

Accelerating the adoption and life-cycle solutions to electric mobility in Thailand

Part I: Project Information

GEF ID
10681

Project Type
FSP

Type of Trust Fund
GET

CBIT/NGI
 CBIT
 NGI

Project Title
Accelerating the adoption and life-cycle solutions to electric mobility in Thailand

Countries
Thailand

Agency(ies)
UNIDO

Other Executing Partner(s)
Eastern Economic Corridor Office (EECO)

Executing Partner Type
Government

GEF Focal Area

Climate Change

Taxonomy

Influencing models, Demonstrate innovative approach, Transform policy and regulatory environments, Stakeholders, Civil Society, Community Based Organization, Non-Governmental Organization, Academia, Communications, Awareness Raising, Education, Behavior change, Beneficiaries, Type of Engagement, Partnership, Information Dissemination, Consultation, Private Sector, Individuals/Entrepreneurs, SMEs, Local Communities, Gender Equality, Gender Mainstreaming, Sex-disaggregated indicators, Gender results areas, Access to benefits and services, Participation and leadership, Capacity, Knowledge and Research, Workshop, Knowledge Generation, Professional Development, Training, Innovation, Enabling Activities, Capacity Development, Focal Areas, Climate Change, Climate Change Mitigation, Renewable Energy, Sustainable Urban Systems and Transport, United Nations Framework Convention on Climate Change, Paris Agreement

Rio Markers**Climate Change Mitigation**

Climate Change Mitigation 2

Climate Change Adaptation

Climate Change Adaptation 0

Duration

60 In Months

Agency Fee(\$)

276,779.00

Submission Date

9/25/2020

A. Indicative Focal/Non-Focal Area Elements

Programming Directions	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
CCM-1-2	GET	2,913,465.00	19,684,900.00
	Total Project Cost (\$)	2,913,465.00	19,684,900.00

B. Indicative Project description summary

Project Objective

To mitigate greenhouse gas emissions from the transportation sector by addressing barriers to the adoption and scale-up of electric mobility in Thailand through enhancing policy and institutional framework and technology demonstrations in Thailand's Eastern Economic Corridor.

Project Component	Financing Type	Project Outcomes	Project Outputs	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
1. Improve national policy and institutional framework for electric mobility and sustainable use of batteries	Technical Assistance	1.1 National policy and institutional framework for electric mobility and sustainable use of batteries enhanced	1.1.1 Analysis, forecast and management system for GHG emissions in transport sector developed 1.1.2 Development of plan for charging infrastructure integrated with renewable energy systems ensuring access for all 1.1.3 Financial and non-financial incentives created for uptake of electric public and private fleets 1.1.4 Framework for addressing life-cycle issues for electric mobility and sustainable use of batteries enhanced	GET	690,000.00	1,049,000.00

2. Accelerate technology adoption of electric mobility and sustainable use of batteries	Investment	2.1 National business sector ecosystem for entrepreneurship enhanced	2.1.1 Entrepreneurship support program for electric mobility solutions developed	GET	1,700,000.00	14,536,200.00
		2.2 Investment in electric vehicles and electric vehicle supply equipment integrated with renewable energy deployment in Eastern Economic Corridor	2.2.1 Deployment of electric mobility solutions for public transport integrated with renewable energy systems, and battery storage in EEC			
		2.3 Investment in addressing life-cycle issues for electric vehicle batteries in Eastern Economic Corridor	2.2.2 Application of big data to support planning and optimization of electric vehicle charger locations			
			2.3.1 Demonstration of circular economy principles in the life cycle management of EV batteries such as extended producer responsibility and application of second life EV batteries within EEC			

3. Capacity building, up-scaling and knowledge sharing	Technical Assistance	3.1 Capacity development and knowledge exchange on lessons learned scaled-up to national, regional and global networks	3.1.1 Existing knowledge-exchange platforms and mechanisms strengthened with key national stakeholders based on lessons learned from EEC with focus on women engagement 3.1.2 Linkages created with regional and global platforms on electric mobility as part of the Global Electric Mobility Program. 3.1.3 Training sessions for public and private sector on life cycle solutions for EVs and batteries with focus on women participation	GET	282,000.00	3,000,000.00	
4. Monitoring and Evaluation	Technical Assistance	4.1 Adequate monitoring of all project indicators	4.1.1 Monitoring and independent mid-term review 4.1.2 Terminal project evaluation	GET	102,729.00	162,324.00	
Sub Total (\$)					2,774,729.00	18,747,524.00	
Project Management Cost (PMC)							
					GET	138,736.00	937,376.00
Sub Total(\$)					138,736.00	937,376.00	
Total Project Cost(\$)					2,913,465.00	19,684,900.00	

C. Indicative sources of Co-financing for the Project by name and by type

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount(\$)
GEF Agency	UNIDO	Grant	Investment mobilized	80,300.00
GEF Agency	UNIDO	In-kind	Recurrent expenditures	150,000.00
Recipient Country Government	Eastern Economic Corridor Office	Grant	Investment mobilized	95,600.00
Recipient Country Government	Eastern Economic Corridor	In-kind	Recurrent expenditures	800,000.00
Recipient Country Government	National Science and Technology Development Agency	Grant	Investment mobilized	400,000.00
Recipient Country Government	National Science and Technology Development Agency	In-kind	Recurrent expenditures	3,000,000.00
Recipient Country Government	Thailand Greenhouse Gas Management Organization	Grant	Investment mobilized	110,000.00
Recipient Country Government	Thailand Greenhouse Gas Management Organization (TGO)	In-kind	Recurrent expenditures	1,049,000.00
Private Sector	Electric vehicle manufacturers, Charging point operators, local public transportation fleet operators and drivers	Equity	Investment mobilized	14,000,000.00
Total Project Cost(\$)				19,684,900.00

Describe how any "Investment Mobilized" was identified

Investments thus far have been identified through consultations with stakeholders on funding priorities and pipeline of projects determined for the Eastern Economic Corridor (EEC) by government and private sector. EECO, NSTDA and TGO have all indicated providing funding in the form of grants and in-kind support towards the project. The Ministry of Industry has indicated that the automotive industry is presently the main economic activity generating revenue for the

country, accounting for 6.4% of Thailand's GDP in 2019, with over a dozen car assemblers and over 100 automotive parts companies located within the EEC. Preliminary discussions with the private sector (e.g., electric vehicle manufacturers, charging point operators, local public transportation fleet operators and drivers) on co-financing have been held and will be solidified through the PPG phase through further consultations and analysis of potential synergies. This had included investments in updating manufacturing processes for electrifying public transport and providing land for charging points.

D. Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount(\$)	Fee(\$)	Total(\$)
UNIDO	GET	Thailand	Climate Change	CC STAR Allocation	2,913,465	276,779	3,190,244.00
Total GEF Resources(\$)					2,913,465.00	276,779.00	3,190,244.00

E. Project Preparation Grant (PPG)

PPG Required



PPG Amount (\$)

100,000

PPG Agency Fee (\$)

9,500

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount(\$)	Fee(\$)	Total(\$)	
UNIDO	GET	Thailand	Climate Change	CC STAR Allocation	100,000	9,500	109,500.00	
					Total Project Costs(\$)	100,000.00	9,500.00	109,500.00

Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO ₂ e (direct)	351164	0	0	0
Expected metric tons of CO ₂ e (indirect)	1755820	0	0	0

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO ₂ e (direct)				
Expected metric tons of CO ₂ e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO ₂ e (direct)	351,164			
Expected metric tons of CO ₂ e (indirect)	1,755,820			
Anticipated start year of accounting	2022			
Duration of accounting	10			

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)				

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)
Solar Photovoltaic	2.00			



Indicator 11 Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	18,210			
Male	17,289			
Total	35499	0	0	0

Provide additional explanation on targets, other methodologies used, and other focal area specifics (i.e., Aichi targets in BD) including justification where core indicator targets are not provided

The project will result in an estimated direct emission reductions of 20,986 tCO₂e (as a result of technology demonstrations, GEF-funded and co-financed activities, and logframe activities) and an estimated direct secondary emission reductions of 330,178 tCO₂e (as a result of larger changes in mobility due to the combined effect of factors such as policy changes and behavioral changes occurring during the project period), at a cost per tonne reduction of 8.15 USD (total direct emission reduction only). Indirect emission reductions (as a result of scaling-up actions after the project implementation period) have been calculated at 1,755,820 tCO₂e (applying conservative multiplication factor of 5). 2 MW of solar PV will also be installed. This is a result of installation of 0.5 MW capacity for solar charging station for e-songthaews + 1.5 MW capacity of solar-powered charging stations (30 chargers, each supplied by 50 kW of PV installation). These estimations are based on increased use of electric vehicles and improved transport infrastructure. The methodology applied for GHG emissions under indicator 6 have been calculated based on the GEF “Manual for Calculating Greenhouse Gas Benefits of Global Environment Facility Transportation Projects”, consistent with other projects within the Global Electric Mobility Program. The exact targets will be reviewed during the PPG stage, considering “Emissions avoided” and “Increase in installed renewable energy capacity”. A complete explanation of these calculations has been included as an attachment. The project anticipates 500 direct beneficiaries of training, including under the regional support and investment platform as well as the global platform. An additional 34,999 individuals are estimated to benefit from riding new EV public transport. In total, based on a gender split calculation using the national gender percentages from the World Bank website, the project will benefit 18,210 women and 17,289 men directly, bringing the overall individual beneficiaries to 35,499. These calculations will be revisited as part of the PPG stage.

Part II. Project Justification

1a. Project Description

a) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed (systems description);

Inclusive and resilient transport is a critical part of a thriving economy and creating communities that are livable. However, existing linear practices in the transportation sector, such as independence on individual vehicle ownership, have created high levels of congestion that contribute to reduced economic productivity, health risks as a result of pollution, and the depletion of finite resources due to the demand and supply for vehicles and supporting infrastructure. Dependence on internal combustion engines (ICE) vehicles that run on fossil fuels has also resulted in the transportation being a significant contributor to greenhouse gas emissions. While innovation and dropping prices for renewable technologies are helping drive progress in the energy generation sector, decarbonizing the transport sector remains a significant challenge for countries around the world. In 2017, the transportation sector accounted for 24% of direct CO₂ emissions with 77% attributable to road vehicles (cars, trucks, buses and two-wheelers). In order to meet the sustainable development scenario goals, emissions from transport must peak around 2020 and drop by over 9% by 2030.

Globally, electric mobility has gained increased attention as a low emissions transport solution. Innovations in battery and electric drive technologies in tandem with high volatility in oil markets have increased the interest in electric mobility as a potential alternative to vehicles with internal combustion engines (ICE). Additionally, provided the electricity used by an electric vehicle (EV) comes from renewable energy, electric mobility can be seen as a climate smart solution to decarbonizing the transport sector. In this respect, distributed, low-carbon power generation from renewables alongside innovations in battery storage remain critical for ensuring the global environmental benefits of reduced GHG emissions in the transport sector are realized.

Despite growth in EV production and adoption, significant economic, regulatory and technical barriers exist to their mass adoption:

Economic barriers:

- EVs generally have higher price tags than conventional ICE vehicles.
- EVs face high costs of acquisition with fleet operators facing high capital costs to replace ICE vehicles with EVs (although EVs have very low operating costs)

Regulatory barriers:

- The characterization of EV charging as the sale of electricity or as a service.
- Tariff issues on charging stations and the cost-prohibitive prices on electricity.

Technical barriers:

- Charger standards and protocols not being standardized in countries resulting in lack of inter-operability.

- Grid stability related issues due to normal EV charging behavior place extra load on the grid during peak hours.
- Battery performance issues with respect to safety at high temperatures and the life cycle of the battery.

Information barriers:

- General awareness among policy makers, the private sector and the public about EVs, their performance, as well as incentives and regulations in place for their use
- Range anxiety due to EVs having limited range compared to ICE cars based on the size of the battery.

Climate change and drivers of GHG emissions

Thailand's vulnerability to climate change impacts has been well documented and acknowledged. In the past decade, recurrent extreme weather events such as droughts, extreme precipitation events, and heat waves have taken a heavy toll on both life and property and adversely affected the country's economic growth. Based on the Global Climate Risk Index (CRI) 2019 developed by Germanwatch, Thailand was ranked among the top ten countries which were most affected by weather-related loss events in 2017. The absolute losses in Thailand were estimated at USD 4,371 million or about 0.35 % of the country's GDP.

According to Thailand's Third National Communication, in 2013 total GHG emissions in Thailand were 319 MtCO_{2e} and 74% of the total GHG emissions came from the energy sector, of which energy use in the transportation sector accounted for around 26% (whereas public electricity generation and heat production accounted for 42% and manufacturing industries and construction accounted for 20%). In other words, energy use in the transportation sector accounted for 19% of the country's total GHG emissions. Within the transportation sector, road transport (cars, trucks, buses and two-wheelers which are dependent on fossil fuels) contributed the most to CO₂ emissions, accounting for 97% of the total transport emissions.

Thailand submitted its Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat on the first of October, 2015. Thailand communicated that it intends to reduce its greenhouse gas (GHG) emissions by 20% from the projected business-as-usual (BAU) level by 2030 (approximately 111 MtCO_{2e} of projected 555 MtCO_{2e} BAU total). The level of contribution could increase up to 25%, subject to adequate and enhanced access to technology development and transfer, financial resources and capacity building support through a balanced and ambitious global agreement under the UNFCCC. As a framework for developing an action plan of implementation to meet the GHG mitigation target in 2030, Thailand's NDC Roadmap on Mitigation 2021-2030 (NDC Roadmap 2021-2030) was prepared. The NDC Roadmap 2021-2030 was approved by the cabinet in May 2017 and included GHG reduction measures in three sectors, i.e., the energy and transportation sector, the industrial process and product use sector, and the waste management sector, as these three sectors were considered as major sectors that have the potential and the readiness to meet the GHG mitigation target in 2030.

Transportation sector and barriers that need to be addressed

With regard to the transportation sector, one of the key sectors for achieving the mitigation target, the NDC Roadmap on Mitigation 2021-2030 states a total mitigation target of 41 MtCO_{2e} and indicates that an improvement in the efficiency of energy use in the transportation sector could contribute to a total reduction of 31 MtCO_{2e} and the use of biofuels in the transportation sector could contribute to a total reduction of 10 MtCO_{2e}.

