ensure that cassava productivity could be improved and the revenue-neutral policy could be adopted by increasing taxes on oil products in order to extend incentive for the use of bio-ethanol. In the case of Lao PDR, the institutional partner involved in the project can neither make decision on the pricing of oil products nor mobilize suitable players for improving productivity of cassava root production. Similarly in Vietnam the institutional partner does not have any influence on how the cassava root productivity can be improved.

3.1.6 Country ownership / drivenness

As it has been pointed out earlier, the project concept is very much in line with the sectoral and developmental priorities and plans of the three participating countries. Initially Myanmar was also included as a participating country but later it was dropped as bio-ethanol did not form an important priority in the government policy.

Since the project has not made adequate progress, it is early to conclude if the project's outcomes will contribute to national priorities and plans, or to policy and regulatory frameworks.

So far, not all relevant country representatives from government and civil society have been involved in the project. Even the Project Steering Committee does not include some of the key stakeholders identified in the project document.

During the project formulation stage, UNIDO collaborated closely with NSTDA, a government institution which could mobilize the necessary government support for the project. However, the same cannot be said about KMUTT which substituted NSTDA as the project executing partner. KMUTT is fully committed to the successful implementation of the project but being an academic institution, does not have the same influence on other government organs. KMUTT has also confirmed an amount of co-financing which is comparable to what was confirmed by NSTDA at the project development stage.

3.1.7 Stakeholder involvement

While the project has involved some of the relevant stakeholders through information sharing and consultation, very little outreach and public awareness campaigns have been undertaken. Even the website dedicated to the project does not provide adequate visibility to the project.

The stakeholders involved in the project are quite limited. As there is no formal project management unit, there is no representation of the executing agency in project management. While the Project Steering Committee (PSC) is established to provide strategic guidance on the project implementation and facilitation of coordination of various government authorities, institutions and industry partners, the fact that a representative of the executing partner chairs the PSC does not serve the purpose well. In the absence of response from some of the potential members of the PSC, it was decided to remove their names in the list, thus reducing further the role some of these stakeholders could play to

facilitate the progress of the project. Moreover, the decision to conduct PSC meetings virtually using media such as Skype further erodes its effectiveness.

3.1.8 Financial planning

UNIDO is managing the overall project budget at its Head Quarters (HQ) and procuring all services required. UNIDO is also preparing and submitting the financial reports to the GEF in accordance with the established UNIDO rules and regulations and applicable GEF requirements.

The UNIDO office in Bangkok is not fully aware of the financial status of the project but interacts with the UNIDO HQ for the sub-contracting and timely flow of funds. UNIDO follows up with partners to update the co-financing contributions which are reported to GEF.

However, only aggregated data according to Budget Line are available from the GEF Grant as project disbursements as a whole.

The financial management details including disbursement as well as co-financing issues have been covered in an earlier section of this report.

In view of the budget engaged in relation to the non-accomplishment of outputs, and considering the low co-financing mobilized so far for the project activities, the financial planning needs to be scrutinized and improved considerably during the remaining project life.

3.1.9 UNIDO supervision and backstopping

UNIDO staff in Bangkok office are keeping track of the project performance and are regularly interacting with the main executing partner on a regular basis. But from the observations made regarding the tracking and monitoring of the project activities, it is evident that they have not able to identify problems in a timely manner and estimate their impacts on the overall project performance. In the **absence of a well structure project management unit, project work plan and M&E program**, they are unable to provide advice to the project and restructure the project when needed. As defined in the project document, UNIDO may consider establishing a stronger PMU consisting of a Project manager, recruited administrative staff, project national experts and designated KMUTT representatives.

A full-scale project with limited budget requires rigor in project execution and this can be assured when there is a suitable organizational structure to pursue all activities and intervene proactively in order to keep the project on track.

The project budget shows allocation of GEF fund for a full-time national coordinator but the project management unit is so far managed by the National Project Officer with support from only one staff at a junior level without experience of GEF project coordination and management.

The PMU needs to be strengthened by involving more people with responsibility instead of depending too much on the main executing partners for matter related to project supervision.

3.1.10 Co-financing and project outcomes and sustainability

As presented in Table 12, the level of co-financing actually realized is quite paltry compared to level of expected co-financing, without taking into considering the cash for the ethanol plant in Myanmar which will not materialize.

There are no constraints so far to carry out the project activities, largely depending on the GEF Funds. *However, considering the fact that none of the outputs has been delivered and*

there are many activities to be undertaken, lack of co-financing can become a major hurdle and affect the project sustainability. The Project team should therefore aggressively pursue to get the co-financing confirmed by the project partners and/or look for alternative sources of co-financing (*e.g. funding through TICA to cover the cost of training and capacity building in the framework of South-South cooperation*).

3.1.11 Delays and project outcomes and sustainability

The project has had to face considerable delay to get started due to the change of the main executing partner as well as political disturbances in the host country. After the project activities were started, the activities undertaken during 2014 have yet to deliver the required outputs and there are further delays in setting up the pilot demonstration plant. Such delays are undesirable and will adversely affect the project outcomes and sustainability.

UNIDO has already asked for and got an extension to the project completion date. However, unless the project work plan and budget are not carefully monitored and suitable action taken, the project outcomes are most likely to be affected.

3.1.12 Implementation approach

The implementation approach adopted by the project is similar to those adopted by UNIDO and other agencies. The approach of UNIDO is in line with its commitments to the Paris Declaration that has five dimensions – ownership, alignment, harmonization, managing for results and mutual accountability. By assessing the national goals and the key barriers to the development of bio-ethanol in the identified countries, UNIDO has aligned its efforts with partner countries' national development strategies and procedures.

Apart from the project's focus on South-South technology transfer, the project has adopted a holistic approach that includes policy, management, operations and financing. The project is designed to promote local ownership and capacity building of institutions as well as businesses as the rural population engaged in preparing feedstock for the industries.

UNIDO has, at the project designing stage, identified a number of risks for the project's sustainability and has foreseen suitable measures to address such risks. However, not all solutions proposed are convincing to tackle the barriers effectively. Secondly, the level of management for achieving results and the level of participation of the stakeholder are sub-optimal, thus hindering the delivery of the expected outcome of the project.

Project coordination and management

Based on the findings of the mid-term review, the project management and overall coordination mechanism has not been efficient and effective because of the over-dependence on the main executing partner for many of the activities, including the preparation of reports for GEF.

The number of project partners is quite limited. The roles and responsibilities of all Project partners have been identified from the beginning and outlined in the project design. However not many partners have so far been actively engaged in the project. UNIDO has signed sub-contracts only with two partners.

The sub-contract with the main partner was officially signed only in June 2014 after 2 years of official starting date of the project. As the mid-term review was conducted barely 8 months after the signing of main sub-contract and the number of activities conducted is limited, it is difficult to judge the project performance over such a limited time frame. However, some

anomalies that were highlighted earlier show that the UNIDO HQ and the Field Office based management, coordination, monitoring, quality control and technical inputs could have been better, helping to avoid some inordinate delays in the starting of some activities and delivery of some outputs. They could also have ensured that a more precise work plan is developed, prioritizing activities that are to be conducted first in order to take up some others in a sequence, keeping aside some activities which were not essential to be carried out in the early phase of the project, etc.

For example, as Vietnam was mandating the sale of E5 in 7 major cities by December 2014, UNIDO team should have ensured that the activities related to the transfer of Thai experience of campaigning for the promotion of ethanol sale should have been taken up as a priority instead of focusing on carrying out the study on the status, gap and needs of financial institutions in Lao PDR and Myanmar for them to provide finance investment on bioethanol production. There seem to be an error of judgment in deciding to pursue the possibility of setting up an ethanol plant in Myanmar where the government does not have any policy to support the development of bio-ethanol.

In the same vein, organization of the focused group meeting in the early phase of the project and wanting to sign terms of cooperation with the government agency from Lao PDR as well as private sector players is a little like *“putting the cart before the horse”*. During the evaluation mission meeting held with one of the private sector players in Vientiane, the director of the company was categorical about not taking any steps towards the setting up of bio-ethanol plant till the government came up with clear and transparent ethanol pricing policy. During the meeting held with the project partner from the Institute of Renewable Energy Promotion (under the Ministry of Energy and Mines of Lao PDR), the Deputy Director General expressed his frustration for not being able to do much because his ministry which was in charge of energy sector development did not have any mandate over the import and distribution of petroleum products in Lao PDR.

The PSC is supposed to be established with the participation of the key stakeholders with concrete mandate to ensure sustainability and coordination. The PSC is also expected to provide strategic guidance on the project implementation and facilitates the coordination of various Government authorities, institutions and the industries. However, the fact that the PSC is chaired by a representative from the main executing agency which is an academic institution does not warrant the legitimacy it merits.

The role of the Project Management Unit (PMU) is to manage the project implementation on a daily basis. Though the project document specified that the PMU would be headed by a project manager who will take the responsibility for monitoring the project performance with respect to each project activity and output and ensure that the overall project milestones are attained, this has not happened in reality as the PMU is too much dependent on the performance of the main executing agency.

Assessment of gender mainstreaming

Gender was not considered in the project design. However, it was noted that the project is well represented by women, both in the project management team as well as the team from KMUTT serving as the main executing partner.

Procurement issues

Since no procurement activities have been undertaken so far, the procurement issues are not considered for the mid-term review.

4 CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

Conclusions

Thailand has established a reputation in the region as a leader for ethanol promotion. The key success factors for Thailand's success can be attributed to: (1) clarity and consistency in policy; (2) pricing transparency across all value chains of ethanol production; (3) getting all key stakeholders on board; and (4) ensuring the availability of raw material for ethanol production. The UNIDO project document had tried to get inspiration from this experience in order not only to replicate the Thai experience but to further improve it by adopting a technology package that would allow to improve the farm productivity and the fermentation process, resulting in further reduction of GHG emissions.

The project document seems to have a few flaws. Firstly, too much importance is given to only one component of the technology package in the project components, i.e. improved fermentation process whose performance is yet to be tested and proven at the industrial scale in Thailand. Moreover, a careful observation leads to the conclusion that this particular process can only be considered as the **"icing on the cake"** as it would contribute to only 5.6% reduction of the GHG emissions expected from the overall technical package.

Another flaw in the project document is the assumption that the ethanol production can be sustained by providing assistance to the private sector without the need for dialogue with the government. For instance, in the case of Myanmar, it was decided that the project could mitigate regional cooperation risk by not cooperating with any government agencies since the private sector had shown interest in participating in the project and providing for the commercialization of the technology. This is in contradiction with the experience of Thailand where clarity and consistency in government policy and pricing transparency across all value chains of ethanol production have been key determinants to mobilize private sector involvement in ethanol production.

Yet another flaw is the inadequate involvement of all key partners of the concerned countries during the project development stage, which will hamper the smooth implementation of the project. In fact, "getting all stakeholders on board" is an important lesson learned from the success of Thailand's ethanol promotion program.

UNIDO project team needs to be applauded for its perseverance in reviving the project which had hit an impasse after the project approval by GEF in March 2012 because NSTDA, the Thai government institution which had collaborated with UNIDO to develop the proposal decided not to take up the project execution. Upon the invitation of UNIDO, KMUTT was gracious and generous in accepting to collaborate with UNIDO and co-financing the project. KMUTT started implementing the project activity after the 1st Project Steering Committee meeting held in December 2014 though the contract between UNIDO and KMUTT was officially signed in June 2014, more than 2 years after the GEF approval.

The project implementing team has not taken note of these flaws while implementing the project activities. Moreover, though the project document had suggested the development of a detailed work plan by UNIDO in collaboration with KMUTT, MOIT and a team of international experts, the actual work plan was quite poorly prepared without consultation with all stakeholders, not providing a clear picture of the sequence of activities to be undertaken and the major milestones to be achieved while keeping in mind the budget and time limitations. As a result, the project performance has been tracked and monitored inadequately with respect to each activity and output, time-bound achievement of project milestones and progress towards the attainment of the set project outputs. Unless the project work plan and budget are carefully monitored and suitable action taken, the project outcomes are most likely to be adversely affected.

Similarly, while the project document suggests the composition of the Project Management Unit and recognizes the important role it can play, these were not followed during the project execution. Likewise, while the project document states that the project M&E would be carried out in accordance with established UNIDO and GEF guidances and procedures, these have not been followed in reality. There is no project-monitoring scheme adopted comprising SMART indicators to be used for the implementation of the M&E plan. The organizational set up for the M&E is not in operation and there is no rigorous monitoring and timely tracking of progress towards project objectives as well as the budget being spent as planned.