Despite its potential and relative readiness to meet the GHG mitigation target in 2030, significant challenges remain to be addressed in the transportation sector. The Thai government has been implementing a Master Plan for Sustainable Transport System and Mitigation of Climate Change Impacts, which identifies and addresses 5 barriers or measures/instruments that are missing and need to be implemented including;

- Infrastructure Planning and Travel Management Instrument (P)
- Policy and Regulatory Instrument/Incentive (R),
- Economic Instrument (E)
- Information instrument (I) to increase awareness about sustainable transport and environmental cost
- Technology instrument (T) to enhance the use of low emissions vehicle technology

These 5 measures/instruments will contribute to the following: “Avoiding travels”, “Shifting travel/transport modes”, and “Improving energy efficiency of transport modes/vehicle technologies”, or “A-S-I” approach which is a common paradigm, under which sustainable transport development is presented. “Avoiding” refers to improving the overall efficiency of the transport system through integrated land-use planning and transport demand management, thereby reducing the need to travel or length of trips. “Shifting” involves improving trip efficiency by moving individuals towards transport options that are more environmentally friendly, such as non-motorized transport (NMT) like walking and cycling, or public transport (PT) like bus and rail. Lastly, “Improving” speaks to the need to improve the energy efficiency of transport modes and vehicle technology

Electric mobility as a key area of climate change mitigation action and economy driver

Furthermore, the Thai government has considered electric mobility as a low GHG and Particulate Matter (PM) emissions transport solution, and a potential alternative to vehicles with internal combustion engines (ICE), while decarbonization of the country’s electricity grid is planned.

According to the Power Development Plan 2015-2036, the percentage of renewable energy (including hydro) in electricity generation will increase from 8% in 2015 to 15-20% in 2036, while the percentage of natural gas in electricity generation will decrease from 64% in 2015 to 30-40% in 2036, and the percentage of coal in electricity generation will stabilize around 20% during 2015-2036).

In 2015, the Thai government, led by the Ministry of Energy, proposed measures to reduce the country’s energy intensity. One measure is to reduce energy use in the transportation sector through the adoption of electric vehicles, and set the target of the adoption of plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) to be 1.2 million vehicles in 2036. The NDC Action Plan in the transportation sector approved by the cabinet in 2018 also includes existing projects and plans on an expansion of electric vehicles, a purchase/leasing of electric and hybrid public buses, and also includes recommended projects and plans on a replacement of air-conditioned public vans with electric mini buses, a replacement of public taxis and pick-up trucks with hybrid vehicles, and a replacement of delivery motorcycles with electric motorcycles in Bangkok, and 6 regional cities including Chiangmai, Kon Khaen, Pitsanulok, Phuket, and Songkhla.

In addition to being a low GHG and PM emissions transport solution, the Thai government has considered and identified electric mobility to be a driver of Thai economy in the future. In 2015, the Thai cabinet approved next-generation automotive industry to be one of the 10 targeted industries that will drive Thai economy in the future (industries with high potential as new-growth engines for Thailand). Next generation automotive industry includes electric vehicles (EVs), connected vehicles, autonomous vehicles, and shared mobility. In 2017, the cabinet also approved measures to support the production of electric vehicles and set the target of the total production of any electric vehicles (xEV) to be 25% of the total production in 2036. Additionally, under the 20-year National Strategy, measures were included and addressed to accelerate the development of Thailand’s automotive industry to be a smart electric automotive industry or an automotive industry based on alternative energy, building upon Thailand’s automotive industry hub as one of the world’s important automotive production hubs (the world’s 11th largest producer, and Asia’s 5th largest producer in 2019). The automotive industry serves as an important foundation for economic development in Thailand, where its export values accounted for 6.4% of Thailand’s GDP in 2019. The Thai government has identified the shift from a

production base focused on traditional automotive manufacturing to one that focuses on modern automotive manufacturing (electric vehicles and automotive vehicles) as an opportunity for the country. Thailand has an abundance of skilled labor with over 700,000 laborers in the automotive industries that can support EV production.

Gaps and barriers to adoption and production of EVs in Thailand:

According to the Policy Recommendations on Thailand Development of Next-Generation Automotive Industry, proposed to the Office of Industrial Economics, Ministry of Industry in 2020 and prepared through a one-year research by the Thai Automotive Institute (TAI) in collaboration with 3 partners including Office of National Higher Education Science Research and Innovation Policy Council (NXPO), National Science and Technology Development Agency (NSTDA), Faculty of Engineering of Chulalongkorn University, the government needs to develop and implement measures that address the following gaps and barriers to adoption and production of EVs in Thailand.

On the supply side:

- **New product and production standards related to EVs and testing facilities:** A total of 21 standards have so far been issued by the Thai Industrial Standards Institute (TISI). The Committee will consider approving around 40 additional standards for next-generation vehicles, around 20 of which will be finished within this year, and the other 20 standards will be finished next year. TISI classifies Thai standards for EVs into 9 categories: 1) Sockets and outlets, 2) Charging systems, 3) Safety for various types of EVs, 4) Performance, 5) Motors, 6) Batteries, 7) Other equipment, 8) Communication system, and 9) Others. So far, Standards under Category 1, 2 and 5 and 7 have been almost completely developed and issued. However, most of standards under Category 3, 4, 6, and 8 have not been developed. In addition, NSTDA has focused upon the development of prototypes of certain types of vehicles for which Thai entrepreneurs have capability to upgrade their production, and to compete in the world markets, particularly BEV niche markets, including electric buses, electric minibuses, electric motorcycles, electric boats/ferries. Standards related to these other types of EVs such as buses, songthaews (modified pick-up trucks) and boats in Thailand have not been developed and issued. Thus, overall, lack of standards as well as facilities for testing standards developed and to be developed is still a barrier to manufacturing of EVs in Thailand.
- **Thai entrepreneurs' technical capabilities on EVs and related technologies (particularly for the design and manufacturing) (reskill and upskill) and for the preparation of new skill labor for the EV industry:** A gap exists for technical expertise on EV manufacturing and related technologies. There is a need for increased professional development opportunities on EVs in education institutions. The Thai Automotive Institute (TAI) in collaboration with the Office of Industrial Economics provides capacity building for technicians on Fundamentals of Electric Vehicles Technologies. In addition, the Department of Industry Promotion has provided a course and raised awareness about EV and autonomous vehicles, including producing manuals on next generation vehicles. However, TAI's courses are only for technicians and only address the fundamentals of EV technologies while the Department of Industry Promotion has just started a course in 2020 as its first year for 40 participants. TAI has also identified the need for upgrading the current Thai entrepreneurs in the areas of the design and the manufacturing of EVs, and for the Office of Higher Education Commission (OHEC) under the Thai Ministry of Higher Education, Science, Research and Innovation to collaborate with technical universities to develop program or curricula particularly in the areas of the design and manufacturing of EVs and to prepare new skill labor for the EV industry. As described earlier in the section, there is a need for increased professional development opportunities on EVs in education institutions.
- **Ecosystem for EV entrepreneurship:** In addition to the need for technical capacity, support is necessary for enhancing an ecosystem for EV entrepreneurs. This includes targeted financial support and building local SMEs and regional and global markets. While there is an existing entrepreneurship ecosystem in the EEC, there are only a few components of EV entrepreneurship ecosystem such as some EV charging operators, some EV

users, and some manufacturers of vehicles which can potentially manufacture EVs. The existing entrepreneurship ecosystem is not complete and needs to be enhanced. The expected target for the entrepreneurship support program is to enhance the existing entrepreneurship ecosystem to be a complete and sustainable ecosystem and can be used as a model for replication in other regions/areas of the country.

· **Research and development activities on EVs and EV parts:** To enhance sustainable competitiveness of the supply chain in the commercialization stage. Some manufacturers have received incentives for EV manufacturing. However, these manufacturers are mostly foreign companies that make or will make mostly electric cars. Therefore gaps in the manufacturing of other types of electric vehicles remain in Thailand.

On the demand side:

· **Consumers' awareness and understanding of EVs and related technologies:** Particularly in terms of safety, usage and maintenance of EVs.

· **Use of EVs for public transportation in pilot areas such as in smart cities.** In addition, demonstrations of RE-EV integrated charging technologies are necessary for derisking investments in integrating renewable sources of energy with charging infrastructure and demonstrating smart charging technologies.

· **Financial and non-financial incentives for EV consumers:** While several supply side incentives are in place to encourage EV manufacturing, there is a need for increased financial and non-financial incentives targeting EV consumers and public and private fleets. Based on EVAT's recent evaluation of the progress of the government's provision of financial and non-financial incentives for EV consumers, the progress with respect to creating sufficient incentives and making the prices of EVs affordable or appropriate for people to purchase has been considered relatively low. TAI has also identified the need for different stakeholders to work together to create more and stronger incentives.

· **Regulations related to EV charging business and related infrastructure such as charging stations and power grid to support widespread use of EVs:**

Although targets have been set, additional support and preparation is necessary for encouraging expansion of EV charging infrastructure across the country. Limited subsidy for selected charging stations has been provided but there is not sufficient financial support for other potential charging service providers as well as related regulations such as regulations to set electricity tariff at charging stations which still hinder the expansion of charging business.

Decarbonization of transport sector:

Existing potential for decarbonization of the transport sector, apart from e-mobility (which is heavily dependent on electricity emission factor), covers the use of bio-fuels and hydrogen. While the bio-fuels constitute a relatively easy-to-implement mean of transport decarbonization it can have a negative side-effects for indirect GHG emission increase due to deforestation, land use change, agriculture and processing of biofuels, therefore it should not be considered as a major option for decarbonization. Another alternative is hydrogen, which also provides zero end-pipe GHG emissions, but the process of H₂ production is highly energy intensive – and depending on the source of this energy the net effect for the GHG emissions may be minimal reduction or even increase.

Considering further development of renewable energy capacity in Thailand with high solar energy potential, accompanied by other renewable energy sources, shifting the transport sector into e-mobility is the most rational solution to be introduced in the country. Increasing renewable generation in the country would also allow for more widespread use of hydrogen generated with the use of renewables, which would allow for further GHG emission reduction from transport (specifically heavy duty transport) in future.

According to IEA report on hydrogen (June 2020), low-carbon production capacity [for hydrogen] remained relatively constant and is still off track with the Sustainable Development Strategy. More efforts are needed to: scale up to reduce costs; replace high-carbon with low-carbon hydrogen in current applications; and expand hydrogen use to new applications. Therefore despite the fact that hydrogen has long been known as a potential low-carbon transport

fuel, establishing it in the transport fuel mix has been difficult mainly due to much higher investment cost compared to electric mobility solutions. Hydrogen is suitable for decarbonisation of industry and this particular solution would be more significant for mitigating GHG emission in Thailand.

By implementing demonstration charging installations powered with renewables (PV) the project would stimulate the demand for such infrastructure, which would use grid power only as a backup source for energy. This would make GHG reductions in transport less reliant on the national grid emission factor.

b) the baseline scenario and any associated baseline projects,

The gaps and barriers identified above highlight the additional actions necessary for Thailand to accelerate its adoption of electric mobility nationally in addition to existing actions already being taken. This section will now provide an overview of current baseline and is followed by the alternative scenario which will outline how this project will address the aforementioned gaps and barriers.

Baseline scenario

Electric vehicles

Existing policy and institutional framework (addressing both supply and demand sides)

In order to efficiently and effectively drive the development of electric vehicle industry in Thailand and to ensure an integrated and coherent plan, policy, and implementation, in February 2020, the Thai Prime Minister appointed the National Electric Vehicle Policy Committee. The Committee consists of the prime minister or deputy prime minister as the chairman, Minister of Industry, Minister of Transport, Minister of Energy, Permanent Secretary of Ministry of Transport, Permanent Secretary of Ministry of Energy, Secretary General of the Board of Investment Office, Secretary General of the National Economic and Social Development Board Office, President of the Thai Federation Industries, President of the Thai Chamber of Commerce, President of the Electric Vehicle Association of Thailand, and some experts, as committee members, as well as, Permanent Secretary of Ministry of Industry as a committee member and the secretariat, and Director General of the Office of Industrial Economics, and Director General of the Energy Policy and Planning Office, as committee members and assistants to the secretariat.

The National Electric Vehicle Policy Committee has the following duties and authorities; 1) direct and set targets of the development of electric vehicles to be consistent with the 20-year National Strategy and approvals of the cabinet; 2) consider and approve plans, action plans, projects of the government that are related to electric vehicle development to be consistent with the 20-year National Strategy; 3) ensure an integrated plan and implementation, monitor and evaluate the implementation, give advice to ensure that policies are effectively implemented; and 4) appoint working groups to support the Committee.

While much has so far been in place on the supply side to encourage EV manufacturing in Thailand, including product standards, plan and targets, policy incentives and measures (both tax and non-tax incentives), research and development, and technical capacity building, less has been in place or implemented on the demand side to encourage widespread use of EVs.

An overview of electric mobility in Thailand is now presented from the supply and demand side.

On the supply side:

Regulatory framework:

In March 2020, the Industrial Product Standards Committee approved the standards for 4-wheeled electric vehicles for goods and passengers transport following the approval of the standards for electric motorcycles in January 2020. A total of 21 standards have so far been issued by the Thai Industrial Standards Institute (TISI). The Committee will consider approving around 40 additional standards for next-generation vehicles, around 20 of which will be finished within this year, and the other 20 standards will be finished next year.

As for charging stations, there are currently three types of standards that have been issued by TISI; 1) Standards for Sockets-Outlets, 2) Standards for Charging Cabinet (Chargers), and 3) Standards for LEV Charging such as light weight motorcycle charging. The first two standards were proposed by NSTDA, and the third standard was proposed by the Thai Automotive Institute. All the three standards were issued as voluntary standards by TISI.

The Thai Automotive Institute plans to open a new laboratory for testing batteries for electric vehicles within this year at the Automotive and Tyre Testing, Research and Innovation Center (ATTRI) in Chachoengsao province, in the EEC area. The laboratory is sponsored by TISI. In 2020, the testing can be done for certain items, but in 2021, the laboratory will be fully open for ASEAN countries.

With regards to battery recycling/reuse, there are related regulations and there is a working group chaired by Pollution Control Department and Industrial Works Department set up under the Basel Convention, and a working group on Energy Storage System chaired by the Ministry of Energy that addresses the issue of battery recycling.

Plan and targets:

The National Electric Vehicle Policy Committee, in its first meeting in March 2020, discussed a draft EV master plan which lays out the following targets: 1) Thailand becomes an industrial hub of electric vehicles production within 5 years; and 2) 30% of total car production of 2.5 million units in 2030 (i.e., 750,000 units) would be electric vehicles. A short-term plan (2020-2022) targets vehicles of the government and public buses, and electric public motorbikes of 60,000-110,000 units, while a medium-term plan (2021-2025) targets eco electric vehicles and smart city buses of 250,000 units (including 3,000 smart city buses), and a long-term plan (2026-2030) targets eco EV (zero emission and shared mobility in Bangkok and large cities) 750,000 electric vehicles, or equivalent to 30% of the total car production of 2.5 million units/year. At present, the government is drafting a roadmap for EV production to serve as a national master plan for EVs, which will be finalized this year.