There is no proper sequencing of the project activities to ensure the timely delivery of outputs. For example, no initiatives have been launched to address the policy environment and incentive mechanism for the sustainable production of ethanol whereas organizing focused group meeting in the early phase of the project and wanting to sign terms of cooperation with the government agency from Lao PDR as well as private sector players is a little like "*putting the cart before the horse*". Here again it is important to learn from the Thai experience which demonstrates how clarity and consistency in policy and pricing transparency are important to trigger the growth of ethanol business. Unless action is taken to share the Thai experience with governments of the neighboring countries as a priority, there is strong likelihood that the financial risks will jeopardize the sustainability of project outcomes.

Some of the outputs of the project may not be relevant for achieving the expected outcome. For example, the proposed pilot plants in Thailand and Vietnam are supposed to showcase the improved production technology. It should be kept in mind that the technology developed by KMUTT at the laboratory scale has no record of being adopted industrially and its cost-effective performance is yet to be confirmed. Hence it would be more appropriate to first showcase the improved technique in an existing ethanol plant in Thailand for imparting confidence to potential adopters of the improved ethanol production techniques in the neighboring countries.

Not enough efforts have been made by UNIDO as well as its main executing partner to ensure project's cost-effectiveness. As far as co-financing is concerned, the budget breakdown indicates the sourcing of the co-financing for the different project components but there are no details available on the co-financing needed for the yearly operations. The co-financing materialized at the time of mid-term review is a paltry 2.25% of the amount confirmed by the project partners. If one does not consider the large co-financing that was confirmed for the ethanol plant in Myanmar, the co-financing materialized represents barely 10.26% of what was confirmed. On the other hand, roughly half of the GEF Funds have

been engaged so far while all project activities undertaken so far have not resulted in the completion of any of the outputs that may lead to the expected outcomes.

The implementation period of the project will obviously have to be extended to take into consideration the delay in the starting of the project and further delays in achieving the expected outputs. *Unless the project is carefully managed and further co-financing materializes, the project outputs are likely to be seriously compromised.*

Finally, the role of the PSC as defined by the project document has been considerably compromised. It does not include some of the key stakeholders identified in the project document. While the PSC is established to provide strategic guidance on the project implementation and facilitation of coordination of various government authorities, institutions and industry partners, the fact that a representative of the executing partner chairs the PSC does not serve the purpose well.

In view of the above observations, there is an urgent need to revise the Project Results Framework so that one can realistically expect the completion of the planned outputs and the move towards the expected outcomes, taking into consideration the experiences from the past. For the successful implementation of the project, it is recommended to seek an extension of 6 more months for ensuring an effective and successful project execution. So UNIDO may request for an extension of the project completion up to the end of June 2017 while seeking additional co-financing to complement the GEF budget.

Recommendations

Based on the evaluation and findings of this report, a number of recommendations has been made to put the project back on course and ensure the achievement of the Project outputs and outcomes and the overall project objective of overcoming policy, market and technological barriers to support technical innovation and South-South technology transfer for the pilot case of ethanol production from cassava. The recommendation are structured by addressees as follows: UNIDO, PMU, PSC, KMUTT and the government organizations.

Recommendations to UNIDO:

1. Request GEF for an extension of project up to mid-July 2017 in view of the delays incurred, the project's under-performance till the mid-term review, and the need to restructure project management structure and review the activities to be undertaken to achieve the outputs in order to attain the outcome 3. This is crucial as the project budget will most likely be inadequate in the absence of committed co-financing.
2. Consider rectifying the flaws identified in the project document: (a) too much importance given to one component of the technology package; (b) attempting to assist the private sector for setting up ethanol production plants prior to evolving the policy and incentive mechanism at the institutional level; and (3) inadequate involvement of the main stakeholders from the beneficiary countries.
3. Create a formal PMU led by an experienced project manager/coordinator with full responsibility to continuously monitor the execution and performance of project activities and tracking of progress towards milestones. The PMU should include UNIDO staff from Hanoi and Vientiane who should be given more precise role to facilitate the mobilization and coordination of key national partners and two-way flow of information needed to project work plan on track.

4. Learning from the Thai experience, put high priority on ensuring government buy-in by anchoring activities within the national settings. Undertake vigorous exercise to initiate dialogue with national partners to identify the relevant stakeholders who should get on board so that the project can replicate the key success factors of ethanol promotion in Thailand. Invite these key national stakeholders to serve as members of the PSC.
5. Consult all partners to assess and reconfirm the co-financing that can be realistically expected. If necessary, explore the scope for expanding the source of co-financing (e.g. approach TICA to mobilize co-financing for training and capacity building activities).
6. Since the improved fermentation process to handle raw cassava is not yet tested and proven at the industrial scale and no funds have been used for the construction of the demonstration pilots, scrap the construction of the demonstration pilots in Thailand and Vietnam. Allocate some resources to support conducting detailed technical and financial feasibility of integrating the VHG-SSF process in the existing ethanol plants in Thailand and Vietnam that are willing to adopt the process into their existing production facilities operating with cassava chips as raw material. If the results of the feasibility studies are deemed attractive, provide some incentives (subject to availability of funds) to the ethanol plants so that they can incorporate the VHG-SSF process in their existing production lines. In return, ask the industries to share information on the performance of the VHG-SSF process with the project and other private players interested in investing in ethanol production (and agree to visits of the VHG-SSF processing unit).

Recommendations to PMU:

7. Once the stakeholders have been identified, with the assistance of an international expert supported by UNIDO, take the lead and collaborate with all project partners for developing a well-structured work plan closely linked with the budget and the expected outputs and outcomes for the remaining duration of the project. Ensure that the work plan reflects well the importance of conducting on priority basis some activities (creating environment for transparent policies and incentive mechanisms, improving farm productivity) that serve as pre-requisite for some other activities to be implemented in a sequential manner.
8. In addition to hiring international experts, mobilize key Thai players involved in formulating transparent policies and incentive mechanisms to hold high level policy dialogues with counterparts from Vietnam and Lao PDR on a priority basis to share the institutional experience and the success factors in promoting bio-ethanol (e.g. policies and pricing structures for promoting gasohol through revenue-neutral models).

Recommendations to PSC:

9. Review project implementation, to facilitate coordination among project stakeholders, to maintain transparency in ensuring ownership and to support the sustainability of the project. Nominate either the GEF Focal point (Operations) or a senior Thai official with experience of implementing the ethanol promotion program as the chair of the PSC.

Recommendations to KMUTT

10. Mobilize an international expert to assist in designing the ethanol information hub institutional structure and developing a model for South-South technology transfer. Revamp the project website to create better project visibility so that the project's activities, outputs and outcomes are shared widely in order to eventually contribute to scaling up of the project's achievements within and outside the project realms. Develop story lines to narrate the success story of Thailand and the stakeholders and factors that have contributed to this success. Keep the website more focused and up-to-date in order to serve the main goals of the project, thus sharing information related to all aspects for the promotion of ethanol from cassava as the raw material.
11. Engage an international expert to revise the structure of the training and capacity building modules, manuals and toolkits that are delivered in partnership with relevant Thai and Vietnamese partners (e.g. collaboration with the relevant ministries to share the experience with counterpart government representatives from other countries, collaboration with relevant government and private organizations such as TTDI to promote the improved productivity of cassava root, and collaborate with FIRI to develop the improved in-factory raw material management and improved fermentation process).
12. Collaborate with interested industries to carry out study to ascertain the technical and financial feasibility of adopting VHG-SSF process in existing ethanol production units in Thailand and Vietnam that have shown interest in this technology. If the results are positive, assist the same units to adopt the technology and monitor their performances for disseminating the results widely.
13. If it is necessary to provide training on the VHG-SSF process and its technical performance, consider upgrading the laboratory ethanol production set-up to incorporate changes so that the VHG-SSF process can be demonstrated at KMUTT.

Recommendations to Government Organizations

14. Take it upon yourselves to play a more pro-active role in the PSC to assess the project's progress in an objective manner and provide all assistance to overcome the hurdles faced in the execution of the project activities that hamper achieving the required outputs and outcomes.
15. Learn from Thailand's holistic approach to promote sustainability of bio-ethanol and mobilize all institutional players needed to achieve transparency in policy formulation and pricing of bio-ethanol by adopting revenue-neutral mechanism such that bio-ethanol remains competitive with gasoline at all times. Mobilize the right private and civil society partners to promote the improved productivity of cassava roots.

Lessons learned

Based on the findings of the mid-term review, a number of lessons can be learned that can be of high relevance for future projects with similar objectives.

1. Projects should be designed in a realistic manner and set goals that can be achieved satisfactorily within the time and budget limitations. The project underestimated the time needed for an industrial plant to be set in the context of countries where there is lack of policy and pricing incentives, poor access to information, technology is not yet mature.

2. The success of a project depends a lot on the extent of understanding, commitment and involvement of the key stakeholders. If a project is designed without prior consultation with concerned stakeholders, especially the institutions that have the power to mandate, they will be less inclined to get actively involved. Sharing information should not be equated to consultation.
3. Projects should take into consideration the fact that many a times doing activities to achieve time-bound outputs may not necessarily guarantee the sustainability of the initiative if one disregards the active participation of the key policy and decision makers. In the case of ethanol production, the State plays a crucial role in creating transparent policy environment and pricing incentive mechanisms that are a pre-requisite for the investment of the private sector. The private sector will rarely take the risk of making huge investment without getting the right policy and pricing signal from the government.
4. The emission reduction targets should be realistic, especially for those to be achieved within the project lifetime. The project activities should be planned commensurate with the level of emission reduction they can contribute to. The CO₂ emission analysis of the project showed that 70.8% of the CO₂ emission reduction would be achieved by switching from gasoline to ethanol produced from conventional SSF process, another 23.6% savings will be from the improved productivity of cassava roots and only 5.6% savings will be from the adoption of improved VHG-SSF process. However, considerable amount of human and financial resources were allocated for promoting the VHG-SSF process without ascertaining its techno-economic viability at the industrial scale.
5. The project document is “sacred” in the sense that the project is judged and approved on the basis of what is proposed in this document. Once approved, the project team should try and adhere as much as possible to whatever is proposed in the project document so as to achieve the expected outputs that can lead to the project outcomes. Any deviation from the project document needs to be discussed, debated and endorsed by the PSC before requesting/reporting the change to the donor. In this project, all that were proposed for the creation of PMU and PSC, and the development of work plan and M&E have not been adhered to, adversely affecting the project effectiveness and efficiency.
6. Where co-financing forms a significant component of the overall budget in the project, it plays a crucial role in the satisfactory completion of the project outputs. Hence, all efforts should be made to pursue the matter with the stakeholders who commit their co-financing during the submission of project proposal so that adequate funds are available for project execution. In any case, the level of co-financing should be tracked on a continuous basis so as to “cut the coat according to the cloth”: adapt the work plan and prioritize project activities according to the co-financing materialized.
7. Timely signing of contracts and disbursement of funds to project activities is critical in the successful implementation of the project and avoiding project delays. In the project, though KMUTT had agreed to substitute NSTDA in September 2013, it took more than 6 months for the formal contract to be signed and funds disbursed. This could have been better managed considering the fact that the starting of the project was already delayed by more than a year.
8. Learning from the past experience is essential for a better delivery of project outputs as one can learn what works and what does not. Though the project document highlights how Thailand’s experience can be shared with neighboring countries to overcome policy, market and technological barriers to sustainable ethanol development, the

project has not made adequate efforts to document and learn from the rich experience of Thailand.

9. Each organization should be assigned the role and responsibility in tune with the organization's capabilities and orientation. In the project, KMUTT volunteered to be the main executing partner to revive the project but as an academic institution, it has its strengths and weaknesses. Hence the project should not ask and expect KMUTT to take up activities or deliver outputs for which it is not geared to.
10. Project design should weigh the costs and benefits of making capital investment on some activities that will have limited impacts and will not be effective and sustainable. In the project, the demonstration pilots which are planned to be developed in Thailand and Vietnam will incur high costs and are not likely to be operated for long time because of the associated operational and maintenance costs (feedstock, human and energy resources needs for a plant that does not provide economies of scale).

Annex A: Terms of reference



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Terms of Reference

Independent Mid-term review of the UNIDO Project:

UNIDO Project Number: XX/THA/10/X03

UNIDO SAP ID: 100264

GEF Project Number: 4037

**Overcoming Policy, Market and Technological Barriers to Support Technical
Innovation and South-South Technology Transfer: The Pilot Case of Ethanol
Production from Cassava**

JANUARY/2015

CONTENTS:

I. PROJECT BACKGROUND AND OVERVIEW	3
II. SCOPE AND PURPOSE OF THE EVALUATION	4
III. EVALUATION APPROACH AND METHODOLOGY	4
IV. EVALUATION TEAM COMPOSITION	6
V. TIME SCHEDULE AND DELIVERABLES	6
VI. PROJECT EVALUATION PARAMETERS	6
VII. REPORTING	12
VIII. QUALITY ASSURANCE	14
Annex 1 - Outline of an In-Depth Project Evaluation Report	15
Annex 2 - Overall Ratings Table	18
Annex 3 - GEF Minimum Requirements for M&E	21
Annex 4 – Required Project Identification and Financial Data	22
Annex 5 – Job Descriptions	25
Annex 6 – Project Results Framework OR Project Logical Framework	29

I. Project background and overview

1. Project Summary

UNIDO's project "Overcoming policy, market and technological barriers to support technical innovation and south-south technology transfer: the pilot case of ethanol production from cassava" (SAP ID:100264), funded by GEF aims at overcoming policy, market and technological barriers to development of Renewable Energy (RE) in Thailand, Lao PDR, Myanmar and Vietnam. The project has three broad thematic components: Institutional capacity strengthening for Very High Gravity-Simultaneous Scarification and Fermentation (VHG-SSF) technology dissemination; South-South technology transfer: Capacity building and policy dialogue with participants from Lao PDR, Myanmar and Vietnam (LMV), demonstration and commercialization of the technology and private sector development.

The project is expected to demonstrate bio fuel technology through the development of two pilot scale ethanol production plants, one each at Thailand (200 l/d) and Vietnam (50 l/d). The project will also facilitate the establishment of one commercial scale ethanol production plant project of 400,000 l/d in Myanmar. In addition, an ethanol information hub at King Mongkut's University of Technology Thonburi (KMUTT), Thailand and a technical centre at Food Industries Research Institute (FIRI), Vietnam.

The project document was signed in March 2012 and according to the same, a mid-term review was envisaged to be carried out approximately two years after implementation start date.

2. Project Objective

The project goal is to reduce GHG emission in the ethanol production sector as well as increase the use of ethanol for fuel in Thailand and LMV countries. The project activity is to transfer VHG-SSF technology to LMV countries,

The project immediate objective is to remove barriers, and creating conducive environment for promoting ethanol technology and South-South technology transfer.

Output	Output indicators
1. Information hub established for disseminating and supporting the south-south technology transfer.	A centre in KMUTT Thailand has been established to promote Thailand to be a regional centre for cassava and ethanol production.
2. Ethanol technology package finalized for dissemination.	
3. Manuals, tool kits and structured training programs developed for	Detailed manual for ethanol production from cassava including raw material handling, feedstock preparation, hydrolysis and fermentation technology has been

Output	Output indicators
<p>technology transfer.</p> <p>4. Database on ethanol technology developed and maintained by ethanol information hub.</p> <p>5. Regional awareness created for the new technology package.</p> <p>6. Trainings conducted in Thailand for farmers, entrepreneurs, technicians, engineers, scientists and researchers.</p> <p>7. A demonstration plant established in Thailand with ethanol production capacity of 200 l/d as well as Vietnam with ethanol production capacity of 50 l/d capacity</p> <p>8. Training centre established at FIRI, Vietnam, to disseminate and provide trainings on the new technology package.</p> <p>9. Financing opportunities improved to finance the new technology.</p> <p>10. Private sector assisted in project development for replicating the projects.</p> <p>11. Bio-ethanol production technology commercialized with the establishment of 400,000 l/d plant in Myanmar.</p>	<p>drafted.</p> <p>The website: www.aseancassava.info has been launched by KMUTT as a database for ethanol production.</p> <p>The Focused Group Meeting was organized during 7-8 August 2014. Three private companies from Lao PDR and investor from Myanmar visited KMUTT Bang Kun Tien campus along with the site visit to Sap Thip's Bio-Ethanol production plant in Lopburi province.</p> <p>Curriculum outlines for farmers, technicians and entrepreneurs have been drafted for the training programme which will be organized around the 1st quarter of 2015. Also, tentative programme for researcher has been updated.</p> <p>MoU for pilot plant to be established at Bang Kla has been signed. Also, ToC between UNIDO and Lao's MoEM for the establishment of ethanol plant for commercialization has been discussed.</p> <p>An assessment of banking capacity on financing bioethanol production in Lao and Myanmar has been conducted.</p>

3. Project Implementation Arrangements

UNIDO as GEF's Executing Agency is responsible for implementing the project, the delivery of the planned outputs and achievement of the expected outcomes. UNIDO is executing the project in collaboration with KMUTT, FIRI, Liquid Distillery Organization (LDO) and the private sector stakeholders.

UNIDO is responsible for:

- The general management and monitoring of the project;
- Reporting on the project performance to the GEF;
- Procuring the international expertise needed for delivering the planned outputs under the three project components; and
- Managing, supervising and monitoring the work of the international teams and ensuring that the deliverables are technically sound and consistent with the project requirements.

A Project Management Unit (PMU) has been established within the UNIDO Regional Office, Bangkok. The PMU consist of a Project Manager (PM) and the Project Administrative Assistant (PAA). The responsibilities of PMU are as follows:

- Coordination of all project activities carried out by the national experts and other partners by having close association with the Ministry of Science and Technology, Thailand, Ministry of Industry and Trade, Vietnam, Ministry of Energy and Mining, Lao PDR;
- Day-to-day management, monitoring and evaluation of project activities as per planned project work; and
- Organization of the various seminars and trainings to be carried out under Project Components 1 and 2.

Since the implementation of the project, the PMU has received the necessary management and monitoring support from UNIDO and the monetary support from GEF and counterparts. A Project Steering Committee (PSC) has been established. This committee has been reviewing progress of project implementation, to facilitate co-ordination among project shareholders and to maintain transparency in ensuring ownership and to provide support for the sustainability of the project. The PSC has a balanced representation from key stakeholders including counterpart Ministries, public institutions and private sector representatives and UNIDO. The committee is chaired by the GEF Focal point (Operations) and meets twice a year.

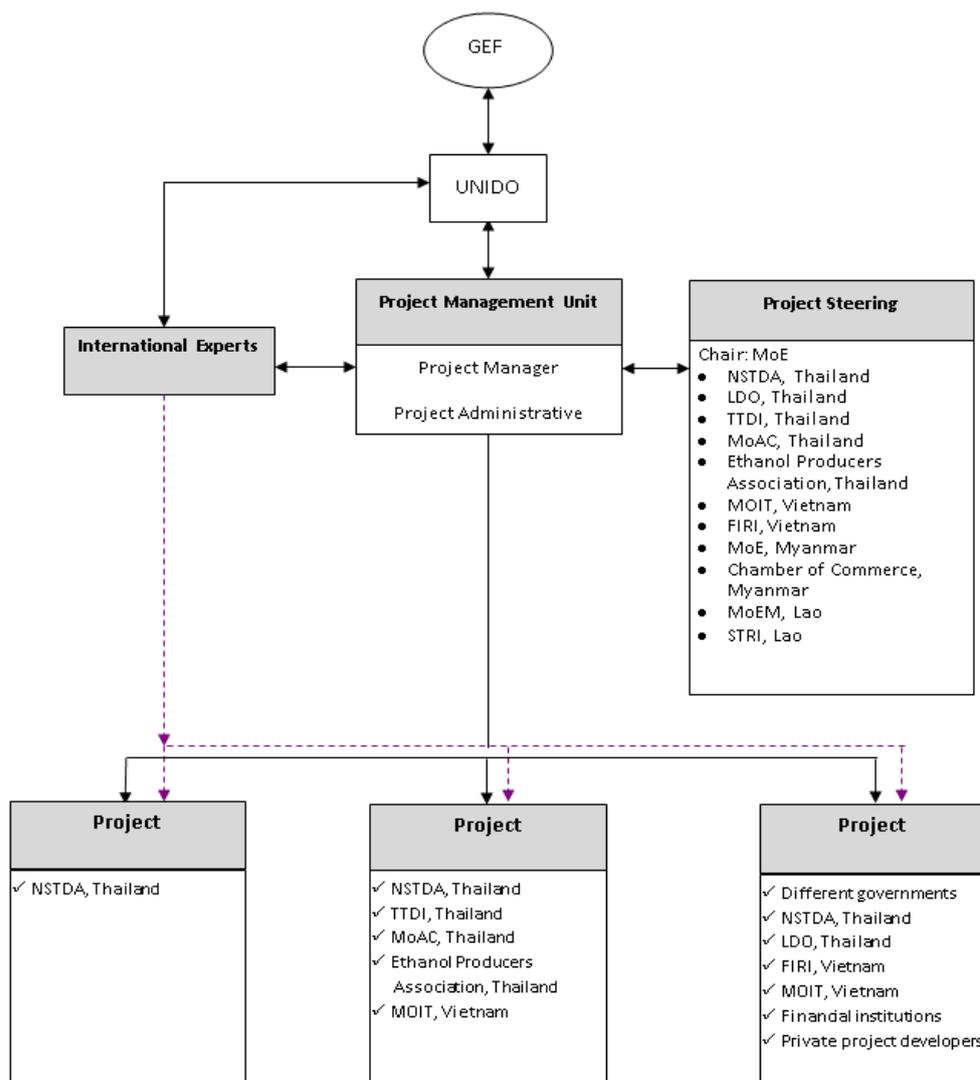


Figure 1: Diagram of project implementation arrangement

A detailed work plan for the entire duration of the project has been developed by UNIDO in collaboration with the PMU, State Governments and international teams of experts. The working plan is used as management and monitoring tool by PMU and UNIDO and it is to be reviewed and updated appropriately on a biannual basis. Figure 1 presents a summary of the project implementation

4. Budget Information

a) Overall cost and financing (including co-financing):

Project Components/Outcomes	Co-financing (\$)	GEF (\$)	Total (\$)
Institutional capacity strengthening for Very High Gravity-Simultaneous Saccharification and Fermentation (VHG-SSF) technology	1,187,000	330,500	1,517,500
South-South technology transfer: Capacity building and policy dialogue with participants from Lao PDR, Myanmar and Vietnam (LMV)	1,253,000	757,500	2,010,500

Demonstration and commercialization of the technology and private sector development	28,492,000	1,262,000	29,754,000
Project management	691,000	250,000	941,000
Total	31,623,000	2,600,000	34,223,000

b) UNIDO budget execution (GEF funding excluding agency support cost in USD):

Budget line	Item	EXECUTED BUDGET in 2013	EXECUTED BUDGET in 2014	Total Expenditure
1100	International consultants	-	17,389.19	17,389.19
1500	Project related travels	8,734.36	9,228.77	17,963.13
1700	National short time consultants	11,628.25	12,012.17	23,640.42
2100	Sub contracts	380,000.00	827,419.97	1,207,419.97
3500	International meetings	5,460.41	8,493.92	13,954.33
5100	Sundries	889.37	1,360.73	2,250.10
	Total	406,712	875,905	1,282,617

(as of 20/01/2015)

II. Scope and purpose of the evaluation

The mid-term review will cover the duration of the project from its starting date in June 2012 to the estimated mid-term review date February 2015. It will assess project performance and progress against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The evaluation team should provide an analysis of the attainment of the main objective and specific objectives under the three core project components. Through its assessments, the evaluation team should enable the Government, counterparts, the GEF, UNIDO and other stakeholders and donors to:

- (a) 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 includes re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters defined in chapter VI.

- (b) Enhance project relevance, effectiveness, efficiency and sustainability by proposing a set of recommendations with a view to ongoing and future activities until the end of project implementation.

The key question of the mid-term review is to what extent the project is achieving the expected results at the time of the mid-term review, i.e. to what extent the project has removed barriers, and creating conducive environment for promoting ethanol technology(bio-fuel) and South-South technology transfer in LMV.

III. Evaluation approach and methodology

The mid-term review will be conducted in accordance with the UNIDO Evaluation Policy, the UNIDO Guidelines for the Technical Cooperation Programmes and Projects, the GEF's 2008 Guidelines for Implementing and Executing Agencies to Conduct Terminal Evaluations, the GEF Monitoring and Evaluation Policy from 2010 and the Recommended Minimum Fiduciary Standards for GEF Implementing and Executing Agencies.