Policy Incentives/measures:

Board of Investment (BOI) incentives

BOI has a role of investment promotion and business matching. BOI provides both tax and non-tax incentives/measures to support supplier development in the EV supply chain, including EV, EV parts, and EV charging stations. EV manufacturing is considered by BOI as infrastructure activities for the country's development, activities using advanced technology to create value added with no or very few existing investments in Thailand, or as high technology activities which are important to the development of the country, with a few investments already existing in Thailand.

Tax incentives include:

- Exemption of import duties on machinery
- Exemption of import duty on raw or essential materials imported for use in production for export
- Exemption of corporate income tax for 5 or 8 years, depending on the type of activity

Non-tax incentives include:

- Permit for foreign nationals to enter Thailand for the purpose of studying investment opportunities
- Permit to bring into Thailand skilled workers and experts to work in investment promoted activities
- Permit to own land in Thailand
- Permit to take out or remit money abroad in foreign currency

Thailand, which is Southeast Asia's largest automotive production hub, has no local content requirement for auto industry, making supply chain management more convenient for manufacturers, but one condition/requirement for EV car makers to receive BOI incentives is to include battery management.

BOI is also in the process of arranging incentives for electric motorcycle producers, which will be similar to those for electric car producers and will include the exemption of corporate income tax and the reduction of excise tax. One requirement for electric motorcycle producers to receive incentives is to produce a key part of motorcycles such as motors. Companies that are ready to produce electric motorcycles in Thailand include, Harley, BMW, and Chinese/Japanese and American companies.

Special excise tax rate:

For HEVs and PHEVs, the tax is reduced to 50% of the normal tax rate till 2025, and for BEVs, the tax is 0% till 2022, and will be 2% till 2025.

Current status of vehicles manufacturing in Thailand:

According to Thai Automotive Institute, there are currently two types of producers of vehicles in Thailand; 1) Assemblers: There are 19 car assemblers and 10 motorcycle assemblers. Out of all these companies, all are foreign companies except one Thai company; 2) Autopart makers/suppliers (including process, body, electrical and electronics, powertrain, and suspension): Tier 1 supplier: there are 523 companies (most of which are pure-foreign or foreign-majority companies); Tier 2 supplier: there are 1,667 companies (about half of which are pure-Thai companies)

To date, COVID-19 has had the strongest negative impact on Thailand's automotive sector as indicated by the drop of manufacturing performance indicator (MPI) in April 2020 of about 82% year on year, showing the lowest production since 1987. Although survey data conducted by UNIDO indicates that global value chain firms have demonstrated a faster recovery capacity in Thailand than other sectors, the recovery time of global value chain (GVC) firms is expected to depend greatly on the situation of trading partners. Since April, the Government has also announced several key government schemes to support struggling enterprises.

Current status of electric vehicles manufacturing:

BOI approved projects

With the ongoing shift towards EV in the global, regional and domestic markets, Thailand is counting on its strong foundation in the automotive and support sectors, as well as its strategic location, and comprehensive investment incentives to attract car makers investment in EV manufacturing. The Thai Board of Investment (BOI) has already approved 24 projects by car makers to produce in the country electric vehicles of all types, including hybrid electric vehicles

(HEVs), plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs), with a combined capacity of over 500,000 units per year. 2 bus-EV projects (SCANINTER, and SAKUN C) have also been approved. Car makers which have been granted EV manufacturing privileges include, for instance, Toyota, Honda, Nissan, Mazda, Mercedes-Benz, BMW, SAIC Motor-CP, FOMM, Mitsubishi and Mine Mobility.

According to BOI, the approved projects include Mitsubishi Motors (Thailand) Co., Ltd.'s 5.48 billion baht investment to upgrade the company's existing car production line at Laem Chabang Industrial Estate to allow the annual production from 2023 of a total of 39,000 electric vehicles, consisting of some 9,500 BEVs and 29,500 HEVs. In June 2020, the BOI also approved a 5.5 billion baht investment by Sammitr Group for the production, in Phetchaburi province, of 30,000 BEVs. Both projects, like most others, will aim at the local market and exports, mainly to other ASEAN countries.

Other manufacturers of which projects have been approved include BMW (production of PHEVs and partnership with the DRÄXLMAIER Group for the production of high-voltage batteries and battery modules), FOMM, a new Japanese EV brand which name means "First One Mile Mobility", which has started making compact BEVs at a plant in Chon Buri province, and Nissan Motor which has for several years made significant investment in hybrid car production in Thailand and received approval recently for a new BEV production project. Other car makers that have been granted BOI incentives for the production of BEVs in Thailand include, for instance, Suplaor, and Takano Auto.

Besides the 5 HEV projects, 6 PHEV projects, 13 BEV projects, and 2 bus-EV projects approved since the BOI first rolled out a comprehensive set of incentives covering all major aspects of the EV supply chain, the BOI has also approved 10 battery production projects with a total capacity of half a million units per year and 2 charging station production projects that will make more than 4,400 outlets per year.

Circular economy principles have been integrated in the manufacturing of EV and EV parts in the aspect of designing EV to be lighter, such as using aluminum replacing steel parts. Other than this, circular economy principles have been little integrated in the EV production. However, auto parts such as Lithium ion batteries are reused for energy storage for PV systems. Recycling of auto parts has not been implemented.

Research and development:

As those manufacturers that have received BOI incentives for EV manufacturing are mostly foreign manufacturers that make or will make mostly electric cars, gaps in the manufacturing of other types of electric vehicles remain in Thailand.

NSTDA is a key government agency in Thailand that has conducted several technical research projects related to the development of electric vehicles manufacturing (see baseline projects later in this section). The agency has aimed at conducting basic research, developing prototypes and enhancing ecosystems for the automotive industry. The agency has focused upon the development of prototypes of certain types of vehicles for which Thai entrepreneurs have capability to upgrade their production, and to compete in the world markets, particularly BEV niche markets, including electric buses, electric minibuses, electric motorcycles, electric boats/ferries. Also, the agency's research has focused on the development of industrial production of key parts of electric vehicles such as motors, control units, battery packs, and chargers. Besides, NSTDA has focused on human resource development.

Other private sector investment in EV manufacturing:

Apart from the BOI approved projects which manufacture or will manufacture electric cars and motorcycles and apart from private companies which have in collaboration with NSTDA developed prototypes of electric vehicles, there are few companies which manufacture other types of electric vehicles. Choedchai Corporation in Nakorn Rajsrima is one which has developed and manufactured other types of electric vehicles such as hybrid low-floor buses, and electric low-

floor buses in collaboration with Suranaree University of Technology and Provincial Electricity Authority (PEA).

Technical capacity building:

NSTDA has supported King Mongkut University of Technology North Bangkok to initiate a project on the contest of the development of prototypes of electric vehicles (EV Cup) aiming to develop students' capability at lower than the undergraduate level in the design of electric vehicles. The Thai Automotive Institute in collaboration with the Office of Industrial Economics also provides capacity building for technicians on Fundamentals of Electric Vehicles Technologies (such as courses on Electric Vehicle and Dynamics, Drive System of Electric Vehicles, Battery Management System, Electric Vehicles Charging Stations and Impact on Power Grid, Light Weight Metals and Composite Materials for Next Generation Car). The courses aim to support the development of electric vehicles industry. In addition, the Department of Industry Promotion has provided a course and raised awareness about EV and autonomous vehicles, including producing manuals on next generation vehicles.

On the demand side:

On the demand side, a plan and targets and policy incentives have so far been in place to encourage widespread use of EVs.

Plan and targets:

In 2015, the Ministry of Energy made a plan for the adoption of EVs and the provision of charging stations, including improving related regulations, support for research on batteries, support for the use of EVs for public transportation such as 3-wheelers, and preparing related infrastructure such as power grid and charging stations. The Ministry of Energy set targets of 1.2 million EVs with more than 690 charging stations nation-wide by 2036.

Policy incentives and measures:

Charging station subsidy program

During 2016-2018, the Energy Conservation Promotion Fund (ENCON Fund) provided financial support for service providers (both government agency, public enterprise, and private companies) to establish charging stations. For fast charge, service providers owned by the government received 1.8 million Baht, while those owned by public enterprise received 1 million Baht, and private companies received 30% of the cost of the chargers. For normal charge, service providers owned by the government received 1.9 million Baht, while those owned by public enterprise received 1 million Baht. The Electric Vehicles Association of Thailand (EVAT) was the implementing agency of the charging station subsidy program.

Electricity tariff incentive

In March 2020, National Energy Policy Council has approved the tariff of around 2.63 Baht/kWh for charging EV, making a higher cost saving for EV compared to internal combustion engine vehicles.

Current use of EVs:

Number and types of EVs and charging stations

In Thailand, types of electric vehicles in use include Hybrid EV (HEV), Plug-in Hybrid EV, and Battery EV (BEV). The current use of the EVs includes all range of vehicles from delivery truck, bus, three-wheelers, personal vehicle (sedan), and motorcycle. According to figures from the Department of Land Transport, Ministry of Transport, as of 30 June 2020, there were 167,767 HEVs/PHEVs and 4,301 BEVs. Personal car (sedan) accounts for nearly all or 96.7% of

HEVs/PHEVs and electric motorbike accounts for 53.5% of the BEVs. Out of the total number of 4,301 BEVs, there were 120 BEV buses and 149 three-wheelers. EV adoption has been growing continuously, with more than 13,214 new HEVs/PHEVs and more than 3,076 battery electric cars and motorcycles registered during Jan 1-June 30, 2010, according to the Electric Vehicle Association of Thailand. However, Thailand's present overall stock of EVs remains below 1%.

Regarding charging stations, as of 11 August 2020, there were about 10 service providers, 1818 charging outlets, 606 of which were fast chargers, and 1,212 were normal chargers, in 557 locations. Fast chargers (DC) are mostly available for passenger cars (and buses) at electricity utilities such as PEA, Metropolitan Electricity Authority (MEA), and Electricity Generating Authority of Thailand (EGAT). In Thailand, currently there is no smart charging of V2G type, as the regulation does not yet allow exporting power to the grid. There is only a stand-alone charging station integrated with PV system at PEA Headquarter. Most of charging stations are connected to the grid.

Baseline projects:

The importance of EEC and EEC projects

The project's overall target geography is Thailand, with demonstrations in the Eastern Economic Corridor (EEC). The EEC is a region comprised of three provinces: Rayong, Chon Buri and Chachoengsao. Thailand's aim of developing the EEC is to establish it as an example of livable, smart community development and as a leading economic area for manufacturing, trading, export and logistics in ASEAN with comprehensive logistic connections to Asian countries and the world. High performance batteries and modern transports have been made a focus industry for innovation clusters under the Eastern Economic Corridor (EEC).

The EEC covers a space of 13,285 km² and has a population of approximately 4 millions with a projection of reaching 6 millions by 2037. Population growth is expected to place even greater pressure on infrastructure and services in the region. With respect to transport, if commuting by fossil fuel-based vehicles remains the dominant modal share car, the carbon emissions of the region are estimated to rise significantly.

The EEC will be developed to include smart cities and promoted zones such as digital park and medical hub in Chon Buri and innovation park in Rayong. Innovation park or the Eastern Economic Corridor of Innovation (EECi) is a comprehensive innovation ecosystem designated under the NSTDA to facilitate investment in research and innovation and human resource preparation for Thailand's targeted industries under the cooperation between government, private sector and academia.

Next-generation automotive industry is among Thailand's 10 targeted industries, and thus EECi will be developed to have complete infrastructure of the industry with attention to a multitude of areas including battery/energy storage, vehicle system integration and smart energy living labs. Attention is also being given to advancements in material technology to reduce vehicle weight. In addition, next-generation automotive hub and electric vehicle learning laboratory will be developed within the medical hub in Chon Buri next to EECi.

The EEC Policy Committee is the primary Royal Thai Government collective force chaired by the Prime Minister of Thailand. The Government has indicated funding for several projects in the EEC including 12 billion USD for new cities and 15 billion USD for industry. A key priority for investment and development in the EEC is the development of smart cities. 7 elements of Thailand smart city include smart living, smart people, smart environment, smart mobility, smart energy, smart economy, and smart governance. An example of new urban development includes the planned expansion of U-tapao airport within the Rayong

Municipality and the development of Laemchabang in Chon Buri, a coastal city with the largest port in Thailand. Additionally, significant investment is being directed towards developing connectivity in the region through infrastructure projects, including a high-speed train, double-track rail lines, expansion of ports and U-Tapao Airport, and encouraging investment in the 10 targeted industries identified by the government.

Several ongoing and announced projects as well as completed projects of particular relevance to this project

· The Regional Transport and Traffic Promotion Bureau (RTPB) of the Office of Transport and Traffic Policy and Planning (OTP) has recently completed a project to develop a Master Plan for the Development of Public Transportation in Chachoengsao, Chon Buri, and Rayong provinces to Support the Development of the EEC. The project aimed to i) formulate the Master Plan for the Development of Public Transportation in Chachoengsao, Chon Buri, and Rayong provinces to Support the Development of the EEC; and ii) conduct preliminary feasibility study of the public transportation system which connects and supports the development of the transport infrastructure projects in the EEC, including the expansion of U-Tapao airport project, the high-speed train connecting 3 airports project, the double-track rail lines project, and the development of ports project. Based on the Master Plan, 18 routes within the 3 provinces were identified, and electric vehicles including electric minibuses, electric buses, tram buses, and trams were proposed as the most appropriate means of public transportation to replace existing modes of transportation in these 18 routes within the EEC area.

The proposed project aims to build on this project and the effort of RTPB OTP through a demonstration of the use of electric buses in one of the 18 routes. OTP RTPB has also implemented other projects to develop the Master Plan for the Development of Public Transportation in other cities such as Phuket, Chiang Mai, Songkhla, Nakornrajsima, and Kon Khaen, and will be able to take lead in disseminating and replicating experiences from the EEC to these cities and to the national level.

· Thailand Greenhouse Gas Management Organization (TGO) has developed and implemented the “Integrating Climate Actions into EEC: Towards the Low Carbon Industry” project. As part of this project, TGO has performed a gap analysis using a questionnaire distributed to 150 factories in the EEC, surveys and in-depth interviews with 30 factories, and a review of energy management reports of designated factories. Based on analysis of 73% of the designated factories in the EEC, energy consumption and greenhouse gas emissions from designated factories were 25,125ktoe or equal to 94,681 ktCO₂. This figure also represents 37% of total emissions from designated factories in Thailand. With respect to the priority S-Curve industries, the automotive industries had the highest share of reported emissions, accounting for 44.95% of total reported emissions. Regionally, Chon Buri accounted for 52.99% of emissions, followed by Rayong (27,2%) and Chachoengsao (19.89%). TGO has proposed based on their analysis five policy recommendations to promote GHG management and reduction in the EEC: policy and organizational management; legal; technology; finance and capacity development.