It will be carried out as an independent in-depth evaluation using a participatory approach whereby all key parties associated with the project are kept informed and regularly consulted throughout the evaluation. The evaluation team leader will liaise with the Project Manager on the conduct of the evaluation and methodological issues.

The evaluation team will be required to use different methods to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information, based on diverse sources: desk studies and literature review, statistical analysis, individual interviews, focus group meetings, surveys and direct observation. This approach will not only enable the evaluation to assess causality through quantitative means but also to provide reasons for why certain results were achieved or not and to triangulate information for higher reliability of findings. The concrete mixed methodological approach will be described in the inception report.

The evaluation team will develop interview guidelines. Field interviews can take place either in the form of focus-group discussions or one-to-one consultations.

The methodology will be based on the following:

1. A desk review of project documents including, but not limited to:
 - The original project document, monitoring reports (such as progress and financial reports to UNIDO and GEF annual Project Implementation Review (PIR) reports), output reports (case studies, action plans, sub-regional strategies, etc.) and relevant correspondence.
 - Notes from the meetings of committees involved in the project (e.g. approval and steering committees).
2. Other project-related material produced by the project.
3. The evaluation team will use available models of (or reconstruct if necessary) theory of change for the different types of intervention (enabling, capacity,

investment, demonstration). The validity of the theory of change will be examined through specific questions in interviews and possibly through a survey of stakeholders.

4. Counterfactual information: In those cases where baseline information for relevant indicators is not available the evaluation team will aim at establishing a proxy-baseline through recall and secondary information.
5. Interviews with project management and technical support including staff and management at UNIDO HQ and in the field and – if necessary - staff associated with the project's financial administration and procurement.
6. Interviews with project partners including Government counterparts, GEF focal points and partners that have been selected for co-financing as shown in the corresponding sections of the project documents.
7. On-site observation of results achieved in demonstration projects, including interviews of actual and potential beneficiaries of improved technologies.
8. Interviews and telephone interviews with intended users for the project outputs and other stakeholders involved with this project. The evaluator shall determine whether to seek additional information and opinions from representatives of any donor agencies or other organizations.
9. Interviews with the relevant UNIDO Country Office and the project's management and Project Steering Committee (PSC) members and the various national and sub-regional authorities dealing with project activities as necessary. If deemed necessary, the evaluator shall also gain broader perspectives from discussions with relevant GEF Secretariat staff.
10. Other interviews, surveys or document reviews as deemed necessary by the evaluator and/or UNIDO EVA.
11. The inception report will provide details on the methodology used by the evaluation team and include an evaluation matrix.

IV. Evaluation team composition

The evaluation team will be composed of one international evaluation consultant acting as a team leader and one national evaluation consultant.

The evaluation team should be able to provide information relevant for follow-up studies, including evaluation verification on request to the GEF partnership up to two years after completion of the evaluation.

Both consultants will be contracted by UNIDO. The tasks of each team member are specified in the job descriptions attached to these terms of reference.

Members of the evaluation team must not have been directly involved in the design and/or implementation of the programme/projects.

The Project Manager at UNIDO and the stakeholders will support the evaluation team. The UNIDO GEF Coordinator will be briefed on the evaluation and equally provide support to its conduct. The UNIDO GEF Coordinator will be briefed on the evaluation.

V. Time schedule and deliverables

The mid-term review is scheduled to take place in the period from February 2015 to March 2015. The field mission is planned for February 2015. At the end of the field mission, there will be a presentation of the preliminary findings for all stakeholders involved in this project in Thailand.

After the field mission, the evaluation team leader will come to UNIDO HQ for debriefing. The draft mid-term review report will be submitted 4-6 weeks after the end of the mission.

VI. Project evaluation parameters

The evaluation team will rate the projects. The ***ratings for the parameters described in the following sub-chapters A to J will be presented in the form of a table*** with each of the categories rated separately and with **brief justifications for the rating** based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in Annexes 1 and 2.

A. Project design

The evaluation will examine the extent to which:

- The project's design is adequate to address the problems at hand;
- A participatory project identification process was instrumental in selecting problem areas and national counterparts;
- The project has a clear thematically focused development objective, the attainment of which can be determined by a set of verifiable indicators;
- The project was formulated based on the logical framework (project results framework) approach;
- The project was formulated with the participation of national counterpart and/or target beneficiaries; and
- Relevant country representatives (from government, industries and civil society) have been appropriately involved and were participating in the identification of critical problem areas and the development of technical cooperation strategies.

B. Project relevance

The evaluation will examine the extent to which the project is relevant to the:

- National development and environmental priorities and strategies of the participating Governments and population of LMV and regional and international agreements. See possible evaluation questions under "Country ownership/driveness" below.
- Target groups: relevance of the project's objectives, outcomes and outputs to the different target groups of the interventions (e.g. companies, civil society, beneficiaries of capacity building and training, etc.).

- GEF's focal areas/operational programme strategies: In retrospect, were the project's outcomes consistent with the focal areas/operational program strategies of GEF? Ascertain the likely nature and significance of the contribution of the project outcomes to the wider portfolio of GEF's Focal area of Climate Change, and Operational Program SP3: "Promoting market approaches to renewable energy".
- UNIDO's thematic priorities: Were they in line with UNIDO's mandate, objectives and outcomes defined in the Programme & Budget and core competencies?
- Does the project remain relevant taking into account the changing environment? Is there a need to reformulate the project design and the project results framework given changes in the country and operational context?

C. Effectiveness: objectives and planned final results at the end of the project

- The evaluation will assess to what extent results at various levels, including outcomes, have been achieved. In detail, the following issues will be assessed: To what extent have the expected outputs, outcomes and long-term objectives been achieved or are likely to be achieved? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
- Are the project outcomes commensurate with the original or modified project objectives? If the original or modified expected results are merely outputs/inputs, the evaluators should assess if there were any real outcomes of the project and, if there were, determine whether these are commensurate with realistic expectations from the project.
- How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually reached?
- What outputs and outcomes has the project achieved so far (both qualitative and quantitative results)? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
- Identify actual and/or potential longer-term impacts or at least indicate the steps taken to assess these (see also below "monitoring of long term changes"). Wherever possible, evaluators should indicate how findings on impacts will be reported in future.
- Describe any catalytic or replication effects: the evaluation will describe any catalytic or replication effect both within and outside the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the project's catalytic role.

D. Efficiency

The extent to which:

- The project cost was effective? Was the project using the least cost options?
- Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that for similar projects. Are the project's activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?
- Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet requirements? Was the quality of UNIDO inputs and services as planned and timely?
- Was there coordination with other UNIDO and other donors' projects, and did possible synergy effects happen?

E. Assessment of sustainability of project outcomes

Sustainability is understood as the likelihood of continued benefits after the GEF project ends. Assessment of sustainability of outcomes will be given special attention but also technical, financial and organization sustainability will be reviewed. This assessment should explain how the risks to project outcomes will affect continuation of benefits after the GEF project ends. It will include both exogenous and endogenous risks. The following four dimensions or aspects of risks to sustainability will be addressed:

✓ **Financial risks**

- Are there any financial risks that may jeopardize sustainability of project outcomes?
- What is the likelihood of financial and economic resources not being available once GEF assistance ends? (Such resources can be from multiple sources, such as the public and private sectors or income-generating activities; these can also include trends that indicate the likelihood that, in future, there will be adequate financial resources for sustaining project outcomes.)
- Was the project successful in identifying and leveraging co-financing?

✓ **Sociopolitical risks**

- Are there any social or political risks that may jeopardize 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 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 sustainability of project outcomes?
 - Are there any environmental factors, positive or negative, that can influence the future flow of project benefits?
 - Are there any project outputs or higher level results that are likely to affect the environment, which, in turn, might affect sustainability of project benefits?
 - The evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.

F. Assessment of monitoring and evaluation systems

✓ **M&E design**

- Did the project have an M&E plan to monitor results and track progress towards achieving project objectives?
- The Evaluation will assess whether the project met the minimum requirements for the application of the Project M&E plan (see Annex 3).

✓ **M&E plan implementation.**

The evaluation should verify that a M&E system was in place and facilitated timely tracking of progress toward project objectives by collecting information on chosen indicators continually throughout the project implementation period; annual project reports were complete and accurate, with well-justified ratings; the information provided by the M&E system was used during the project to improve performance and to adapt to changing needs; and the project had an M&E system in place with proper training for parties responsible for M&E activities to ensure that data will continue to be collected and used after project closure. Were monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impacts? Are there any annual work plans? Was any steering or advisory mechanism put in place? Did reporting and performance reviews take place regularly?

✓ **Budgeting and Funding for M&E activities.**

In addition to incorporating information on funding for M&E while assessing M&E design, the evaluators will determine whether M&E was sufficiently budgeted for at the project planning stage and whether M&E was adequately funded and in a timely manner during implementation.

G. Monitoring of long-term changes

The monitoring and evaluation of long-term changes is often incorporated in GEF-supported projects as a separate component and may include determination of environmental baselines; specification of indicators; and provisioning of equipment and capacity building for data gathering, analysis, and use. This section of the evaluation report will describe project actions and accomplishments toward establishing a long-term monitoring system. The review will address the following questions:

- Did this project contribute to the establishment of a long-term monitoring system?
- If it did not, should the project have included such a component?
- What were the accomplishments and shortcomings in establishment of this system?
- Is the system sustainable—that is, is it embedded in a proper institutional structure and does it have financing?
- How likely is it that this system continues operating upon project completion?
- Is the information generated by this system being used as originally intended?

H. Assessment of processes affecting achievement of project results

Among other factors, when relevant, the evaluation will consider a number of issues affecting project implementation and attainment of project results. The assessment of these issues can be integrated into the analyses of project design, relevance, effectiveness, efficiency, sustainability and management as the evaluators find them fit (it is not necessary, however it is possible to have a separate chapter on these aspects in the evaluation report). The evaluation will consider, but need not be limited to, the following issues that may have affected project implementation and achievement of project results:

a. Preparation and readiness / Quality at entry.

- Were the project's objectives and components clear, practicable, and feasible within its time frame?
- Were counterpart resources (funding, staff, and facilities), and adequate project management arrangements in place at project entry?
- Were the capacities of executing institution and counterparts properly considered when the project was designed?
- Were lessons from other relevant projects properly incorporated in the project design?
- Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project approval?

b. Country ownership/drivenness.

- Was the project concept in line with the sectoral and development priorities and plans of the country—or of participating countries, in the case of multi-country projects?

- Are project outcomes contributing to national development priorities and plans?
- Were the relevant country representatives from government and civil society involved in the project?
- Did the recipient government maintain its financial commitment to the project?
- Has the government—or governments in the case of multi-country projects—approved policies or regulatory frameworks in line with the project’s objectives?

c. Stakeholder involvement.

- Did the project involve the relevant stakeholders through information sharing and consultation?
- Did the project implement appropriate outreach and public awareness campaigns? Were the relevant vulnerable groups and powerful supporters and opponents of the processes properly involved?
- Which stakeholders were involved in the project (i.e. NGOs, private sector, other UN Agencies etc.) and what were their immediate tasks?
- Did the project consult with and make use of the skills, experience, and knowledge of the appropriate government entities, nongovernmental organizations, community groups, private sector entities, local governments, and academic institutions in the design, implementation, and evaluation of project activities?
- Were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process taken into account while taking decisions?
- Were the relevant vulnerable groups and the powerful, the supporters and the opponents, of the processes properly involved?

d. Financial planning

- Did the project have appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds?
- Was there due diligence in the management of funds and financial audits? Did promised co-financing materialize?
- Specifically, the evaluation should also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co- financing.

e. UNIDO's supervision and backstopping

- Did UNIDO staff identify problems in a timely fashion and accurately estimate their seriousness?
- Did UNIDO staff provide quality support and advice to the project, approve modifications in time, and restructure the project when needed?
- Did UNIDO provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?

f. Co-financing and project outcomes and sustainability.

- If there was a difference in the level of expected co-financing and the co-financing actually realized, what were the reasons for the variance?
- Did the extent of materialization of co-financing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?

g. Delays and project outcomes and sustainability.

- If there were delays in project implementation and completion, what were the reasons? Did the delays affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?

h. Implementation approach¹.

- Is the implementation approach chosen different from other implementation approaches applied by UNIDO and other agencies?
- Does the approach comply with the principles of the Paris Declaration?
- Does the approach promote local ownership and capacity building?
- Does the approach involve significant risks?

The evaluation team will rate the project performance as required by the GEF. The ratings will be given to four criteria: Project Results, Sustainability, Monitoring and Evaluation, and UNIDO related issues as specified in annex 2. The ratings will be presented in a table with each of the categories rated separately and with brief justifications for the rating based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in the same annex. As per the GEF's requirements, the report should also provide information on project identification, time frame, actual expenditures, and co-financing in the format in Annex 4, which is modeled after the GEF's project identification form (PIF).

¹ Implementation approach refers to the concrete manifestation of cooperation between UNIDO, Government counterparts and local implementing partners. Usually POPs projects apply a combination of agency execution (direct provision of services by UNIDO) with elements of national execution through sub-contracts.

I. Project coordination and management

The extent to which:

- 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 and Field Office based management, coordination, monitoring, quality control and technical inputs have been efficient, timely and effective (problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits...)?
- The national management and overall coordination mechanisms were efficient and effective?
- Did each partner have specific roles and responsibilities from the beginning till the end?
- 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...)?
- Were the UNIDO HQ based management, coordination, quality control and technical inputs efficient, timely and effective (problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits...)?

J. Assessment of gender mainstreaming

The evaluation will consider, but need not be limited to, the following issues that may have affected gender mainstreaming in the project:

To which extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions?

K. Procurement issues

The following evaluation questions that will feed in the Thematic Evaluation on Procurement have been developed and would be included as applicable in all projects (for reference, please see Annex 7 of the ToR: UNIDO Procurement Process):

- To what extent does the process provide adequate treatment to different types of procurement (e.g. by value, by category, by exception...)
- Was the procurement timely? How long the procurement process takes (e.g. by value, by category, by exception...)

- Did the good/item(s) arrive as planned or scheduled? If no, how long were the times gained or delays. If delay, what was the reason(s)?
- Were the procured good(s) acquired at a reasonable price?
- To what extent were the procured goods of the expected/needed quality and quantity?
- Were the transportation costs reasonable and within budget. If no, please elaborate.
- Was the freight forwarding timely and within budget? If no, please elaborate.
- Who was responsible for the customs clearance? UNIDO FO? UNDP? Government? Other?
- Was the customs clearance handled professionally and in a timely manner? How many days did it take?
- How long time did it take to get approval from the government on import duty exemption?
- Which were the main bottlenecks / issues in the procurement process?
- Which good practices have been identified?
- To what extent roles and responsibilities of the different stakeholders in the different procurement stages are established, adequate and clear?
- To what extent there is an adequate segregation of duties across the procurement process and between the different roles and stakeholders?

VII. Reporting

Inception report

This Terms of Reference 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). 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 timetable².

² The evaluator will be provided with a Guide on how to prepare an evaluation inception report prepared by the UNIDO Evaluation Group.

Evaluation report format and review procedures

The draft report will be delivered to UNIDO EVA (the suggested report outline is in Annex 1) 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 the Project Manager 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 mid-term review report.

The evaluation team 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 in Thailand and at HQ after the field mission.

The mid-term review 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 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 1.

Evaluation work plan

The “Evaluation Work Plan” includes the following main products:

Desk review, briefing by project manager and development of methodology: Following the receipt of all relevant documents, and consultation with the Project Manager about the documentation, including reaching an agreement on the Methodology, the desk review could be completed.

Inception report: At the time for departure to the field mission, the complete gamete of received materials have been reviewed and consolidated into the Inception report.

Field mission: The principal responsibility for managing this evaluation lies with UNIDO. It will be responsible for liaising with the project team to set up the stakeholder interviews, arrange the field missions, coordinate with the Government. At the end of the field mission, there will be a presentation of preliminary findings to the key stakeholders in the country where the project was implemented.

Preliminary findings from the field mission: Following the field mission, the main findings, conclusions and recommendations would be prepared and presented in the field and at UNIDO Headquarters.

A draft Mid-term review report will be forwarded electronically to the Project Manager, who will forward the same to the Evaluation Group and circulated to main stakeholders.

A final Mid-term review report will incorporate comments received.

VIII. Quality assurance

The Project Manager (PM) will be responsible for managing the evaluation, preparing the terms of reference (TOR) and the job description (JD) of the evaluation consultant(s) on the basis of guidance of UNIDO's evaluation group (ODG/EVA). The PM will forward drafts and final reports to ODG/EVA for review, distribute drafts and final reports to stakeholders (upon review by ODG/EVA), and organize presentations of preliminary evaluation findings which serve to generate feedback on and discussion of evaluation findings and recommendations at UNIDO HQ. Finally, the PM will be responsible for the submission of the final Mid-term review Report.

Annex 1 - 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 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. Countries and project background

- Brief countries 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 project³ 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. Design
- B. Relevance (Report on the relevance of project towards countries and beneficiaries)
- C. Effectiveness (The extent to which the development intervention's objectives and deliverables were achieved, or are expected to be achieved, taking into account their relative importance)

³ 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.)

- D. Efficiency (Report on the overall cost-benefit of the project and partner Countries contribution to the achievement of project objectives)
- E. Sustainability of Project Outcomes (Report on the risks and vulnerability of the project, considering the likely effects of sociopolitical and institutional changes in partner countries, and its impact on continuation of benefits after the GEF project ends, specifically the financial, sociopolitical, institutional framework and governance, and environmental risks)
- F. Assessment of monitoring and evaluation systems (Report on M&E design, M&E plan implementation, and Budgeting and funding for M&E activities)
- G. Monitoring of long-term changes
- H. Assessment of processes affecting achievement of project results (Report on preparation and readiness / quality at entry, country ownership, stakeholder involvement, financial planning, UNIDO support, cofinancing and project outcomes and sustainability, delays of project outcomes and sustainability, and implementation approach)
- I. Project coordination and management (Report project management conditions and achievements, and partner countries commitment)
- J. 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 required by the GEF 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 a few key recommendations. They should:

- be based on evaluation findings
- 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 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, and other detailed quantitative information. Dissident views or management responses to the evaluation findings may later be appended in an annex.

Annex 2 - Overall Ratings Table

Criterion	Evaluator's Summary Comments	Evaluator's Rating
Attainment of project objectives and results (overall rating)		
Sub criteria (below)		
Effectiveness		
Relevance		
Efficiency		
Sustainability of Project outcomes (overall rating)		
Sub criteria (below)		
Financial risks		
Sociopolitical risks		
Institutional framework and governance risks		
Environmental risks		
Monitoring and Evaluation (overall rating)		
Sub criteria (below)		
M&E Design		
M&E Plan Implementation (use for adaptive management)		
Budgeting and Funding for M&E activities		
UNIDO specific ratings		
Quality at entry / Preparation and readiness		
Implementation approach		
UNIDO Supervision and backstopping		
Overall Rating		

RATING OF PROJECT OBJECTIVES AND RESULTS

Highly Satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately Satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately Unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Highly Unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Please note: Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results may not be higher than the lowest rating on either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

RATINGS ON SUSTAINABILITY

Sustainability will be understood as the probability of continued long-term outcomes and impacts after the GEF project funding ends. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits beyond project completion. Some of these factors might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes.

Rating system for sustainability sub-criteria

On each of the dimensions of sustainability of the project outcomes will be rated as follows.

Likely (L): There are no risks affecting this dimension of sustainability.

Moderately Likely (ML). There are moderate risks that affect this dimension of sustainability.

Moderately Unlikely (MU): There are significant risks that affect this dimension of sustainability.

Unlikely (U): There are severe risks that affect this dimension of sustainability.

All the risk dimensions of sustainability are critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in either of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

RATINGS OF PROJECT M&E

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The Project monitoring and evaluation system will be rated on 'M&E Design', 'M&E Plan Implementation' and 'Budgeting and Funding for M&E activities' as follows:

Highly Satisfactory (HS): There were no shortcomings in the project M&E system.

Satisfactory(S): There were minor shortcomings in the project M&E system.

Moderately Satisfactory (MS): There were moderate shortcomings in the project M&E system.

Moderately Unsatisfactory (MU): There were significant shortcomings in the project M&E system.

Unsatisfactory (U): There were major shortcomings in the project M&E system.

Highly Unsatisfactory (HU): The Project had no M&E system.

"M&E plan implementation" will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on "M&E plan implementation."

All other ratings will be on the GEF six point scale:

HS	= Highly Satisfactory	Excellent
S	= Satisfactory	Well above average
MS	= Moderately Satisfactory	Average
MU	= Moderately Unsatisfactory	Below Average
U	= Unsatisfactory	Poor
HU	= Highly Unsatisfactory	Very poor (Appalling)

Annex 3 - GEF Minimum requirements for M&E⁴

Minimum requirement 1: Project design of M&E

All projects will include a concrete and fully budgeted monitoring and evaluation plan by the time of work program entry for full-sized projects and CEO approval for medium-sized projects. This monitoring and evaluation plan will contain as a minimum:

- SMART indicators for project implementation, or, if no indicators are identified, an alternative plan for monitoring that will deliver reliable and valid information to management;
- SMART indicators for results (outcomes and, if applicable, impacts), and, where appropriate, indicators identified at the corporate level;
- Baseline for the project, with a description of the problem to be addressed, with indicator data, or, if major baseline indicators are not identified, an alternative plan for addressing this within one year of implementation;
- Identification of reviews and evaluations that will be undertaken, such as mid-term reviews or evaluations of activities; and
- Organizational set-up and budgets for monitoring and evaluation.

Minimum requirement 2: Application of project M&E

Project monitoring and supervision will include implementation of the M&E plan, comprising:

- SMART indicators for implementation are actively used, or if not, a reasonable explanation is provided;
- SMART indicators for results are actively used, or if not, a reasonable explanation is provided;
- The baseline for the project is fully established and data compiled to review progress reviews, and evaluations are undertaken as planned; and
- The organizational set-up for M&E is operational and budgets are spent as planned.

⁴ http://www.thegef.org/gef/sites/thegef.org/files/documents/ME_Policy_2010.pdf

Annex 4 – Required project identification and financial data

The evaluation report should provide information on project identification, time frame, actual expenditures, and co-financing in the following format, which is modelled after the project identification form (PIF).

I. Project general information:

Project Title	
GEF ID Number	
UNIDO ID (SAP Number)	
Region	
Country(ies)	
GEF Focal Area and Operational Program:	
Co-Implementing Agency(ies)	
GEF Agencies (Implementing Agency)	
Project Executing Partners	
Project Size (FSP, MSP, EA)	
Project CEO Endorsement/Approval Date	
Project Implementation Start Date (PAD Issuance Date)	
Original Expected Implementation End Date (indicated in CEO Endorsement/Approval document)	
Revised Expected Implementation End Date (if any)	
Project Duration (Months)	
GEF Grant (USD)	
GEF PPG (USD) (if any)	
Co-financing (USD) at CEO Endorsement	
Total Project Cost (USD) (GEF Grant + Co-financing at CEO Endorsement)	
Agency Fee (USD)	

II. Dates

Milestone	Expected Date	Actual Date
Project CEO Endorsement/Approval Date		
Project Implementation Start Date (PAD Issuance Date)		
Original Expected Implementation End Date (indicated in CEO Endorsement/Approval document)		
Revised Expected Implementation End Date (if any)		
Mid-term review completion		
Planned Tracking Tool Date		

III. Project framework

Project Component	Activity Type	GEF Financing (in \$)		Cofinancing (in \$)	
		Approved	Actual	Promised	Actual
1.					
2.					
3.					
4.					
5.					
6. Project Management					
Total					

Activity types are:

- a) Experts, researches hired
 - technical assistance, Workshop, Meetings or experts consultation scientific and technical analysis, experts researches hired
 - Promised co-financing refers to the amount indicated on endorsement/ approval.

IV. Co-financing

Source of cofinancing	Type	Project preparation		Project implementation		Total	
		Expected	Actual	Expected	Actual	Expected	Actual
Host gov't contribution							
GEF Agency (ies)							
Bilateral aid agency (ies)							
Multilateral agency (ies)							
Private sector							
NGO							
Other							
Total co-financing							

Expected amounts are those submitted by the GEF Agencies in the original project appraisal document. Co-financing types are grant, soft loan, hard loan, guarantee, in kind, or cash.