· TGO has also implemented the “City Carbon Footprint” Project since 2014 in order to help cities calculate their footprint (based on GHG protocol calculation methodology), identify mitigation potential which will help them prepare mitigation action plans in their cities, including action on their transportation sector. As of now, there are 94 municipalities and 17 provinces which participated and calculated City Carbon Footprint (CCF). In addition, there are 214 municipalities which participated in the TGO Carbon Footprint of Organization (CFO) project to calculate and identify mitigation potential to reduce GHG in their organizations. In the next Fiscal Year, which will start in October 2020 till the end of September 2021, TGO under the EEC Integrated Budgeting Plan, will implement the “City Carbon Footprint” Project in the EEC area (Rayong, Chachoengsao, and Chon Buri provinces).

The results of this project could be relevant to the proposed project, as they could provide baseline GHG emissions for pilot areas for demonstration of the use of EVs within the EEC area.

· NSTDA has conducted several technical research projects related to the development of electric vehicles manufacturing (see below). The agency has aimed at conducting basic research, developing prototypes and enhancing ecosystems for the automotive industry. The agency has focused upon the development of prototypes of certain types of vehicles for which Thai entrepreneurs have capability to upgrade their production, and to compete in the world markets, particularly BEV niche markets, including electric buses, electric minibuses, electric motorcycles, electric boats/ferries. Also, the agency's research has focused on the development of industrial production of key parts of electric vehicles such as motors, control units, battery packs, and chargers. Besides, NSTDA has focused on human resource development.

· The agency has worked with 4 partners including the Bangkok Mass Transit Authority (BMTA), Electricity Generating Authority of Thailand (EGAT), Metropolitan Electricity Authority (MEA) and Provincial Electrical Authority (PEA) to improve Thai entrepreneurs' technical and capacity potential to have their own knowledge and technology for electric buses. This project also aims to develop new knowledge of ICE to electric bus conversions as well as develop an understanding of components that could be provided by Thai manufactures in order to decrease the volume of imported electric buses.

The agency has in collaboration with several Thai universities developed 4 prototypes of electric buses from BMTA's used buses, which can now be registered as public buses and be operated legally and safely. The potential for BEV electric buses is estimated to be 600-700 buses. An extension of the above project includes the research and development of a charging station prototype, up to IEC and SAE standard, to be used by BMTA's electric buses, by the National Electronics and Computer Technology Center (NECTEC) under NSTDA. The charging station prototype will be also used for collecting related data and developing energy management systems.

In addition, the agency has in collaboration with a private bus producer in Nakorn Rajchasma province and a few Thai universities developed prototypes of large electric inter-city buses based on fast charge and studied various related issues such as minimizing impact on power grid system and satisfying customers' demand, safety standards, tariffs for charging, total cost of ownership, and environment impact.

- As for electric minibuses, the agency has in collaboration with a group of private companies developed prototypes of electric minibuses with the length between 7 and 8 meters to replace public vans as supported by the government policy. The agency has also developed these electric minibus to be lighter, with aluminum replacing steel parts. Besides, the agency is in the process of developing a prototype of induction motors for minibuses and aims to support industrial production of electric minibuses.

Also, the agency is completing research and developing a prototype of three-phase induction motors for microbuses. Induction motors are inexpensive, easy to produce and control compared to standard EV motors.

- Regarding electric motorcycles, the agency has in collaboration with a private company developed a prototype BEV motorcycle. As for electric boats, the agency has in collaboration with private companies developed prototypes of key parts and core technologies of electric boats. The agency has also just signed an MOU with Marine Department and private sector for the development of electric ferries.

The proposed project will build on these projects of NSTDA and knowledge developed, particularly related to electric buses (e.g., knowledge and lessons of the conversion of ICE vehicles to electric buses). As a national agency, NSTDA could provide linkages with the national level through sharing knowledge developed and lessons learned as well as upscaling the manufacturing and adoption of these electric vehicles in other parts of the country, through a demonstration of the use of electric buses for public transportation in one of the 18 routes within the EEC area.

Related projects from development banks, bilateral organizations, and/or other partners

- Under GEF-4, the World Bank completed the “Chiang Mai Sustainable Urban Transport” project. The project aimed to improve the technical capacity of Chiang Mai Municipality (CMM) and the city administrator, for sustainable urban transport development through technical support on integrated land use and sustainable urban transport planning and pilot demonstration of non-motorized transport (NMT) improvement. CMM was the recipient of the GEF grant and the executing agency of the project, and the Regional Transport and Traffic System Promotion Bureau (RTPB) of the OTP, was an implementation partner, that provided overall policy guidance, technical assistance and supervision support to CMM in designing and implementing the pilot demonstration project. OTP RTPB lead in disseminating and replicating experiences from Chiang Mai to relevant cities in Thailand and Mekong region.

As mentioned earlier, OTP RTPB has also completed projects to develop the Master Plan for the Development of Public Transportation in other cities such as Chiang Mai. Exchanges with Chiang Mai Municipality and the World Bank’s team are envisioned to take place during the PPG, in particular to understand the challenges that the project faced with the implementation of the master plan that took place after the GEF project completion, as well as technology demonstration activities.

- Under the Electric Mobility Program of the United Nations Environment Program, UN Environment is supporting a large group of low- and middle-income countries with the introduction of electric mobility policies and pilots. As for the electric two and three wheelers workstream UN Environment is supporting eight countries with the introduction of electric two- and three-wheelers. These are Kenya, Uganda, Rwanda, Ethiopia, Morocco, Philippines, Vietnam and Thailand. The emphasis is on introducing policies and incentives for the introduction, removing administrative hurdles, and piloting of electric motorcycles. It is working with local operators, companies and governments, and includes financing and local production and assembly for a wider uptake of electric motorcycles.

- Building on the aforementioned UNEP programme and a host of other global electric mobility initiatives, the GEF 7 Global Program to Support Countries with the Shift to Electric Mobility (hereafter the Global Program) will support the rapid introduction of electric mobility in GEF recipient countries. The program was submitted initially with the following 17 child projects (Antigua & Barbuda, Armenia, Burundi, Chile, Costa Rica, India, Ivory Coast, Jamaica, Madagascar, Maldives, Peru, Seychelles, Sierra Leone, St. Lucia, Togo, Ukraine, and Uzbekistan). The program was expanded at a second stage to include a second group of countries: Albania, Bangladesh, Ecuador, Grenada, Indonesia, Jordan, Philippines, South Africa, Sri Lanka, and Tunisia. It will undertake activities at the global, regional and country levels. It will also build on a solid basis of knowledge and outreach capacity developed by the leading electric mobility programme of the International Energy Agency and the United Nations Environment Program (with partners). It will be the first-ever global inter-agency electric mobility program.

The overall objective of the GEF 7 Global Program is to contribute to the implementation of the Paris Climate Agreement through contributing to reaching the levels of electric mobility necessary to achieve emission reductions from the transport sector outlined in the alternative, low-carbon scenario (B2DS) in low and middle-income countries, while minimizing adverse effects for the sustainability of transport and energy systems. This is to be achieved by providing an integrated approach to support countries with the development of electric mobility policy frameworks and the support of electric mobility projects. This global

program is designed to focus on all road transport modes - including two and three wheelers, cars, buses and trucks. It uses a programmatic approach with a “parent” project at global and regional level and related in-country “child” projects. The in-country child projects will support the development and implementation of enabling environments for electric mobility, the demonstration of electric mobility interventions, and frameworks for scaling-up electric mobility.

The proposed project will also create linkages with the Global Program and regional platform under the program in order to support capacity building, knowledge sharing and replication of best practices in electric mobility adoption in other countries. In particular, the proposed project will benefit from transfer on the state-of-the-art technology on electric mobility. The NSTDA as the technical focal point of the proposed project will receive transfer of technology and knowhow concerning the state-of-the-art technology on electric mobility through capacity building and knowledge sharing. Thereafter, they will provide trainings and transfer the technology and knowhow to wider-stakeholders in Thailand, through this propose project.

- The UNIDO GEF-5 project entitled “Greening Industry through Low Carbon Technology Application for SMEs” (GEF ID 5725) promotes and supports the adoption of energy efficient practices and technologies in selected Small and Medium Enterprises (SMEs) in Thailand for improved competitiveness and a greening of industry. To achieve this, the project will create demand for low-carbon technologies through policy support, awareness raising activities and capacity building of government, financial institutions, industries, technical personnel, as well as the implementation of demonstration projects to encourage the adoption of such technologies in SMEs. These interventions will create an environment conducive to increased investment in low-carbon technologies and energy efficiency improvements by SMEs in Thailand. The automotive sector is a targeted industry under this project, with UNIDO supporting the adoption of industrial energy efficiency measures and adoption of ISO 50001 standard for Energy Management Systems.

This proposed project will aim to build on these interventions, building on lessons learned to date and applying them to this project’s interventions on electric mobility. Furthermore, additional coordination and knowledge exchange between the two projects will be facilitated by the joint Project Steering Committee members, in particular National Science and Technology Development Agency (NSTDA) and Ministry of Energy.

- German International Cooperation Agency (GIZ) has implemented the project “ Facilitating the development of ambitious transport mitigation actions (TRANSfer III)”, which supports the Thai government in the design and creation of the Thai Clean Mobility Program (TCMP). TCMP is a national program that supports city administrations in their efforts to plan and implement Sustainable Urban Transport Projects, thereby reducing GHG emissions and air pollution stemming from transport in Thai cities. The project includes a study of a congestion charging scheme for Bangkok, support to the bus sector reform and fleet modernization in Bangkok, and setting up a national Sustainable Urban Transport (SUT) Fund to finance SUT projects in other Thai cities. Office of Transport and Traffic Policy and Planning (OTP) is the project partner. The project has been implemented since July 2017 and will end by June 2022.

The proposed project will share experiences and lessons learned with this project in order to support scale-up and replication of e-mobility in other cities in Thailand.

c) the proposed alternative scenario with a brief description of expected outcomes and components of the project;

The proposed project’s overall objective is to realize the full potential benefits of EVs for contributing to GHG emission reductions in the transportation sector in Thailand, through addressing gaps and barriers to EV adoption and production in Thailand identified in the previous sections with the support of GEF funding. While Thailand has made steps towards supporting electric mobility adoption, additional support is necessary to increase the rate of adoption and

support decarbonisation of the transport sector beyond the existing baseline. The project has 3 specific objectives aimed at addressing the identified gaps and barriers:

First, the project aims to support wider adoption of EVs and sustainable use of batteries within the EEC and in Thailand, through 1) improving policy and institutional framework to address barriers on both the demand and supply sides, and to address life cycle issues of electric mobility and sustainable use of batteries; 2) pilot demonstrations of the use of EVs and charging infrastructure integrated with renewable energy systems and of sustainable use of batteries within EEC; and 3) scale-up opportunities across the EEC and Thailand.

Second, the project aims to enhance a business sector ecosystem for EV entrepreneurship within the EEC and Thailand, through 1) improving policy and institutional framework, 2) developing an entrepreneurship support program for electric mobility solutions within the EEC, and 3) demonstration of innovative electric mobility solutions (e.g. the conversion of ICE vehicles to EVs) within the EEC.

Third, the project aims to support the integration of circular economy practices into the life cycle of batteries through enhancing policy and regulatory framework to address life cycle issues of batteries and demonstration of, for instance, the application of second life EV batteries within the EEC.

The project consists of 4 components of which the first 2 components address each of the 3 specific objectives above (with the first component addressing at a national policy and institutional level, and the second component addressing at an investment level), while the third component focuses on the up-scaling to national, regional and global networks, and the fourth component focuses on monitoring and evaluation to ensure that the project's objectives will be met.

Component 1: Improve national policy and institutional framework for electric mobility and sustainable use of batteries

This component addresses gaps and barriers to wider adoption of EVs and related life cycle issues within in Thailand on both the demand and supply sides mentioned in the previous section, through improving policy and institutional framework at the national level. In other words, this component will develop policies, incentives, a regulatory framework and plan for implementation at the national level to address these barriers and to address life cycle issues of electric mobility and encourage the sustainable use of batteries. This component will build on the results of the policy research project related to EVs implemented by the Thai Automotive Institute and its partners, and will be integrated with practical experiences, knowledge, and lessons to be developed and learned from Component 2.

As mentioned earlier in the previous section, on the demand side, consumer's awareness and understanding of EVs and related technologies, particularly in terms of safety, usage and maintenance of EVs, financial and non-financial incentives for EV consumers, and related infrastructure such as charging stations and power grid to support widespread use of EVs remain barriers to wider adoption of EVs.

On the supply side, new product and production standards related to EVs and components, and an ecosystem for EV entrepreneurship, remain barriers to wider adoption of EVs. Although the Thai government has prioritized the development of EV manufacturing, work is still required in developing standards for EVs and related components as well as enhancing an ecosystem for entrepreneurship in EV development. Lack of coordination between ministries and different levels of governments on EV policies also poses a risk to ensuring alignment between the development of charging infrastructure and renewable energy systems and maximizing the potential for GHG mitigation.

To realize the full potential benefits of electric mobility for contributing to GHG emission reductions in the transportation sector, this component also focuses on creating policy coherence between different sectors and an institutional framework that supports the rapid adoption of electric vehicles and growth of charging infrastructure in tandem with the increased decarbonisation of the power grid.

This component will build on the results of the policy research project related to EVs implemented by the Thai Automotive Institute and its partners, and will be integrated with practical experiences, knowledge, and lessons to be developed and learned from Component 2. With TAI and EVAT joining the project, this component will coordinate with both organizations to ensure that this component will build upon the policy recommendations proposed by both organizations and their partners. In addition, this component will coordinate with both organizations to ensure that practical experiences, knowledge and lessons to be developed and learned from the subnational (the EEC region) under Component 2 will be brought up to the national level for developing additional policy and institutional framework at the national level, and ensure that this additional policy and institutional framework will be also practical and applicable to the subnational level such as in the EEC and other regions of the country during the implementation. Thus, this component will enhance the link between the national level and the subnational level when developing policy and institutional framework at the national level.

Expected Outcomes:

1.1 National policy and institutional framework for electric mobility and sustainable use of batteries enhanced

Expected Outputs:

- 1.1.1 Analysis, forecast, and management system for GHG emissions in transportation sector developed
- 1.1.2 Development of plan for charging infrastructure integrated with renewable energy systems ensuring access for all
- 1.1.3 Financial and non-financial incentives created for uptake of electric public and private fleets
- 1.1.4 Framework for addressing life cycle issues for electric mobility and sustainable use of batteries enhanced

Component 2: Accelerate technology adoption of electric mobility and sustainable use of batteries

This component addresses and enhances a business sector ecosystem for EV entrepreneurship, as a barrier to wider adoption of EVs, through developing a bottom-up entrepreneurship support program for electric mobility solutions, and demonstration of innovative electric mobility solutions (e.g. the conversion of ICE vehicles to EVs). The component will support assessing existing gaps in the EV entrepreneurship ecosystem and establish mechanisms for identifying innovative electric mobility solutions. Partner entities for the demonstration of innovative electric mobility solutions will be selected based on opportunities for co-financing, readiness for technology demonstration, and opportunities for scale-up across the EEC and Thailand.

Although there is an existing entrepreneurship ecosystem in the EEC. Currently, in the EEC, there are only a few components of EV entrepreneurship ecosystem such as some EV charging operators, some EV users, and some manufacturers of vehicles which can potentially manufacture EVs. The existing entrepreneurship ecosystem is not complete and needs to be enhanced. The expected target for the entrepreneurship support program is to enhance the existing entrepreneurship ecosystem to be a complete and sustainable ecosystem and can be used as a model for replication in other regions/areas of the country.

As described under NSTDA's research projects, NSTDA as a key agency for implementing the entrepreneurship support program has already created partnerships with various universities and research centers when developing prototypes of various types of EVs.

The GEF resources are expected to be used in this output to develop an entrepreneurship support program for various private sectors in the EEC including electric vehicle manufacturers, charging point operators, local public transportation fleet operators and drivers, to create a complete and sustainable ecosystem, and thus co-financing of various kinds from these various private sectors are expected.

Moreover, this component addresses in particular the use of EVs for public transportation in pilot areas such as in smart cities, as a barrier to wider adoption of EVs, through demonstrations within the EEC of 1) the use of electric buses for public transportation and charging infrastructure integrated with renewable energy systems, and sustainable use of batteries. This component thus contributes to the direct reduction of GHG emissions.

Based on a preliminary consultations with the Office of Transport and Traffic Policy and Planning (OTP) and the Master Plan for the Development of Public Transportation in Chachoengsao, Chon Buri, and Rayong provinces, Rayong municipality has the potential and readiness for implementing electric vehicle projects. In Rayong municipality and in the EEC, songthaews (modified pick-up trucks) are widely used as vehicles for local public transportation. Based on preliminary interviews with cooperatives which operate songthaews in Rayong, currently, there are more than 700 songthaews in Rayong. These songthaews are diesel-run and operated by 8 cooperatives and 2 companies for local public transportation in 10 different routes in Rayong.

This component will demonstrate the use of electric vehicles such as songthaews (modified pick-up trucks) for local public transportation in Rayong municipality, as a pilot area for the demonstration. This project component will select one of these cooperatives/companies based on the potential and readiness for co-financing, the interest in the demonstration, and the importance of the routes and their potential for raising wider public awareness and understanding of EVs.

Based on preliminary interviews with cooperatives operating songthaews in Rayong, the project has preliminarily identified one cooperative with the potential and readiness for co-financing of the conversion of existing diesel-run songthaews to electric songthaews, and with an initial interest in the demonstration. This cooperative has approximately 100 members and songthaews and operates songthaews for local public transportation in an important route which connects the center of Rayong and Rayong's estuary (or Paknam) with a total distance of around 7 kilometers per one leg. In this PIF formulation, we use this route as our model to calculate estimated GHG emissions avoided. We are informed that songthaews operating along this route would run around 8 trips per day ($8 \times 14 = 112$ km per day per one songthaew). However, there are 10 important routes in Rayong which are run by songthaews, therefore during the PPG we will re-investigate in detail to confirm the demonstration route.

This component will also demonstrate the use of charging infrastructure for electric vehicles integrated with renewable energy systems and battery storage that enable the use of renewables in the selected pilot route and within the EEC. The component will also apply big data solutions to supporting the planning and optimization of charging infrastructure.

Furthermore, this component addresses life cycle issues of EV batteries through demonstration of the integration of circular economy practices into the life cycle of batteries. This might include applying extended producer responsibility practice to battery management. The extended producer responsibility operates where battery provider would rent out batteries and would replace them once they reach their end of lifetime. The battery producer would work with the project to manage these used batteries safely and sustainably such as options for using second life EV batteries for productive purposes.

This component will build on the efforts of the OTP in developing the Master Plan for the Development of Public Transportation in Chachoengsao, Chon Buri, and Rayong provinces to support the development of the EEC Area, and the efforts of NSTDA in developing prototypes of electric vehicles and charging stations.

Expected Outcome:

- 2.1 National business sector ecosystem for EV entrepreneurship enhanced
- 2.2 Investment in electric vehicles and electric vehicle supply equipment integrated with renewable energy deployment in Eastern Economic Corridor
- 2.3 Investment in addressing life-cycle issues for electric vehicle batteries in Eastern Economic Corridor

Expected Outputs:

- 2.1.1 Entrepreneurship support program for electric mobility solutions developed
- 2.2.1 Deployment of e-mobility solutions for public transport integrated with renewable energy systems and battery storage in the EEC
- 2.2.2 Application of big data solutions to support planning and optimization of electric vehicle charger locations
- 2.3.1 Demonstration of circular economy principles in the life cycle management of EV batteries such as extended producer responsibility and application of second life EV batteries within the EEC

Component 3: Capacity building, up-scale and knowledge sharing

This component will contribute to the scale-up of other components of the projects within the EEC and nationally through capacity building and knowledge sharing on outputs of Component 1 and 2, and through strengthening relevant ministries and government agencies on derisking and attracting further investment from the private sector. Specifically, with regard to the experiences of the use of electric buses for public transportation, EECO will disseminate and replicate experiences from the selected route to the other routes of public transportation within the EEC. OTP will also take lead in disseminating and replicating experiences from the EEC to other cities for which OTP has developed the Master Plan for the Development of Public Transportation including Phuket, Chiang Mai, Songkhla, Nakorn Rajsrima, and Kon Khaen, as well as other cities across the country.

Therefore, the knowledge, experiences, and lessons learned from Component 1 and 2 will be integrated as content of Component 3 and will be shared across national, regional, and global networks. The project will also share project deliverables such as analytical reports, policies, business models and lessons learned with the Global Program in order to support scale-up and replication of e-mobility in other countries and regions.

Under this component, several other activities are envisioned: i) Documentation of best practices and solutions; ii) Peer to peer learning within relevant stakeholders; iii) Communication strategy around the planning process and production of well-designed and easy to understand materials; iv) Tailored trainings for key actors in the planning and management process; v) Awareness-raising; vi) Training, resources, and technical assistance to cities on data collection strategies, validating the information, and other analytic tools required for investment analysis; and vii) Media/communications, outreach, and stakeholder engagement.

Expected Outcome:

3.1 Capacity development and knowledge exchange on lessons learned scaled-up to national, regional and global networks

Expected Outputs:

3.1.1 Existing knowledge-exchange platforms and mechanisms strengthened with key national stakeholders based on lessons learned from the EEC with focus on women engagement

3.1.2 Linkages created with regional and global platforms on electric mobility as part of the Global Electric Mobility Program

3.1.3 Training sessions for public and private sector on life cycle solutions for EVs and batteries with focus on women participation

Component 4: Monitoring and Evaluation

UNIDO will regularly monitor progress on each component to ensure the project is completed on time and to budget, as well as to be responsive and proactive about any potential adjustment or opportunities that arise that can further leverage the GEF grant for achieving additional GEBs. As per GEF and UNIDO guidelines, an independent terminal evaluation will be conducted at the conclusion of the project to glean best practices and lessons learned for future projects.

Expected Outcome:

4.1 Adequate monitoring of all project indicators

Expected Outputs:

4.1.1 Monitoring and independent mid-term review

4.1.2 Terminal project Evaluation

d) alignment with GEF focal area and/or Impact Program strategies;

This project is categorized under the GEF-7 Climate Change Mitigation (CCM) focal area, specifically addressing the strategic area of CCM-2: Promote innovation and technology transfer for sustainable energy breakthroughs for electric drive technologies and electric mobility. The project supports decarbonization of Thailand’s transport sector by promoting the adoption of low-carbon electric mobility and development of innovative electric mobility solutions, contributing to direct reductions in GHG emissions and indirect reductions via scale-up within the market and country.

e) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing;

Despite its targets for EV adoption and policies geared at EV manufacturing, Thailand’s overall stock of EVs remains under 1%. Thailand requires further incremental technical and financial assistance from GEF to ensure that its transportation sector decarbonizes at a rate consistent with meeting the Paris Agreement. This assistance is essential to strengthen institutional capacities and policy framework for electric mobility and derisk electric mobility technologies to attract stable co-financing from foreign and domestic investments in advanced technologies. With a relatively minimal GEF grant, this project will support mobilization of investment to support and accelerate the adoption of electric mobility in Thailand at a ratio of 8.15 USD per tCO_{2e}, contributing to the program’s overall objective of reducing global greenhouse gas emissions from the transport sector.

Components	Business as usual	Incremental cost reasonin	Main outcomes expected
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		g	
1. Improve policy and institutional framework for electric mobility and sustainable use of batteries	Limited progress in enhancing policy and institutional framework to address gaps and barriers to the production and adoption of EVs with RE integration results in a lower rate of adoption of EV public/private fleets and RE-EV grid integration	Systematic promotion of mutually reinforcing policy and institutional framework for EV and RE integration and EV adoption developed including addressing the existing gaps related to new products, production of EVs and testing facilities.	Policy and institutional framework for electric mobility and decarbonisation of power grid enhanced
2. Accelerate technology adoption of electric mobility and sustainable use of batteries	Lack of demonstration of the uses of EVs for public transportation, innovative electric mobility solutions, addressing life cycle of EV batteries, and underdeveloped ecosystem for electric mobility entrepreneurship leads to a rate of adoption of electric mobility technologies inconsistent with meeting required targets for GHG mitigation in the transportation sector and limited management of used EV batteries	Innovative electric mobility technologies and life-cycle solutions for EV batteries are trialed and programme put in place to support entrepreneurship, leading to new knowledge, experiences, and lessons about EVs to be developed and learned, and increasing public and national awareness, interest and evaluation of their uses. The solar PV integrated charging infrastructure in the EEC will raise awareness on potential for EV-RE integration as a solution for mitigating GHG and supporting the decarbonisation of the transport sector.	Investment in innovative electric mobility and battery technologies is derisked, accelerating their mainstreaming and adoption and greater support for bottom-up innovation in electric mobility from entrepreneurs
3. Capacity building, up-scaling and knowledge sharing	Knowledge and expertise on EVs, RE integrated charging infrastructure and life-cycle issues for batteries is not widely shared and up-scaled and is insufficient	Increased national technical capacity and knowledge developed with connections through national, regional and global programs and networks. Current know	Capacity development and knowledge exchange on lessons learned scale-up to national, regional and global networks

	...t to lead to widespread adoption of EVs, and meeting national GHG mitigation targets	...wledge and expertise of Thai industries in the areas of design and manufacturing of EVs is upgraded and prepares new skill labor for the EV industry.	
4. Monitoring and evaluation	Lessons from implementation are not captured and project risks not meeting its objectives	Effective monitoring and evaluation of project is completed	Project achieves objectives with lessons learned for improving future projects

Investments thus far have been identified through consultations with stakeholders on funding priorities and pipeline of projects determined for the Eastern Economic Corridor (EEC) by government and private sector. The Ministry of Industry has indicated that the automotive industry is presently the main economic activity generating revenue for the country, accounting for 6.4% of Thailand's GDP, with over a dozen car assemblers and over 100 automotive parts companies located within the EEC.

f) global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF); and

- **Co Direct and indirect GHG emissions and their precursors reduction**
- GHG mitigated: Direct: 20,986 tCO₂e; Secondary Direct: 330,178 tCO₂e; Indirect: 1,755,820 tCO₂e;
- Direct beneficiaries disaggregated by gender: 18,210 women and 17,289 men

The project will result in an estimated direct emission reductions 20,986 tCO₂e and 330,178 tCO₂e secondary direct emission reductions at a cost per tonne reduction of 8.15 USD (direct emissions only). Indirect emissions have been calculated at 1,755,820 tCO₂e (applying a conservative multiplication factor of 5). These estimations are based on the increase use of electric vehicles and improved transport infrastructure. Additionally, 2 MW of solar PV will also be installed. This is a result of installation of 0.5 MW capacity for solar charging station for e-songthaews + 1.5 MW capacity of solar-powered charging stations (30 chargers, each supplied by 50 kW of PV installation). A complete explanation of these calculations has been included as an attachment.

The methodology applied for GHG emissions under indicator 6 have been calculated based on the GEF "Manual for Calculating Greenhouse Gas Benefits of Global Environment Facility Transportation Projects", consistent with other projects within the Global Electric Mobility Programme. The exact targets will be reviewed during the PPG stage, considering "Emissions avoided", "Energy saved", and "Increase in installed renewable energy capacity".

The project anticipates 500 direct beneficiaries of training, including under the regional support and investment platform as well as the global platform. An additional 34,999 individuals are estimated to benefit from riding new EV public transport. In total, based on a gender split calculation using the national

gender percentages from the World Bank website, the project will benefit 18,210 women and 17,289 males directly for a total of 35,499. These calculations will be revisited as part of the PPG stage.

g) innovation, sustainability and potential for scaling up.

Innovation

Thailand already has a developed automotive sector with many SMEs part of a national value chain and has indicated a strong commitment to supporting the development of electric mobility in its manufacturing sector. However, in transitioning the sector towards electric mobility, increased support is needed for enhancing an ecosystem that supports entrepreneurship and innovation around EVs. This project helps address this gap by establishing mechanisms for identifying innovative electric mobility solutions and developing an entrepreneurship support program for these innovative electric mobility solutions. By supporting the development of this entrepreneurship ecosystem in tandem with policies and regulations that aim to drive demand, the project can model how to support countries in meeting supply through local innovation.

Sustainability

The design of each project activity and selection of counterparts is premised on ensuring long-term sustainability of the change that this GEF project will catalyze. Fundamentally, there needs to be national ownership of all interventions and their mainstreaming into the operations of the national entities to ensure that institutions will be responsible for taking actions forward beyond the project implementation period.

Long-term ownership and sustainability will be ensured through working closely with Eastern Economic Corridor, as well as other national partners and private sector. Developed tools and methodology will be universal and owned by the EEC, which will guarantee the overall sustainability of the project outcomes. Accelerated adoption of technological solutions will be executed as public-private partnerships. The selected private sector partners will secure part of the required financing for the execution, as defined in the tendering process. As such, the private partner will have a vested interest that the technologies operate successfully for them to recover their investments. Given the commercial interest in sustaining the operations of the projects, the different proponents will also have an interest in keeping the projects running and hence sustain the global environmental benefits beyond the project lifetime.

Potential for scale-up

The project strategy to ensure scale-up and replication is to develop the supporting policy framework, national examples and build up capacity, particularly within national and local government departments, private sector, research and academic institutions, and financial institutions since these organizations are in the best position to replicate the activities. The outputs to be generated by the Project will contribute to creating an enabling environment for integrating sustainability strategies into investment planning and management. All planned outputs are consistent with, and instrumental to, achievement of the objectives of Thailand's key policies and legislation. Therefore, the combined efforts of technical project components are designed in such a way to ensure the scale-up of global environmental benefits beyond the life of the project. Finally, the project will share project deliverables such as analytical reports, policies, business models and lessons learnt with the Global Programme in order to support scale-up and replication of e-mobility in other countries and regions.