Annex 5 – ToR - Job descriptions



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE FOR PERSONNEL UNDER INDIVIDUAL SERVICE AGREEMENT (ISA)

Title:	International Evaluation Consultant (Team leader)
Main Duty Station and Location:	Home-based (Chennai, India)
Mission/s to:	Thailand, Vietnam, Lao PDR
Start of Contract (EOD):	17 February 2015
End of Contract (COB):	16 May 2015
Number of Working Days:	30 days over 3 months (WAE)

ORGANIZATIONAL CONTEXT

The Office for Independent Evaluation is responsible for the independent evaluation function of UNIDO. It supports learning, continuous improvement and accountability, and provides factual information about result and practices that feed into the programmatic and strategic decision-making processes. Evaluation is an assessment, as systematic and impartial as possible, of a programme, a project or a theme. Independent evaluations provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons learned into the decision-making processes at organization-wide, programme and project level. The Office for Independent Evaluation is guided by the UNIDO Evaluation Policy, which is aligned to the norms and standards for evaluation in the UN system.

PROJECT CONTEXT

The consultant will evaluate the projects according to the Terms of Reference. S/he will act as leader of the evaluation team and will be responsible for preparing the draft and final evaluation report. S/he will perform the following tasks:

<u>MAIN DUTIES</u>	Concrete/ measurable Outputs to be achieved	Expected duration	Location
Review project documentation and relevant country background information (national policies and strategies, UN strategies and general economic data...); determine key data to collect in the field and prepare key instruments (questionnaires, logic models...) to collect these data through interviews and/or surveys during and prior to the field missions Assess the adequacy of legislative and regulatory framework in Thailand, Vietnam and Lao PDR.	List of detailed evaluation questions to be clarified; questionnaires/ interview guide; logic models; list of key data to collect, draft list of stakeholders to interview during the field missions Brief assessment of the adequacy of the country's legislative and regulatory framework	3 days	Home-based
Briefing with the UNIDO Office for Independent Evaluation, project managers and other key stakeholders at HQ Preparation of the Inception Report	Interview notes, detailed evaluation schedule and list of stakeholders to interview during the field missions Division of evaluation tasks with the National Consultant Inception Report	2 days	Bangkok Field Office
Conduct field mission	Presentations of the evaluation's initial findings, draft conclusions and recommendations to stakeholders in the country at the end of the missions. Agreement with the National Consultant on the structure and content of the evaluation report and the distribution of writing tasks	12 days (including travel days)	Thailand, Vietnam and Lao PDR
Present overall findings and recommendations to the stakeholders at UNIDO HQ (incl. travel)	Presentation slides, feedback from stakeholders obtained and discussed	2 days	Vienna, Austria, UNIDO HQs
Prepare the evaluation report according to TOR Coordinate the inputs from the National Consultant and combine with her/his own inputs into the draft evaluation report	Draft evaluation report	7 days	Home-based
Revise the draft project evaluation reports based on comments from UNIDO Office for Independent Evaluation and stakeholders and edit the language and form of the final version according to UNIDO standards	Final evaluation report	4 days	Home-based
Total		30 days	

REQUIRED COMPETENCIES

Core values:

1. Integrity
2. Professionalism
3. Respect for diversity

Core competencies:

1. Results orientation and accountability
2. Planning and organizing
3. Communication and trust
4. Team orientation
5. Client orientation
6. Organizational development and innovation

Managerial competencies (as applicable):

1. Strategy and direction
2. Managing people and performance
3. Judgement and decision making
4. Conflict resolution

MINIMUM ORGANIZATIONAL REQUIREMENTS

Education: Advanced university degree in environmental science, engineering or other relevant discipline like developmental studies with a specialization in renewable energies, industrial energy efficiency and/or climate change.

Technical and Functional Experience:

A minimum of ten years practical experience in the field of environment and energy, including evaluation experience at the international level involving technical cooperation in developing countries. Exposure to the needs, conditions and problems in developing countries.

Languages: Fluency in written and spoken English is required.

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 programme/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 the completion of her/his contract with the Office for Independent Evaluation.

Annex 6 – Project results framework OR project logical framework

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
Goal	To reduce GHG emission in the ethanol production sector as well as due to increased use of ethanol for fuel in Thailand and LMV countries.	<ol style="list-style-type: none"> Incremental avoided GHG emission due to increased number of ethanol plants using VHG - SSF technology established. Incremental GHG emission reduction due to increased use of ethanol as biofuel replacing fossil fuels. 	<ol style="list-style-type: none"> Usage of conventional fossil fuel CO₂ emission due to fossil fuel usage instead of ethanol as fuel. CO₂ emission due to conventional method of ethanol production technology. 	<ol style="list-style-type: none"> 1.400,250 l/d of ethanol production plant added during the project leading to cumulative emission reduction of 2,760,524 t CO₂e over a period of 10 years. 2. At least 800,500 l/d of ethanol production added during the next 10 years leading cumulative emission reduction of 5,521,049 t CO₂e. 	<ol style="list-style-type: none"> Physical verification of plants in operation. End of project survey. 	<p>Continuous support of all participating countries, Ministries, organizations and project investors.</p> <p>Environmental protection and fossil fuel conservation becomes a priority for consumers</p>
Objective of the project	Removing barriers, and creating conducive environment for promoting ethanol technology and South-South	<ol style="list-style-type: none"> Installed capacity of the demonstration projects Installed capacity of commercial plant Bio-ethanol 	<ol style="list-style-type: none"> New ethanol production technology net yet disseminated and commercialized. Inadequate support 	<ol style="list-style-type: none"> To implement demonstration of cumulative 250 l/day capacity To implement commercial plant of capacity 400,000 	<ol style="list-style-type: none"> Physical verification of the project. Training programmes conducted. 	Continued support of different governments, NSTDA, LDO & FIRI

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
	technology transfer.	<p>production from these plant (l/day).</p> <p>4. No. of persons trained for the new technology.</p> <p>5. Improved policy and pricing environment in respective countries.</p> <p>6. Percentage increase in private sector investment.</p> <p>7. Percentage increase in lending by financial institutions.</p> <p>8. No. of replication projects under development in Thailand and LMV countries.</p>	<p>policies and pricing strategies to support bio-ethanol production.</p> <p>3. Low private sector participation</p> <p>4. Not enough support from financing institutions.</p>	<p>l/day.</p> <p>2. To train at least 250 people under the project.</p> <p>3. To train banks and financial institutions.</p> <p>4. To assist at least 5 private sector project development.</p> <p>5. Cumulative bio-ethanol production of 132.1 million litre per year from project activity plants and 264.2 million litre per year from replication plants</p>	<p>3. Government papers for policy and pricing</p> <p>4. Private sector investment and documents on lending</p> <p>5. Replication projects under development.</p>	
Outcome 1	Enhanced capacity of NSTDA, Thailand to lend sustainable support to the region	1. Increased capacity of NSTDA for technology transfer.	NSTDA do not have sufficient capacity for technology transfer	Ethanol information clearing house and Centre for excellence established at	<p>1. Physical verification.</p> <p>2. Published manual on</p>	Continuous support of the Thai Government & NSTDA

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
		2. Technology package developed. 3. Manuals, training materials and toolkits developed. 4. Database developed and operated		NSTDA	technology package 3. Published technology training modules 4. Physical operation of the database	
Output 1.1	Information hub established for disseminating and supporting the south-south technology transfer.	1. Information hub established. 2. South-South technology transfer model developed.	No organisation exists for technology dissemination and transfer.	NSTDA, Thailand developed as Ethanol information clearing house.	1. Physical verification. 2. Government reports. 3. End of project M&E report. 4. Activities of the clearing house.	Continuous support of the Thai Government & NSTDA.
Output 1.2	Ethanol technology package finalised for dissemination	VHG-SSF ethanol production technology developed as package.	New technology package not available.	NSTDA's new ethanol production technology is developed for dissemination.	Published manual on technology package	Continuous support of the Thai Government & NSTDA.
Output 1.3	Manuals, tool kits and structured training programs	1. Technology training module developed.	Manuals, toolkits, training programmes not available for	To develop manuals, toolkits and training programs for	1. Published technology training	Continuous support of the Thai Government &

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
	developed for technology transfer.	2. Training programmes developed. 3. Follow-up tools and procedures developed for monitoring.	technology transfer	technology transfer.	modules. 2. Training program approved by the Project Steering Committee. 3. Monitoring tools and procedures.	NSTDA.
.Output 1.4	Database on ethanol technology developed and maintained by ethanol information hub	Data base developed, tested, launched and operated.	No database available for the new ethanol technology.	To develop, operate and maintain ethanol database.	Physical operation of the database.	Continuous support of the Thai Government & NSTDA.
Outcome 2	Conducive environment to promote bio-ethanol technology and strengthened policies to promote ethanol for replacing conventional fuels.	1. Improved pricing and policy environment. 2. No. of persons involved with new bio-ethanol technology (farmers, entrepreneurs, technicians, researchers) trained.	1. Inadequate policies and pricing strategies for bio-ethanol production. 2. Lack of interest among key stakeholders for the new bio-ethanol technology 3. Lack of technical expertise for bio-	1. To improve the pricing and policy environment. 2. To train at least 250 persons for the promotion of new bio-ethanol production (in all sectors including farmers, entrepreneurs, researchers, etc.)	1. Policy and pricing reports. 2. No. of persons trained/ attended workshops. 3. Training / workshop reports. 4. Study tour reports. 5. Published training materials.	Continuous support of different governments, NSTDA & FIRI.

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
			ethanol production.			
Output 2.1	Regional awareness created for the new technology package.	<ol style="list-style-type: none"> No. of regional workshops conducted in Thailand. No. of national workshops conducted in Thailand and Vietnam. No of study tours organized for person (no). 	Very little awareness about new bio-ethanol production technology.	To create sufficient awareness in the new technology.	<ol style="list-style-type: none"> Regional workshop report. National workshop reports. Study tour reports. 	Continuous support of government of Thai, LMV countries, respective government officials and from private investors.
Output 2.2	Trainings conducted in Thailand for farmers, entrepreneurs and technicians.	<ol style="list-style-type: none"> Training materials prepared No. of farmers, entrepreneurs and technicians trained. 	<ol style="list-style-type: none"> Entrepreneurs and technicians not aware of the new bio-ethanol production technology. Low productivity yield in Cassava in LMV countries. Farmers are not aware of the improved 	To train at least 150 farmers, 30 entrepreneurs and 30 technicians for the promotion of new ethanol production technology.	<ol style="list-style-type: none"> Published training modules. Training reports. Number of persons trained. End of project survey. 	Continuous support of government of Thai, LMV countries, local farmers, entrepreneurs and technicians.

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
			cassava cultivation practices.			
Output 2.3	Trainings conducted in Thailand for engineers, scientists and researchers.	<ol style="list-style-type: none"> 1. Training materials prepared. 2. No. of engineers, scientists and researchers trained. 	Engineers, scientists, and researchers are less aware in new bio-ethanol production technology.	To train at least 40 engineers, scientists, and researchers for the promotion of new bio-ethanol production technology.	<ol style="list-style-type: none"> 1. Published training modules. 2. Training reports. 3. Number of persons trained. 4. End of project survey. 	Continuous support of government of Thai, and Vietnam, local engineers, scientists, and researchers.
Output 2.4	Pricing practices and policy environment improved.	<ol style="list-style-type: none"> 1. Assessment report on policy needs. 2. No. of experts trained in pricing and policy requirements for bio-ethanol. 3. Policy intervention tools created. 	Insufficient policies and pricing strategy for the improvement of bio-ethanol.	Adequate policy environment and pricing practices are in place.	<ol style="list-style-type: none"> 1. Assessment reports on policy needs. 2. No. of experts trained. 3. Training reports. 4. Policy forum reports. 5. Reports with policy and pricing strategy. 	Continuous support of NSTDA, MOIT, Vietnam and other respective government counterparts.
Outcome 3	Strengthened technological and technical cross-	1. Private made aware of opportunities of the	1. No demonstration plants exist for the new ethanol	1. To establish technical centre	1. Physical verification.	Continuous support of different governments,

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
	border cooperation and improved investment climate in Thailand and LMV.	<p>technology.</p> <p>2. Technical centre established as a result of cross-border cooperation.</p> <p>3. No. of replication projects developed.</p> <p>4. Capacity of demonstration and commercial projects established as a result of cross-border cooperation.</p>	<p>production technology.</p> <p>2. Private sector and financial institutions sceptical about the new technology.</p>	<p>at FIRI, Vietnam.</p> <p>2. To implement demonstration projects of capacity 50 l/d in Vietnam.</p> <p>3. To implement commercial plant of capacity 400,000 l/d in Myanmar.</p> <p>4. To replicate at least 5 projects in Thai and LMV countries</p>	<p>2. Government reports.</p> <p>3. Project development activities for replication projects.</p>	NSTDA, LDO & FIRI.
Output 3.1	A demonstration plant established in Thailand with ethanol production capacity of 200 l/day.	Capacity of demonstration plant and operation of the plant.	No demonstration plants exist for the new ethanol production technology.	To implement a 200 l/d demonstration project and operate it in Thailand.	<p>1. Physical verification.</p> <p>2. Government reports.</p>	Continuous support of Thai Government, LDO & NSTDA.
Output 3.2	Training centre established at FIRI, Vietnam, to disseminate and provide trainings on the new technology	<p>1. Training centre established at FIRI, Vietnam.</p> <p>2. Operation of the training centre.</p> <p>3. Toolkits and</p>	No technical centre available for the development of bio-ethanol technology in Vietnam.	Establishment and sustainable operation of the centre.	<p>1. Physical verification of the centre.</p> <p>2. No. of persons trained.</p>	Continuous support of NSTDA, Vietnamese Government and FIRI.