1b. Project Map and Coordinates

Please provide geo-referenced information and map where the project interventions will take place.

The overall project targets Thailand as a country (13° 44' 12.1812" N, 100° 31' 23.4696" E) with the technology demonstration expected to happen in Thailand's Eastern Economic Corridor and its corresponding provinces: Chon Buri (13.3611° N, 100.9847° E); Rayong (12.7074° N, 101.1474° E); Chachoengsao (13.6904° N, 101.0780° E).

Thailand's Eastern Economic Corridor



2. Stakeholders

Select the stakeholders that have participated in consultations during the project identification phase:

Indigenous Peoples and Local Communities

Civil Society Organizations Yes

Private Sector Entities Yes

If none of the above, please explain why:

In addition, provide indicative information on how stakeholders, including civil society and indigenous peoples, will be engaged in the project preparation, and their respective roles and means of engagement.

UNIDO is the GEF implementing agency of the project, and is accountable for the GEF grant. The Executing Agency is the Eastern Economic Corridor Office (EECO). The National Science and Technology Development Agency (NSTDA), and Thailand Greenhouse Gas Management Organization (TGO) will act as executing partners, with EECO coordinating the partners execution based on each entities technical expertise.

Stakeholders will form a comprehensive integrated structure to enhance a synergy among the project partners and serve as the knowledge source of new clean technologies, emerging entrepreneurs, knowledge network, applied research collaboration and additional team members. Furthermore, to promote gender quality and the empowerment of women the guiding principle will be to ensure equal opportunity for women and men to lead, participate in and benefit from the project, e.g. early involvement of women entrepreneurs, associations that promote GEEW and gender focal points. This will be in line with the GEF Policy on Stakeholder Engagement that sets out the core principles and mandatory requirements for stakeholder's involvement.

Function	Stakeholder	Role in the project
Implementation Agency	United Nations Industrial Development Organization (UNIDO)	UNIDO is the specialized agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalization and environmental sustainability. UNIDO will act as the Implementation Agency for the project and take a lead role in managing Component 4: Monitoring and Evaluation. This includes coordinating the Independent Midterm and Final Evaluations.
Lead governmental agency - project steering committee chair.	Eastern Economic Corridor Office (EECO)	EECO is a governmental agency that promotes investment, innovation and advanced technologies, and facilitate business operations within the EEC area. This project will build on the work being done to develop the E

		<p>astern Economic Corridor (EEC) in Thailand. The EEC is strategic development area comprised of three provinces: Chachoengsao, Chon Buri and Rayong. The aim of developing the EEC is to establish it as a strategic location for manufacturing, trading, export and logistics in ASEAN with comprehensive logistic connections to Asian countries and the world. Significant investment is being directed towards developing connectivity in the region through infrastructure projects, including a high-speed train, double-track rail lines, expansion of ports and U-Tapao Airport, and encouraging investment in the 10 major industries identified under Thailand 4.0, a government initiative to transition out of a current emphasis on heavy industry and advanced machinery and towards a “value-based economy”. Given that this automotive industry is heavily influenced and disrupted by cutting-edge technological advances, and so as to foster continued future growth, the EEC places great importance on the production of electric vehicles (EV).</p> <p>Role in the Project EECO, the management office for the EEC, will act as chair of the project steering committee and be responsible for overall project execution and coordination of execution partners based on their relevant expertise.</p>
<p>Executing agency</p>	<p>National Science and Technology Development Agency (NSTDA), Ministry of Higher Education, Science, Research and Innovation</p>	<p>The NSTDA is a governmental agency under the Thai Ministry of Higher Education, Science, Research and Innovation, which supports research in science and technology and their application in the Thai economy. NSTDA consists of four National Research Centers, which are BIOTEC, MTEC, NANOTEC and NEC TEC with a Technology Management Center (TMC).</p> <p>The project will strive to maximize collaboration with NSTDA as a developer of prototypes of electric vehicles and one of innovation hubs in Thailand. In addition, NSTDA can provide useful channels and networks to mobilize resources, disseminate information and best practices and further promote the adoption of electric buses.</p> <p>Role in the Project NSTDA will act as an executing agency for the project and a ke</p>

		y counterpart for component 2 and 3.
Executing agency	Thailand Greenhouse Gas Management Organization (TGO), Ministry of Natural Resources and Environment (MNR E)	<p>TGO is an autonomous governmental organization under the Ministry of Natural Resources and Environment (MNRE) responsible for promoting and encouraging stakeholders to reduce greenhouse gas emissions in Thailand.</p> <p>Role in the Project</p> <p>TGO will act in tandem with NSTDA as an executing agency for the project to ensure the project aligns with Thailand's national GHG mitigation strategies and initiatives. The TGO is a key counterpart for Component 1.</p>
Project steering committee member	Office of Transport and Traffic Policy and Planning (OTP), Ministry of Transport	<p>OTP is a governmental agency under the Ministry of Transport, that develops policy framework for national transport and traffic policy, plans, measures and standards. In other words, OTP is the national transport planning agency. 3 divisions under OTP are particularly relevant to this project.</p> <p>1) Bureau of Safety Planning promotes sustainable transport, has developed the NDC Action Plan in the transportation sector and is responsible for supporting the implementation at the national level to meet the NDC mitigation target in the transport sector.</p> <p>2) Bureau of Regional Transport and Traffic System Promotion has developed the Master Plan for the Development of Public Transportation in Chachoengsao, Chon Buri, and Rayong Provinces to Support the Development of EEC Area.</p> <p>3) Division of Transport and Traffic System Development provides knowledge and information related to transport and traffic technologies including electric vehicle technologies.</p> <p>Role in the project</p> <p>OTP will act as a member of the project steering committee to provide directions to the project and support upscaling of the project to the national level.</p>
Project steering committee member	The Office of Industrial Economics (OIE), Ministry of Industry	OIE is a policy-making agency of the Ministry of Industry. The agency also acts as an assistant to the secretariat and a member of the National Electric Vehicle Policy Committee chaired by the prime minister.

		<p>Role in the project</p> <p>OIE is assigned to be a member of the project steering committee to provide directions to the project and ensure that the project is in line with Thailand's policy to shift from traditional automotive production hub to electric vehicles production hub.</p>
Project steering committee member	Energy Policy and Planning Office (EPP O)/Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy	<p>Ministry of Energy has implemented initiatives and provided policy incentives on the demand side to promote electric mobility such as an incentive for installation of battery charging stations, and an electricity tariff incentive for EV charging. Ministry of Energy has also set a target of the use of EVs in 2036 to be 1.2 million vehicles.</p> <p>Potential role in the project</p> <p>During the PPG phase, the project will discuss with and invite EPPO or DEDE under the Ministry of Energy to be a member of the project steering committee to provide directions to the project and support upscaling of the project to the national level. In addition, Ministry of Energy chairs the energy storage working group which the project could be connected with and benefit from.</p>
Project steering committee member	Department of Local Administration (DLA), Ministry of Interior	<p>DLA is a governmental agency under the Ministry of Interior. Its main responsibility is to promote and support the work of the local administrative organizations (LAOs)</p> <p>Potential role in the project</p> <p>During the PPG phase, the project will discuss with and invite Department of Local Administration, Ministry of Interior to be a member of the project steering committee to provide directions to the project.</p>
Local administrative organization of the pilot area	Rayong City Municipality	<p>Rayong City Municipality is a local administrative organization of Rayong City.</p> <p>Role in the project</p> <p>Rayong City Municipality will act as a taskforce to support and facilitate the demonstration of the use of EVs and charging stations in the selected route in Rayong and coordinate and mobilize with local garages/technicians and operators of existing local public transportation.</p>

Sub-contractor of executing agencies	Thailand Automotive Institute (TAI)	<p>TAI was established based on the Ministry of Industry's order and is an independent organization under the co-operation between the government and private sectors. Several divisions under TAI are relevant to this project, including Entrepreneur Development, Industrial Research, and EV battery testing units. TAI developed and proposed policy recommendations on EV development in collaboration with partners to the Office of Industrial Economics, the assistant to the secretariat of the National Electric Vehicle Policy Committee, chaired by the Prime Minister. TAI has good networks within the automotive industry.</p> <p>Role in the project TAI will act as a sub-contractor of executing agencies and counterparts of Component 1, 2, and 3.</p>
Sub-contractor of NSTDA	Electric Vehicle Association of Thailand (EVAT)	<p>Registered on September 14, 2015, the EVAT aims at promoting the usage of EV in Thailand, which leads to a reduction of road pollution especially in the major cities. The EVAT support includes the industrial manufacturing, research and development on EV technologies in Thailand; this strengthens and increases the competitiveness of entrepreneurs in Thailand into the global market. EVAT members include 114 corporate members such as BMW, Toyota, Mitsubishi Motors, Honda, Nissan, Mercedes-Benz, Denso, ABB, PTT, Bosch, Schneider Electric, Kawasaki, Thairung, Delta, OSKA The Battery Expert, LEABON New Energy, and other 43 individual members. The members of EVAT can be divided into three groups covering the whole range of the EV value chain. The three groups include i) Charging, Operator & Service Provider such as Bangchak, PTT, GREENLOTS, EGAT, and the Fifth Element; ii) EV Company such as BMW, Mercedes-Benz and MG and iii) EV Supply Equipment such as ABB, Alfen, and Delta. Thus, EVAT has good networks of the whole range of EV value chain and can be source of information of these groups of companies as well as outreach to these companies.</p> <p>Potential role in the project During the PPG phase, the project will discuss with and invite EVAT to be a sub-contractor of NSTDA.</p>
Project partner	Private sector	Electric vehicle manufacturers, charging point operators, local

		<p>public transportation fleet operators and drivers are all stakeholders relevant to the project's planned interventions.</p> <p>Potential role in the project Preliminary discussions with the private sector on co-financing have been held and will be solidified through the PPG phase through further consultations and analysis of potential synergies. This had included investments in updating manufacturing processes for electrifying public transport, providing land for charging points and participating in the demonstration of electric mobility along a public transport route under component 2.</p>
Project partner	Civil Society Organizations (CSOs)	<p>CSOs are essential stakeholders to the project design, implementation and long term sustainability. Some relevant organizations have already been consulted on this project's design and additional CSO mapping and consultations will be completed during PPG.</p> <p>Potential role in the project CSOs will be engaged with providing inputs to policy enhancement recommendations under Component 1 as well as beneficiaries of capacity building and knowledge exchange under Component 3. Local CSOs within EEC will also participate in the design and development of demonstrations planned under Component 2 to ensure local needs are met and to instill a sense of ownership necessary for the project's sustainability and scale-up.</p>
Project partner	Academia	<p>The involvement of academic institutions within Thailand and within the EEC are critical to the success of the project and long-term sustainability of its outcomes. Several local universities are located within the EEC area such as Kasetsart University at Sriracha Branch, and Thammasart University at Chon Buri Branch.</p> <p>Potential role in the project Project will explore opportunities to partner with universities to inform policy enhancement under Component 1, technology demonstration under Component 2, and capacity building under component 3.</p>

Project partner	Gender focal points and associations that promote GEEW	<p>UNIDO's mandate to promote inclusive and sustainable industrial development (ISID) relies on the advancement of gender equality and the empowerment of women. UNIDO addresses gender inequalities in industry and harnesses women's full potential as economic agents of change and leaders thereby transforming economies and generating inclusive growth. One of the guiding principles of the project will be to ensure that both women and men are provided equal opportunities to lead, participate in, and benefit from the project (UNIDO Gender Policy 2019). The project has been developed considering the UNIDO guide on gender mainstreaming in energy and climate change projects.</p> <p>Potential role in the project</p> <p>Gender dimensions will be considered in all decision-making processes. With respect to project management, the Project Steering Committee meetings will aim to be gender balanced and extend invitations to observers that represent gender dimensions, such as organizations / associations promoting gender equality and advocating women's empowerment. During project activity implementation, effort will be given during stakeholder consultations towards focusing on gender equality and women's empowerment issues, in particular during policy review and formulation.</p>
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3. Gender Equality and Women's Empowerment

Briefly include below any gender dimensions relevant to the project, and any plans to address gender in project design (e.g. gender analysis).

3. Gender Equality and Women's Empowerment. Briefly include below any gender dimensions relevant to the project, and any plans to address gender in project design (e.g. gender analysis). Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment? yes /no / tbd ; If possible, indicate in which results area(s) the project is expected to contribute to gender equality:

closing gender gaps in access to and control over natural resources;

improving women's participation and decision-making; and/or

generating socio-economic benefits or services for women.

Will the project's results framework or logical framework include gender-sensitive indicators? yes /no / tbd

Climate change is one of the greatest environmental and development challenges facing the world today and has critical impacts on human rights and inequalities, including gender inequality. Renewable energy and energy efficiency technologies and approaches, such as electric vehicles, are climate solutions that can boost sustainable and inclusive economic growth and industrialization. Strategic gender-responsive interventions, public policies and measures can help ensure that women can equally lead, participate in and benefit from the growing opportunities and employment in these dynamic sectors. Taking the needs of women and men into consideration during consultations and project planning can reduce conflicts and make energy infrastructure projects more inclusive and efficient.

Recently it has been criticized that electric carmakers are all making a mistake because they only marketing to men^[1]. According to the article 'Women appear to be the primary influence for some 85% of all new U.S. vehicle purchases', which shows the influence of women on buying decisions and the need to consider gender dimensions in interventions that promote electric mobility. This could be explained with the findings of a University of Sussex study on who will buy electric vehicles and why stating that, 'Men generally want speed, acceleration, style. Women want there to be a planet when their children grow up'.

Energy infrastructure is an umbrella term that often relates to the generation, transmission and distribution of large-scale power, but that also encompasses charging stations for electric vehicles. Transmission and distribution projects focus on connecting generated energy (electricity or heat) to energy consumers. Sustainable energy infrastructure has the potential to be transformative by providing much needed energy access and reducing greenhouse gas emissions, whilst also increasing opportunities for women's empowerment, employment and gender equality. For instance, charging stations for EVs could help to increase safety through lighting, which improves the mobility of women and girls to safely access transport at night (e.g. roads, bus stations, public transport).

Discriminatory gender norms and practices, occupational segregation and lack of labour force experience and technical and professional skills can also impede women from engaging in employment opportunities associated with energy infrastructure and access projects. To address these issues projects can offer gender-sensitive training and skills development and encourage hiring women in non-traditional occupations where possible, while ensuring women's safe working conditions.

Both workers and the communities in and around which energy projects take place can be affected by sexual harassment and violence, HIV transmission and other occupational health and safety issues, with women and girls particularly at risk. Embedding codes of conduct on sexual exploitation within projects can help mitigate these impacts

Women can play a key role in promoting and implementing new clean technologies. Energy interventions that meet the needs of and involve both women and men increase the likelihood of technologies being adopted and used. Entrepreneurship programmes and innovation accelerator programs have also proven effective in tapping into women's potential to identify affordable and scalable solutions for cleaner, more resilient economies. For instance, in South Africa, the woman-led business ZingCO won in 2015 with its innovative battery swapping solution for electric vehicles that aims to promote sustainable and affordable transportation.

Gender quality in Thailand:

Thailand ranks 83 in the Gender Inequality Index 2017^[2]. However, Thailand has demonstrated its commitment towards gender equality within its assurances and ratifications at the international level. Thailand ratified the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) in 1985 and its Optional Protocol in 2000, and has endorsed the Beijing Platform for Action (BPFA) and the Sustainable Development Goals (Gender Equality). Thailand has made significant efforts to integrate the international principles and instruments into its policy and programming framework as is evident within the Constitution B.E. 2550 (2007) which includes anti-sex discrimination and gender equality provisions. The Protection of Domestic Violence Victim Act was promulgated in 2007, and the penal codes and sex discriminated laws have been significantly revised. The Government of Thailand has made several efforts since 1972 to reduce discrimination against women within employment and improve skill development in various sectors (including agriculture), to enable them to earn better wages and become economically independent. There are also several social security and protection policies in place for all women to facilitate their employment in the labour market^[3]. There are special protection policies of women employed in the informal economy in Thailand.

Despite the above efforts, there are major challenges within the country that are blocking the road towards achieving gender equality. These include a lack of sex disaggregated data, traditional attitudes and gender related stereotypes that exist in the society. Such problems in Thailand are responsible for high rates of domestic violence against women, low rates of participation of women in politics and decision-making positions, discrimination against ethnic and rural women, prevalence of HIV, human trafficking and unsafe work environment within the informal sector (Hansatit, 2014). Traditionally, Thai women are concentrated in roles and relationships that invariably make them subordinate to men. There is a common saying in Thailand – “*women are the rear legs of an elephant*”, which means that men are the fore legs of the elephant and they are meant to take up leadership roles, while women are expected to follow and care for the husband and the family. A Time-Use Survey, conducted by UNDP (United Nations Development Programme) in 2015, for 65 counties demonstrate that in 2009, women in Thailand spent more time in care work more than men did.

To measure gender equality, one indicator is the share of women among legislators, senior officials and managers (figure 3). In 2001, the ratio of men to women's employment in this category was 2.9, suggesting that men were three times more likely to be in this higher-quality or higher-skilled employment than women. The declining ratio in the later years indicated a decreasing gender gap, but the economic crisis in late 2008 hit female employment at this high level, and the ratio in 2008 shot up to 3.2 before gradually dropping to 2.7 in 2010 (Labour Force Survey, 2010).^[4]

Opportunities and Constraints of Women in Economic Participation:

The Global Entrepreneurship Monitor 2007 stated that the social and cultural fabric in Thailand has been conducive for participation of women in the workforce, which explains the high rates of women entrepreneurs (particularly small businesses). In Thailand, gender is not necessarily perceived as an impediment to success in business. For example, the total number of procedures required for married women to register a firm – where procedure is defined as any interaction of the company founders with external parties (for example, government agencies, lawyers, auditors or notaries) – is the same for both married men and women (Virasa and Hunt, 2008). Similarly, the total number of days required for married women to register a firm is same as for men. However, despite this commonly held perception, research reveals that women still face a wide range of barriers in starting, sustaining and growing their businesses. For example, while women have the same legal rights as men, married women need their husbands' consent for critical legal transactions, including bank loans. Therefore, due to a range of cultural expectations and industrial restrictions, Thai women mostly own businesses within the lower-earning rungs of those sectors such as retail, food, hospitality and personal services.

According to a study conducted by APEC (2013) across Malaysia, Philippines and Thailand on the Access to Trade and Growth of Women's SMEs in APEC Developing Economies, it was found that women's access to and control over formal networks is poor compared to men. In Thailand, business women reported finding it harder to manage and build rapport with their male workers as compared to their female workers, and that managing male labor required a constant effort to prove oneself. Women entrepreneurs in Thailand face three major barriers in entrepreneurship (Thakur and Walsh 2013):

- Women traditionally face discrimination in the Thai society, in which they are not considered equal to men in terms of social and economic status; (conservative views about the role of women))
- Women lack access to education, training, information and networking due to their role and status in society;
- Women lack access to capital that is crucial for any entrepreneurial activity.
- Other barriers include: Unequal share of family responsibilities

Women occupy less than 5% of the seats in the Thai parliament, which is one of the lowest in the world (The United Nations, 2019). Additionally, women have very low representation in the decision-making bodies in the political space in Thailand. In 2009[5], only 5.88% of women were presidents of the local councils, member of local administrative organizations and members of the provincial and district councils. The scenario is similar for Thai women working in the corporate world. The percentage of women participating as members of the board of committee in companies registered in the Stock Market is merely 22%, while the percentage of women member of the board of committee of companies registered with the Ministry of Commerce is 35.37%.

Women's Access to and Control over Resources and Technology:

Thai women's access to and control over land is largely influenced by their marriage. Access to resources like network and support is also limited for women in Thailand. In a study conducted by the Asia Foundation in 2013, where Thai women entrepreneur's perception about different aspects of entrepreneurship was evaluated, it was found that in Thailand, they are perceived to be receiving low level of government support as compared to men. Further, 23% women entrepreneurs were less likely to think that government was accessible as compared to men. This perception was even stronger amongst women in the export sector, where 63% of women found that the government is inaccessible to them as compared to men. Women entrepreneurs also lag behind in their knowledge of technology as compared to men. Business women in Thailand found the application process to obtain a loan cumbersome and therefore a major constraint in starting an enterprise. In Thailand, the process to obtain a loan from a public SME bank was longer as compared to commercial banks, highlighting a limitation on the part of the government to support SMEs in general (ibid).

In addition, married women need their husbands' consent for critical legal transactions, including bank loans. Therefore, due to a range of cultural expectations and industrial restrictions, Thai women mostly own businesses within the lower-earning rungs of those sectors such as retail, food, hospitality and personal services.

Gender Equality in SMEs in Thailand:

A 2010 study by MasterCard Worldwide revealed that women-owned SMEs in Thailand contributed approximately 38% to the GDP of Thailand and that their businesses had an annual growth-rate of 2.25% compared to 0.31% of men-owned SMEs. Labor force participation in Thailand is 68% overall^[6]. The average labor force participation rate of women in Thailand was 64.76% between the years 1990 and 2018 according to the World Bank, the lowest being 59.47% in 2018 and highest 67.65% in 1997^[7]. Women constitute 47% of Thailand's business people and, as such, are a driving factor for the country (MasterCard Worldwide 2010). However, they are less likely to be owners of SMEs. Although most of the businesses flourish in Bangkok, there has also been an increase in the number of women entrepreneurs in other parts of the country (Thakur and Walsh 2013).

Women's participation in SMEs in Thailand, with respect to Cleantech projects and startups is low and they remain a minority. The gender gap is particularly amplified for two reasons^[8]:

- Women in STEM^[9] fields are less likely to be entrepreneurs
- Overall women are less represented among entrepreneurs.

3.2.4 Gender Equality and Cleantech Education

Most Cleantech startups are based on deep science—Physics, Chemistry, Engineering. Very often they spring from university research departments or are built by technical people who have spent years at industrial, mining or utility companies, and have seen a business opportunity. Engineering is still heavily male-dominated, and industrial conglomerates are also skewed in favour of men in most countries including Thailand of South and South East Asia. So, the pipeline of women who would be inclined to start Cleantech companies with appropriate technical skills and experience to succeed is quite narrow (Kearns, 2019).

[1] <https://marker.medium.com/electric-cars-have-a-women-problem-9b5b0ac15af0>

[2] <http://hdr.undp.org/en/composite/GII>

[3] These policies are applicable to all women regardless of the sector in which they are employed. They do apply to women in the informal sector where they can access them through NGOs and such institutions in Thailand. Certainly women in rural and informal sector may not be able to claim such policies, but there are institutional mechanisms available for the same.

[4] https://www.ilo.org/wcmsp5/groups/public/--asia/--ro-bangkok/documents/publication/wcms_205099.pdf

[5] https://sustainabledevelopment.un.org/content/documents/13208Thailand_review_Beijing20.pdf

[6] <https://data.worldbank.org/indicator/SL.TLF.CACT.ZS>

[7] <https://data.worldbank.org/country/thailand>

[8] Here the author is referring to Cleantech projects and entrepreneurs and not just any entrepreneur (in Thailand there is a high representation of women in entrepreneurship)

[9] Science Technology Engineering and Mathematics

Gender mainstreaming of this project:

UNIDO acknowledge that the empowerment of women and gender equality have significant positive impacts on key drivers of poverty alleviation and social progress, such as sustained economic growth and inclusive industrial development. UNIDO's mandate to promote inclusive and sustainable industrial development (ISID) relies on the advancement of gender equality and the empowerment of women. UNIDO addresses gender inequalities in industry and harnesses women's full potential as economic agents of change and leaders thereby transforming economies and generating inclusive growth. One of the guiding principles of the project will be to ensure that both women and men are provided equal opportunities to lead, participate in, and benefit from the project (UNIDO Gender Policy 2019). The project has been developed considering the UNIDO guide on gender mainstreaming in energy and climate change projects.

In practical terms, gender mainstreaming will be demonstrated in a multitude of ways across the project:

- During PPG phase a Gender Analysis will be carried out and a gender mainstreaming action plan developed which will inform the project formulation. This will involve identification of the differentiated needs and roles of women and men as they relate to the project's interventions. In the project design UNIDO will ensure that the relevant gender dimensions are considered, and the project log-frame developed reflects key gender dimensions of the respective outputs, activities, indicators and targets. The gender analysis will identify how the project can improve gender equality and empower women, as well as propose gender specific targets to be monitored and evaluated throughout the project implementation period. Additionally, the PPG stage will be used to create relevant tools and methodologies for tracking gender issues throughout the project's implementation. To establish a baseline and develop targets, basic relevant data and qualitative information will be collected during PPG as part of the gender analysis and gender markers will be assigned in the project design.
- Budget will also be allocated based on the gender mainstreaming action plan, to ensure project implementation will promote GEEW, including collecting additional baseline data and monitoring progress towards the targets.
- Gender-responsive recruitment will be practiced at all levels, where possible, especially in the selection of project staff, researchers and experts, as well as technical staff. Gender sensitive recruitment will be encouraged in instances where the project does not have direct influence.
- Existing staff, project teams and stakeholders will be trained and their awareness raised on gender issues.
- Gender dimensions will be considered when data collections or assessments are conducted as part of project implementation. Examples include sex-disaggregated data collection and performing gender analysis during PPG.
- Gender dimensions will be considered in all decision-making processes. With respect to project management, the Project Steering Committee meetings will aim to be gender balanced and extend invitations to observers that represent gender dimensions, such as organizations / associations promoting gender equality and advocating women's empowerment. During project activity implementation, effort will be given during stakeholder consultations towards

focusing on gender equality and women's empowerment issues, in particular during policy review and formulation.

- Research, data and assessments will consider gender and age differentiated needs of women and men from different social groups.
- Women's groups, associations that promote GEEW, gender focal points and stakeholders that work in the area of gender and mobility will be involved in the project, e.g. they will be consulted during PPG phase to verify the final project log frame is gender mainstreamed as well as PPG funds will be allocated towards having a review completed by specialized expertise. Possible partners could be Professor Benjamin Sovacool, Director of the Centre on Innovation and Energy Demand (CIED) at the University of Sussex and Johannes Kester from Aarhus University who did a study on who will buy electric vehicles and why^[1].

[1] <https://theecologist.org/2018/jul/05/women-will-drive-transition-electric-cars-study-finds>;
<https://www.sciencedirect.com/science/article/pii/S095937801830030X>

Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment? Yes

closing gender gaps in access to and control over natural resources;

improving women's participation and decision-making; and/or Yes

generating socio-economic benefits or services for women.

Will the project's results framework or logical framework include gender-sensitive indicators?

Yes

4. Private sector engagement

Will there be private sector engagement in the project?

Yes

Please briefly explain the rationale behind your answer.

Private sector would be engaged through financial support for project components and in the adoption of innovative technologies and best practices within municipalities and industry. UNIDO has a long history of supporting catalytic public investments that have led to large-scale private flows of finance. Strengthening synergies and collaboration with relevant partners will expand the opportunity to successfully catalyzing commercial financing. The Ministry of Industry has indicated that the automotive industry is presently the main economic activity generating revenue for the country, accounting for 6.4% of Thailand's GDP, with over a dozen car assemblers and over 100 automotive parts companies located within the EEC.

A wider range of actors from the private sector to be involved in this project, including, electric vehicle manufacturers, charging point operators, and local public transportation fleet operators and drivers. There will also be engagement with other private sector actors such as manufacturers/sellers/recyclers of batteries for EVs, garage owners, private banks and/or financial institutions, owners of private land for potential charging stations, and etc. Thus, there will be a lot of opportunities for private sector engagement. With EECO and Rayong Municipality and other organizations such as TAI and EVAT as partners in the project, which know and have collaboration with the private sector in the EV industry, especially in the EEC area, the project will identify and engage relevant private sector stakeholders. Co-financing from the private sector (e.g., electric vehicle manufacturers, charging point operators, local public transportation fleet operators and drivers) will also be solidified through the PPG phase through further consultations and analysis of which companies best align with project components.

As a key output of the project, the project will develop an entrepreneurship support program for electric mobility solutions to enhance the business sector ecosystem for entrepreneurs. There are currently only few components of EV entrepreneurship ecosystem in the EEC such as some EV charging operators, some EV users, and some manufacturers of vehicles which can potentially manufacture EVs. The existing entrepreneurship ecosystem is not complete and sustainable and needs to be enhanced. The project will engage and support various potential private sector stakeholders as mentioned above in order to enhance components of the existing entrepreneurship ecosystem to be a more complete and sustainable ecosystem which can be used as a model for replication in other regions/areas of the country. In order to financially support relevant private sector stakeholders for related investment required in the project such as for the establishment of charging infrastructure integrated with renewable energy systems, the purchase of electric vehicles, and the establishment of battery recycling stations for second life applications, the project will also engage banks and/or financial institutions, including private banks/financial institutions. For some related investment required in the project, a collaboration between the public and private sector in the form of public and private sector partnerships (PPP) will also be explored. For instance, in order to expand charging infrastructure throughout the EEC area, land of the public sector may also be used for private investment in the establishment of charging infrastructure. A PPP of granting of concessions by local administrative organization for private operators of local public transportation using EVs in routes within the EEC can also be explored.