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
	package.	manuals (NSTDA) adjusted for local conditions.			3. Training report. 4. Model to ensure sustainability of the centre.	
Output 3.3	A demonstration plant established in Vietnam with ethanol production capacity of 50 l/d capacity.	Capacity of the demonstration plant and operation of the plant	No demonstration plants exist for the new ethanol production technology.	To implement a 50 l/d demonstration project and operate it in Vietnam	1. Physical verification. 2. Government reports.	Continuous support of NSTDA, Vietnamese Government and FIRI.
Output 3.4	Financing opportunities improved to finance the new technology.	Percentage increase in financing for new ethanol technology by the financing institutions.	Financial institutions reluctant to finance for the new bio-ethanol production technology.	Financial institutions ready to finance the new bio-ethanol production technology.	1. % increase on financing. 2. End of project survey. 3. Final evaluation.	Continuous support of financial institutions.
Output 3.5	Private sector assisted in project development for replicating the projects.	1. No. of interested entities identified. 2. At least 5 replication projects developed in Thai and LMV countries.	1. Private entities less interested. 2. Lack of knowledge in project development.	1. To identify interested private project developers. 2. At least 5 replication projects developed.	1. Bankable project proposal readied for financing. 2. Project reports.	Continuous support of Government of Thai and LMV countries, financial institutions and private investors.

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
Output 3.6	Bio-ethanol production technology commercialized with the establishment of 400,000 l/d plant in Myanmar.	Capacity of the commercial plant with and its operation in Myanmar.	No commercial plants exist for the new ethanol production technology.	To implement and operate the project in Myanmar.	Physical verification of the project.	Continuous support of NSTDA, private sector and Myanmar government.
Output 3.7	Demonstration projects evaluated, lessons learned and information widely distributed.	<ol style="list-style-type: none"> 1. Plant performance study reports. 2. Full scale demonstration site visits and seminars. 3. Dissemination leaflets. 4. Website. 	No demonstration projects are in place to study the performance and to learn the lessons from the demonstration plants.	<ol style="list-style-type: none"> 1. Performance assessment report. 2. Full scale demonstration site visits and seminar. 3. Website. 4. Project leaflet. 	<ol style="list-style-type: none"> 1. Performance monitoring report. 2. Site visit/seminar. 3. Programme evaluation form. 4. Seminar material, leaflet, website. 	Sustained investor support to visit the project while in operation and data collection.

Annex B: List of persons met (interviewees) and the meetings held

Name	Title	Agency
Mr. Jossy Thomas	Back Stopping Officer	UNIDO/Vienna
Ms. Sooksiri Chumsuk	National Programme Officer/Project Coordinator	UNIDO/Bangkok
Ms. Jintipaporn Saiprom	Project Assistant	UNIDO/Bangkok
Asso.Prof. Boosya Bunnag	Associate Professor	KMUTT/Thailand
Mr. Terence Henry Commins		KMUTT/Thailand
Asst. Prof. Veara Loha	Assistant Professor	KMUTT/Thailand
Ms. Ruenrom Lerdlattaporn		KMUTT/Thailand
Dr. Warinthorn Songkasiri		KMUTT/NSTDA
Dr. Kanchana Saengchan		KMUTT/NSTDA
Dr. Kuakoon Chamsuk		NSTDA/Thailand
Mr. Somchart Wongwattanasarn	Director	LDO/Thailand
Other staff members		LDO/Thailand
Mr. Charae Chutharatkul	President	TTDI/Thailand
Prof. Dr. Chareinsuk Pojanaridpiched	Board Member	TTDI/Thailand
Dr. Kuakoon Chamsuk		NSTDA/Thailand
Mr. Jatupong Wipakkit-a-nunt	Member/EPA and Corporate Planning Manager	Ubon Bio Ethanol/Thailand
Mr. Yongyuth Sawatdisawanee	Director of Bureau of Biofuel Development	DEDE/Thailand
Ms. Pisamai Sathienyanon	Renewable Energy Expert	DEDE/Thailand
Ms. Apiradee Thammanomai	Engineer of Bureau of Biofuel Development	DEDE/Thailand
Asso.Prof. Dr. Le Duc Manh	Director	FIRI/Vietnam
Asso. Prof. Vu Nguyen Thanh	Director of Center for Industrial Microbiology	FIRI/Vietnam
Dr. Dang Hong Anh	Head of Beverage Technology Department	FIRI/Vietnam
Mr. Nguyen Phu Cuong	Director General of Science & Technology Department	MOIT/Vietnam
Mr. Nguyen Duc Vinh	Staff of Science and Technology Department	MOIT/Vietnam
Dr. Patrick J. Gilabert	UNIDO Representative in Vietnam	UNIDO/Hanoi
Ms. Le Thi Thanh Thao	National Programme Officer	UNIDO/Hanoi
Mr. Nguyen Duc Huu	Deputy Director	Vietnam Central Biofuel JSC/Vietnam
	Director	Vietnam Central Biofuel JSC/Vietnam

Annex B: List of persons met

Name	Title	Agency
Mr. Sommai Faming	Head of UNIDO Operations in Lao PDR	UNIDO/Vientiane
Mr. Chantho Milattanapheng	Deputy Director General	IREP (MoEM)/Lao PDR
Mr. Bounchanh Douangvilay	Deputy Director General	RENMI (MOST)/Lao PDR
Mr. Houmpheng Theuambounmy	Director of Alternative Energy Division	RENMI (MOST)/Lao PDR
Mr. Phongsavath Senaphum	Director	Phongsubthavy Road & Bridge Co./Lao PDR
Mr. Ned Clarence-Smith	Director of Regional Office	UNIDO/Bangkok
Mr. Javier Guarnizo	Senior Evaluation Officer, Evaluation Group	UNIDO/Vienna
Ms. Nina Zetsche	Industrial Development officer	UNIDO/Vienna
Mr. Mark Draeck	Industrial Development Officer	UNIDO/Vienna
Ms. Foteini Kanatsouli	Evaluation Group	UNIDO/Vienna
Ganna Onysko	GEF Coordination Officer	UNIDO/Vienna

Annex C: Schedule of the evaluation mission

Date	Time	Place	Organization	Activity	Persons met	Affiliation/Organization
1/3/15	01h30-06h25	Bangkok		Flight from Chennai to Bangkok (TG338)		
2/3/15	08h45		UNIDO	Travel to KMUTT	Ms. Intipaporn Saiprom	Project Assistant/UNIDO
	10h00-11h00			Introduction	Asso. Prof. Boosya Bunnag	Associate Professor/KMUTT
	11h00-12h00	Bangkok		Discuss work progress	Asst. Prof. Veera Loha	Assistant Professor/KMUTT
	12h00-13h00		KMUTT	Lunch	Mr. Terence Henry Commins	KMUTT
	13h00-14h00			Work around ethanol pilot plant	Ms. Uenrom Lerlattaporn	KMUTT
	14h00-15h30			Discuss future work plan	Dr. Warinthorn Songkasiri	KMUTT/NSTDA
					Dr. Kanchana Saengchan	KMUTT/NSTDA
					Dr. Kuakoon Chamsuk	NSTDA
3/3/15	10h30-12h15			Travel to LDO	Ms. Intipaporn Saiprom	Project Assistant/UNIDO
	12h15-13h15	Bangkok	LDO	Lunch	Mr. Somchart Wongwattanasarn	Director/LDO
	13h30-15h00			Discuss LDO's bio-ethanol policy	Other staff members	LDO
	15h00-16h00			Walk around LDO facility		
4/3/15		Bangkok		Official holiday in Thailand		
5/3/15	09h30-11h00		TTD	Discuss TTD's bio-ethanol policy	Mr. Charae Hutharatkul	President/TTD
					Prof. Dr. Chareinsuk	
					Pojanaridpiched	Board Member/TTD
					Dr. Kuakoon Chamsuk	NSTDA
	11h30-13h00	Bangkok	EPA	Discussion with EPA representative over lunch	Mr. Atapong Wipakit-a-nunt	Member/EPA and Corporate Planning Manager/Ubon Bioethanol
	14h00-15h30		DEDE	Discussion with DEDE on bioethanol status	Mr. Yongyuth Sawatdisawanee	Director of Bureau of Biofuel Development/DEDE
					Ms. Pisamai Sathienyanon	Renewable Energy Expert/DEDE
					Ms. Apiradee Thammanomai	Engineer in Bureau of Biofuel Development/DEDE
	18h35-20h25			Flight from Bangkok to Hanoi (VN612)		
6/3/15	09h30-12h00		FIRI	Discuss with FIRI	Asso. Prof. Dr. Le Duc Manh	Director/FIRI
					Asso. Prof. Vu Nguyen Thanh	Director of Center for Industrial Microbiology/FIRI
					Dr. Dang Hong Anh	Head of Beverage Technology Department/FIRI
	12h30-13h30	Hanoi		Lunch		
	13h30-14h30		MOIT	Discuss the project evaluation	Mr. Nguyen Phu Cuong	Director General of Science & Technology Department/MOIT
					Mr. Nguyen Duc Vinh	Staff of Science and Technology Department/MOIT
	14h30-15h30		UNIDO/UCO	Discuss the project evaluation	Dr. Patrick Gilibert	Representative in Vietnam/UNIDO
					Ms. Le Thi Thanh Hao	National Program Officer/UNIDO
7/3/15	12h15-13h35			Flight from Hanoi to Danang (VN167)		
8/3/15				Sunday		
9/3/15	Full day	Central reg.		Meeting with Vietnam Central Biofuels SC	Mr. Nguyen Duc Huu	Deputy Director/Vietnam Central Biofuel SC
						Director/Vietnam Central Biofuel SC
					Asso. Prof. Vu Nguyen Thanh	Director of Center for Industrial Microbiology/FIRI
					Mr. Nguyen Duc Vinh	Staff of Science and Technology Department/MOIT
10/3/15	12h00-13h20			Flight from Danang to Hanoi (VN166)		
	16h40-17h50			Flight from Hanoi to Vientiane (QV312)		
11/3/15	09h00-09h30		UNIDO	Briefing	Mr. Sommai Faming	Head of Operations in Lao PDR/UNIDO
	10h00-11h30	Vientiane	IREP (MoEM)	Discuss project status and evaluation	Mr. Chantho Milattapheng	Deputy Director General/IREP (MoEM)
	14h00-15h30		RENMI (MOST)	Discuss project status and evaluation	Mr. Bounchanh Douangvilay	Deputy Director General/RENMI (MOST)
					Mr. Houmpheng Heuambounmy	Director of Alternative Energy Division/RENMI (MOST)
12/3/15	Morning	Vientiane		Meeting with private companies		
	18h35-19h35			Flight from Vientiane to Bangkok (QV445)		
13/3/15	10h00-11h00		GEF (FP/MONRE)	Discuss project status and evaluation	Ms. Intipaporn Saiprom	Project Assistant/UNIDO
	12h00-13h00			Lunch		
		Bangkok	UNIDO ROTH and KMUTT	Debriefing session with Director and KMUTT	Mr. Ned Clarenc Smith	Director of Regional Office/UNIDO
	13h30-15h00					
	22h35-00h30			Flight from Bangkok to Chennai (TG337)	KMUTT project team	KMUTT
30/3/15	Morning	Vienna	UNIDO HQ	Meeting with UNIDO team at HQ	Evaluation Group	UNIDO

Annex D: Evaluation matrix

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
A. Project Design			
A.1. Is the project's design adequate to address the problem at hand?	Barriers identified and activities proposed to overcome the barriers	Review of project document	Project Results Framework, country energy status review
A.2. Was a participatory project identification process adopted in selecting problem areas and national counterparts?	Problem areas selected and national counterparts identified	Review of project document	Alignment of project design with the original PIF
A.3. Has the project a clear thematically focused development objectives, the attainment of which can be determined by a set of verifiable indicators?	Development objectives	Review of project document	Project documents, national energy policies
A.4. Was the project formulated based on the project results framework approach?	Project strategy and objectively verifiable indicators	Review of project document	Project results framework
A.5. Was the project formulated with the participation of national counterpart and/or target beneficiaries?	Project outputs and objectively verifiable indicators	Review of project document	Project documents, Project stakeholders
A.6. Were relevant country representatives (from government, industries and civil society) appropriately involved and participating in the identification of critical problem areas and the development of technical cooperation strategies?	Involvement of the relevant country representatives in the project	Review of project document	Project documents
B. Project Relevance			

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
B.1. Is it relevant to national development and environmental priorities and strategies of the participating Governments and population of LMV and regional and international agreements?	National priorities and strategies, and international agreement for technology transfer for climate change	Review of project document	Project documents, International agreement documents
B.2. Are the project's objectives, outcomes and outputs relevant to the different target groups of the interventions (e.g. companies, civil society, beneficiaries of capacity building and training, etc.)?	Role and involvement of the different target groups in the project	Review of project document, interview of stakeholders	Project documents
B.3. Were the project's outcomes consistent with the focal areas/operational program strategies of GEF (SP4: "Promoting sustainable energy production from biomass")?	Evidence of value added in the GEF climate change focal areas	Review of project document	Project documents, GEF strategic documents
B.4. Were UNIDO's thematic priorities in line with UNIDO's mandate, objectives and outcomes defined in the Program & Budget and core competencies?	Objectives and outcomes in line with UNIDO's thematic priorities	Review of project document	UNIDO policy documents
B.5. Is the project still relevant taking into account the changing environment? Is there a need to reformulate the project design and the project results framework given changes in the country and operational context?	Amended made in the project design	Review of project document, interview of stakeholders	Project management documents, and UNIDO project team
C. Project Effectiveness			
C.1. To what extent results at various levels, including outcomes, have been achieved or are likely to be achieved?	Project's outputs and the rate of achievement of objectives	Project document review	Project progress and the mid-term review report
C.2. Are the project outcomes commensurate	Project's output and the rate of	Project document	Project progress and

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
with the original or modified project objectives?	achievement of objectives	review	the mid-term review report
C.3. How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually reached?	Stakeholders' involvement and feedback to the project	Interview	Interview of stakeholders
C.4. What outputs and outcomes has the project achieved so far (both qualitative and quantitative results)? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?	The rate of achievement of objectives; evidence of changes felt by beneficiaries; project's intended/unintended outputs?	Project document review	Project progress and mid-term review report
C.5. Identify actual and/or potential longer-term impacts or at least indicate the steps taken to assess these.	Evidence of changes felt by beneficiaries	Project document review, interview project management unit and project implementing agencies	Project M&E document, project beneficiaries
C.6. Describe any catalytic or replication effects, both within and outside the project.	Evidence of changes felt by beneficiaries	Project document review, interview project management unit and project implementing agencies	Project M&E document, project beneficiaries
D. Efficiency			
D.1. Was the project cost effective? Was the project using the least cost option?	The percentage of budget engaged and the outputs achieved	Review of financial document, sub-contracts signed, interview with the	Project documents, PMU, stakeholders

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
		PMU	
<p>D.2. Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? Are the project's activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?</p>	<p>Actual status versus planned activities; impact of the delay on project time frame, budget and outputs; status of the project against the work plan; expenditures versus the status of activities</p>	<p>Review of project documents and financial statements, interview with PMU and main executing agency</p>	<p>Project progress and mid-term review report, project M&E document, Work plan, project stakeholders</p>
<p>D.3. Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet requirements? Was the quality of UNIDO inputs and services as planned and timely?</p>	<p>Available resources (cash and in-kind); actual versus planned co-financing; timely intervention and support from UNEP office</p>	<p>Review of financial documents; sub-contracts and MoUs, interview with PMU</p>	<p>Project documents; PMU and relevant stakeholders</p>
<p>D.4. Was there coordination with other UNIDO and other donors' projects, and did possible synergy effects happen?</p>	<p>Evidence of interaction with other UNIDO and other donors' projects</p>	<p>Review of project documents; meeting with PMU</p>	<p>Project documents: PMU</p>
E. Assessment of sustainability of project outcomes			
<p>E.1. Financial risks: Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once GEF assistance ends? Was the project successful in identifying and leveraging co-financing?</p>	<p>Evidence of financial sustainability strategy; Evidence of commitments to continue project initiatives Level of co-financing achieved compared to that committed</p>	<p>Review of project documents; discussion with stakeholders</p>	<p>Project document; interview of government and private representatives</p>

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
<p>E.2. Socio-political risks: Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership 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?</p>	<p>Evidence of social or political risks Evidence of risks due to insufficient awareness/ participation/ ownership of stakeholders Evidence of initiatives taken by stakeholders to mitigate risks</p>	<p>Review of project documents; discussion with key stakeholders</p>	<p>Project document; government representatives; PMU</p>
<p>E.3. 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 sustainability of project benefits? Are requisite systems for accountability and transparency, and required technical know-how, in place?</p>	<p>Evidence of the risks associated with the institutional framework within which the project operates Assessment of measures taken to strengthen policy</p>	<p>Review of project documents; discussion with key stakeholders</p>	<p>Project document; government representatives; PMU</p>
<p>E.4. Environmental risks Are there any environmental risks that may jeopardize sustainability of project outcomes? Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level</p>	<p>Assessment of the precautions taken to avoid environmental risks</p>	<p>Review of project documents; discussion with PMU and lead executing agency</p>	<p>Project document; PMU and lead executing agency</p>

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
<p>results that are likely to affect the environment, which, in turn, might affect sustainability of project benefits?</p> <p>Will certain activities pose a threat to the sustainability of the project outcomes?</p>			
F. Assessment of monitoring and evaluation systems			
<p>F.1. M&E design:</p> <p>Did the project have an M&E plan to monitor results and track progress towards achieving project objectives?</p> <p>Did the project meet the minimum requirements for the application of the Project M&E plan?</p>	<p>Project results framework, including SMART indicators</p> <p>Mechanism to receive feedback to make informed decision</p>	<p>Review of project documents</p>	<p>Project progress reports; medium-term review report</p>
<p>F.2. M&E plan implementation:</p> <p>Did the M&E system facilitate timely tracking of progress toward project objectives?</p> <p>Were monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impacts?</p> <p>Are there any annual work plans? Was any steering or advisory mechanism put in place?</p> <p>Did reporting and performance reviews take place regularly?</p>	<p>Evidence of the M&E system to keep track of the progress towards objectives</p> <p>Existence of the relevant M&E system to achieve the project objectives</p> <p>Evidence of the annual work plan and the tracking and reporting mechanism</p>	<p>Review of project documents; interview with PSC members</p>	<p>Project progress reports; M&E stakeholders</p>
<p>F3. Was the M&E sufficiently budgeted and adequately funded and in a timely manner during implementation.</p>	<p>Evidence of funds allocated and disbursed for M&E activities</p>	<p>Review of project documents</p>	<p>Financial reports</p>
G. Monitoring of long term changes			
<p>G.1. Did this project contribute to the</p>	<p>Evidence of any long-term</p>	<p>Review of project</p>	<p>Project documents;</p>

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
establishment of a long-term monitoring system? If it did not, should the project have included such a component?	monitoring system in place	documents and interview with PMU	PMU
H. Assessment of processes affecting achievement of project results			
H.1. Preparation and readiness / Quality at entry		Review of project documents and interview with relevant stakeholders	Project documents; stakeholders
H.2. Country ownership/drivenness			
H.3. Stakeholder involvement			
H.4. Financial planning			
H.5. UNIDO's supervision and backstopping			
H.6. Co-financing and project outcomes and sustainability			
H.7. Delays and project outcomes and sustainability			
H.8. Implementation approach			
I. Project coordination and management			
I.1. Have the management and overall coordination mechanisms been efficient and effective? Did each partner have assigned roles and responsibilities from the beginning? Did each partner fulfill its role and responsibilities?	Assessment of the project outcomes; evaluation of the role and contribution of each project partner	Review of project documents	Project documents, including project progress reports
I.2. Have the UNIDO HQ and Field Office based management, coordination, monitoring, quality control and technical inputs been efficient, timely and effective?	Projects outputs as per work plan	Review of project documents	Project documents

Issues/Questions	Indicators	Data collection/ analysis method	Sources of information
J. Assessment of gender mainstreaming			
J.1. To what extent were socioeconomic benefits delivered by the project, including consideration of gender dimensions?	Gender analysis in the project document	Review of project documents	Project documents
K. Procurement issues			
K.1. Was the procurement process in line with UNIDO procurement guidelines?	Not applicable so far	Tendering procedure	Project documents

Annex E: Bibliography / Documents reviewed

Document title	Author	Date
<i>Project documents</i>		
Project Document for CEO Endorsement/Approval	UNIDO	December 2011
Back-to-office Mission Report – Hanoi, Vietnam	Ms. S. Chamsuk, UNIDO	July 2012
Back-to-office Mission Report – Vientiane, Lao PDR	Ms. S. Chamsuk, UNIDO	July 2012
Update on technology transfer activities for GEF report to UNFCCC COP 19	UNIDO	May 2013
1 st Project Steering Committee Meeting Report	KMUTT	December 2013
UNIDO Annual Project Implementation Report: FY 2013 (July 2012 – June 2013)	UNIDO	February 2014
Inception Report/1 st Progress Report: UNIDO Annual Project Implementation Report	UNIDO	May 2014
2 nd Progress report submitted by KMUTT	KMUTT	June 2014
Update on technology transfer activities for GEF report to COP20	UNIDO	May 2014
Assessment of capacities of financial institutions in Lao PDR and Myanmar to provide loans to new and renewable energy technologies for the large scale production of ethanol from Cassava	Report of International Expert, UNIDO	June-August 2014
Use of cassava for large-scaled ethanol production, presented at the Focused Group Meeting on Bioethanol Investment in Lao PDR and Myanmar	KMUTT	August 2014
Focused Group Meeting Report: Bioethanol Investment in Lao PDR and Myanmar	UNIDO and KMUTT	August 2014
Issues and Challenges in the Development of Bioethanol Production in Myanmar, presented at the Focused Group Meeting on Bioethanol Investment in Lao PDR and Myanmar	Mr. Sein Thaug Oo, Bio-fuel Consultant	August 2014
Bioethanol Policy Status in Lao PDR, presented at the Focused Group Meeting on Bioethanol Investment in Lao PDR and Myanmar	Mr. Chantho Milattanapheng	August 2014
Back-to-Office Mission Report – Yangon, Myanmar	Ms. S. Chamsuk, UNIDO	September 2014
UNIDO Project Mid Term Review Report FY2014 (revised)	UNIDO	October 2014

Document title	Author	Date
Tracking Tool for Climate Change Mitigation Projects (Mid Term Evaluation: July 2013 – June 2014)	UNIDO	October 2014
Minutes of Meetings of KMUTT Working Group	KMUTT	March 2014 April 2014 June 2014 July 2014 January 2015
<i>Other documents</i>		
Renewable Energy Development Strategy in Lao PDR	Lao PDR	October 2011
Potential of biomass utilization in ACMECS (Laos, Myanmar, Cambodia, Vietnam and Thailand)	Kasetsart University	
ASEAN Bioenergy Technology Status Report 2014	JGSEE and STI	2014
An Assessment of Thailand's Biofuel Development	S. Kumar, P. Abdul Salam, Pujan Shrestha and Emmanuel Kofi Ackom	2013
Bio-ethanol Policy, Production and Situation in Vietnam	Dept. of Science & Technology, MOIT	N.A.
Biofuels issues in Vietnam	AFD, Vietnam	June 2012
Cassava bioethanol production	Dr. Kuakoon Piyachomkwan	June 2011
Renewable Energy Development Strategy in Lao PDR	Lao Government	October 2011
Potential of biomass utilization in ACMECS (Laos, Myanmar, Cambodia, Vietnam and Thailand)	Kasetsart University	N.A.
Recent Situation of Bioethanol in Thailand: Policy and Production	Klanarong Sriroth	June 2011
Alternative Fuel Policy for Thai Transportation	DEDE	June 2014