Based on preliminary interviews with cooperatives operating songthaews in Rayong, the project has preliminarily identified one cooperative with the potential and readiness for co-financing of the conversion of existing diesel-run songthaews to electric songthaews, and with an initial interest in the demonstration. This cooperative has approximately 100 members and songthaews and operates songthaews for local public transportation in an important route which

connects the center of Rayong and Rayong's estuary with a total distance of around 7 kilometers.

Based on an initial interview with this cooperative, 2 business models for the co-financing of the conversion of existing diesel-run songthaew to electric songthaews were preliminarily proposed by this cooperative. First, the project may arrange so that members of the cooperative can get a soft loan from a bank to pay the cost of the conversion of diesel songthaews to electric songthaews. Second, the project may arrange so that a producer of diesel-run songthaews buys existing diesel-run songthaews of the members of the cooperative and provides them back with electric songthaews and a soft loan to pay back over a period of time. The producer of diesel-run songthaews is also responsible for the maintenance and the maintenance cost of electric songthaews, similar to an extended producer responsibility scheme. For both models, a producer of electric vehicle batteries may also rent batteries to members of the cooperative and take back used batteries for other applications. These business models for the private sector co-financing will be further explored and verified during the PPG phase.

The route operated by this cooperative could be selected as a pilot route for the demonstration of electric songthaews, including for raising public awareness and understanding of electric vehicles. The demonstration will also include initiatives to encourage people to use electric vehicles demonstrated by the project (e.g., a cash back or royalty scheme with one free ride after 10 rides). The demonstrated electric vehicles will include zero-emission vehicle tags or banners as a public campaign to publicize the project, increase awareness of the general public including other local public transportation operators about electric vehicles, encourage people to ride electric vehicles demonstrated, and encourage wider use and uptake of other electric vehicles in Rayong and the EEC.

5. Risks to Achieving Project Objectives

Indicate risks, including climate change, potential social and environmental risks that might prevent the Project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the Project design (table format acceptable)

COVID-19 Pandemic:

The project faces a variety of potential risks due to the COVID-19 pandemic. First, general trends in people's transportation preferences in response to COVID-19 could pose challenges to the project's objectives of increasing adoption rates of electric mobility and the project's implementation. The demonstration and awareness raising linked to the adoption of electric public transportation could be hindered due to less interest in public transportation from the public, in turn creating challenges for the viability of the business model. Additionally, if people are nudged by the pandemic towards private transport, the high upfront purchase costs for electric vehicles for private use could push people towards purchasing vehicles with internal combustion engines. Additionally, the reduction in car sales could lower interest in private sector investment for EVs – indeed, an assessment by Deloitte of the Thai industry recovery timeframes anticipates the automotive sector is not expected to rebound in Thailand until 2022.

To mitigate this risk, the project will create linkages with international and national green recovery packages to build back the market towards electric mobility. To date and of relevance, Thailand has already released a suite of COVID-19 recovery measures including soft loans of THB 500 billion to SMEs through commercial banks and 6 month loan payment holidays. During PPG, the project will discuss with stakeholders additional opportunities to align the project with recovery measures.

The project will likely also face practical challenges in terms of delays due to potential restrictions in the movement of people and goods. Stakeholder consultations and site screening for technology demonstrations could be delayed as well as any needs for addressing maintenance or service issues after installation due to movement restrictions. To address these challenges, the project will build into its work plan a certain amount of consideration for potential delays as well as flexibility in terms of planning the potential need to conduct capacity building and stakeholder engagement through online approaches.

Preliminary climate risk assessment:

Thailand is located in the southeastern part of the Asian mainland, in a tropical region with a relatively warm year-round temperature. Thailand is vulnerable to many natural and human-induced hazards, including floods, droughts, tsunamis, forest fires and landslides (World Bank Climate Change Knowledge Portal). In particular, hydrological events and drought are common and have had fatal consequence – notably during the 2004 Indian Ocean earthquake and tsunami which resulted in over 200,000 fatalities. Thailand's greatest risk are floods and droughts and to a lesser extent, cyclones, specifically in the northern portion of the country. Climate change has already had an impact on the frequency and severity of hazards. In 2020, the Global Climate Risk Index ranked Thailand as the 8th most affected country by climate change for the period of 1999 to 2008.

Using the Coupled Model Intercomparison Project Phase 5 (CMIP5) models included under the IPCC's Fifth Assessment Report (AR5), key projected climate trends for Thailand include a mean annual temperature increase of 1.4 to 1.8^oC by the 2060's and 3.0 to 3.8 ^oC by the 2090's. Projections for mean annual rainfall across different model's project changes in precipitation between +28% to 74% by 2090. The Thai Office of Natural Resources and Environmental

Policy and Planning estimates that sea levels will rise one meter over the next 40 to 100 years, impacting at least 3,200 km² of the country's coastal land, and affecting 17% of Thailand's population.

The rise in global temperature is anticipated to contribute to an increase in storms and in turn, flooding, in particular on coastlines along the Gulf of Thailand. Climate change is also projected to contribute to increased levels of drought, with some areas projected to have lower overall annual rainfall but also experience a higher frequency of storms.

The Eastern Economic Corridor, which includes the provinces of Chachoengsao, Chonburi and Rayong and is the region selected for the project's technology demonstrations, is located in the central eastern part of the country along the Gulf of Thailand. People and infrastructure along the region's coastlines have exposure to hazards such as flooding and storms that could potentially intensify during the course of the project and its outcomes lifetime. However, these risks will be managed by completing a climate risk assessment during PPG and incorporating its findings into the design of the project. Specifically, the project will mitigate any potential risk by selecting appropriate project sites that have minimal exposure to the identified hazards. With these measures in place, and given the unlikelihood that the project would be negatively impacted by the above risks, the project's climate change risk has been assessed as low.

Additional risks:

An overview of all project risks, including COVID-19 and climate change, is now provided below:

Risks	Risk Level	Mitigation Actions
Lack of partnership engagement (from stakeholders, government, private sector, etc.)	low	Early engagement strategy, regular outreach with networks to keep the momentum. Dissemination of information and knowledge to ensure scalability of project beyond the selected pilot cities.
Lack of local capacity to execute the project according to the relevant UNIDO and GEF policies	medium	External assessments of potential executing entities will be conducted during the PPG.
Unviable investment/project	low	The project will actively involve the private sector to ensure that financial modelling, business plan development, rollout of financial mechanisms is in alignment with the interest of investors. Early partners can create flexibility to overcome financial challenges and build trust between the municipalities and investors, where a track record does not exist.
Climate change: - Increase in intensity and frequency of extreme events (cyclones, floods etc.); - Droughts:	medium	The project will focus on increasing overall resilience of EEC– the climate change risks will directly be addressed by project activities significantly reducing impact of climate change on the project. During site selection for the d

<ul style="list-style-type: none"> - Droughts; - Heat waves; 		<p>...change on the project during the execution for the demonstration projects, relevant climate change risks will be taken into consideration.</p>
<p>Environmental change</p>	<p>low</p>	<p>The project components address the problem of sustainability considering local ecosystems, so the realization of the project should effectively decrease the risk of environmental change.</p>
<p>Political instability in Thailand or in the region</p>	<p>low</p>	<p>The project will aim to engage a wide range of stakeholders across government and private sector to ensure ownership over project is wide reaching. Project will work to continue to educate and engage all stakeholders in event of any changes in key stakeholders.</p>
<p>Gender Risk:</p> <p>Risk of resistance against, or lack of interest in, the project activities from stakeholders, especially with regard to the active promotion of gender equality.</p> <p>Low participation rates of suitable female candidates due to lack of interest, inadequate project activity or missing qualified female population within engineering sector.</p>	<p>low</p>	<p>The project will pursue thorough gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as civil society and non-governmental organizations promoting gender equality. This shall mitigate social and gender related risks, promote gender equality, create a culture of mutual acceptance, and maximize the potential contribution of the project to improving gender equality in the energy field. As gender has been clearly mainstreamed throughout the project design, this will help mitigate any potential risk. Furthermore, a national Gender Consultant will be recruited to support the implementation of gender mainstreaming measures into the project activities.</p>
<p>COVID-19 global pandemic:</p> <ul style="list-style-type: none"> • Risk of lack of resources or change in priorities from stakeholders due to ongoing economic and social challenges related to pandemic • Issues around implementation and delay of project's demonstrations due to restrictions around movement of people 	<p>Medium</p>	<p>The project will fully consider the realities of COVID-19 during the PPG phase and identify with stakeholders appropriate and effective ways for this project to support Thailand's recovery efforts. Consideration will also be given during PPG for how COVID-19 could have bearing on the project's implementation and design interventions and activities to consider additional challenges that may subsequently arise due to the pandemic as well as opportunities to align the project with economic recovery efforts.</p>

6. Coordination

Outline the institutional structure of the project including monitoring and evaluation coordination at the project level. Describe possible coordination with other relevant GEF-financed projects and other initiatives.

The GEF Implementing Agency for the project is UNIDO and will be responsible for the overall project development and oversight. The project execution will be undertaken through multiple partnership/contractual arrangements between UNIDO and selected national/international entities with relevant mandates and capacities. External assessments of potential executing entities will be conducted during the PPG.

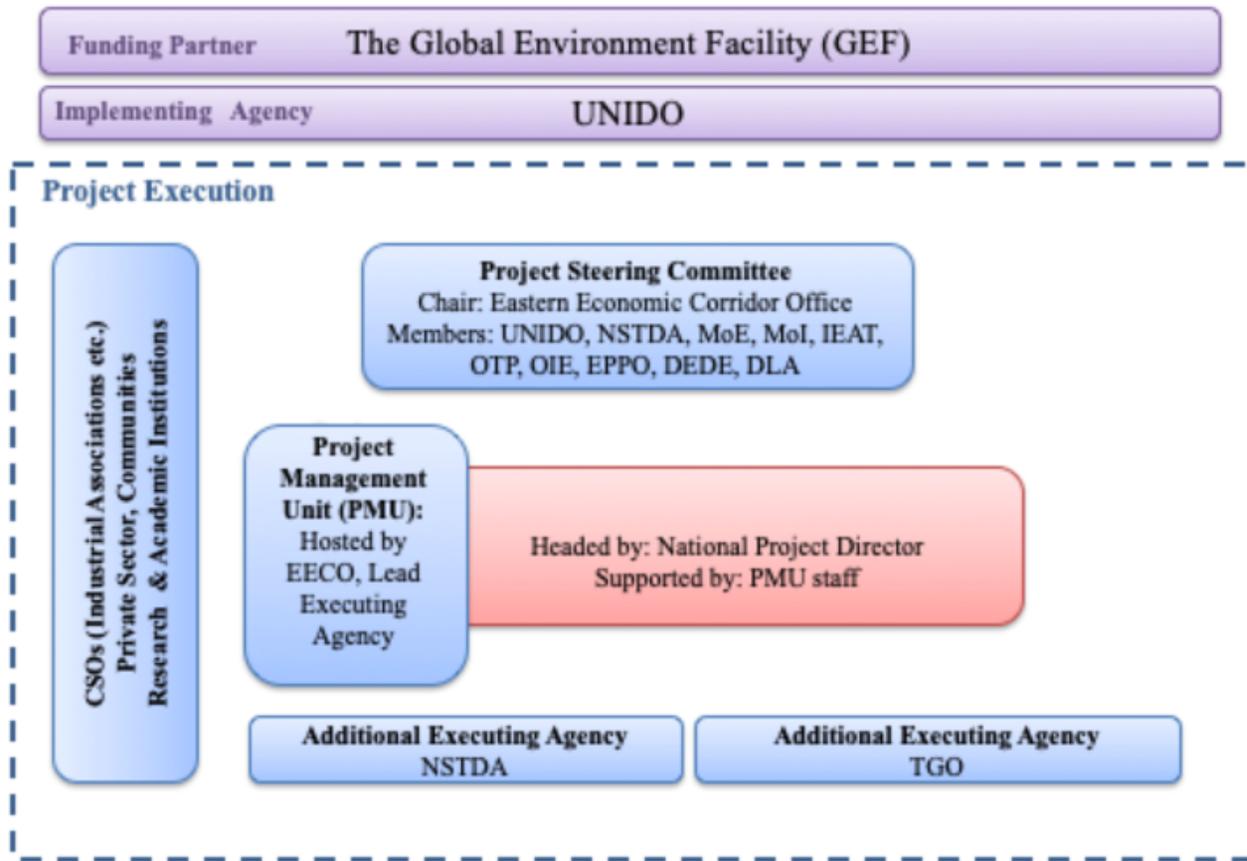
The Executing Agency is the Eastern Economic Corridor Office (EECO). The National Science and Technology Development Agency (NSTDA), and Thailand Greenhouse Gas Management Organization (TGO) will act as executing partners (NSTDA for Component 2 & 3 and TGO for Component1), with EECO coordinating the partners execution based on each entities technical expertise.

A Project Steering Committee (PSC) will provide strategic and operational guidance to the project and ensure its smooth execution according to the approved project document. The PSC will also be consulted on matters relating to project budget and work plans.

Project Management Unit (PMU) will be established within the Eastern Economic Corridor Office to ensure the day-to-day management for the project and coordination with relevant baseline initiatives. The PMU will report to UNIDO and PSC. The PMU shall be provided with an appropriate office space and will work in close coordination with the National Project Director (NPD) and the UNIDO Regional Office in Thailand.

Government support will also be required in identifying an NPD to act as main national project focal point. The NPD will also provide guidance to the PMU as far as government policies and regulations are concerned, facilitate coordination with other government entities, and facilitate approvals required from government in relation to project activities.

The Project Management Framework is given in the figure below:



The project development team will endeavour to establish and strengthen linkages with other agencies and actors that are currently planning or implementing relevant projects which will contribute to the overall outcome of the proposed GEF project. Some of such partners active in this area are local private entrepreneurs, CSOs and NGOs, academia, etc. The project development team will identify the most relevant partners during the project preparation phase. During the PPG stage, numerous stakeholders' consultation including the log frame analysis will be organized to discuss related issues and concerns and prepare comprehensive structures for project implementation and management. A detailed stakeholders' involvement plan will be designed too. This will ensure complementarity and build on best practices and lessons learned by the stakeholders. During the implementation stage, the coordination mechanism will be further established to ensure proper coordination and involvement of the baseline project proponents.

Stakeholders will form a comprehensive integrated structure to enhance a synergy among the project partners and serve as the knowledge source of new clean technologies, emerging entrepreneurs, knowledge network, applied research collaboration and additional team members. Furthermore, the gender mainstreaming approach will be applied in the form that early involvement of designated women entrepreneurs, associations and gender focal points will take part in all project activities. This will be in line with the GEF Policy on Stakeholder Engagement that sets out the core principles and mandatory requirements for stakeholder's involvement.

The project will also have linkages with the Global and Regional Programs established under GEF-7. Concretely, this will include participating in capacity building activities, contributing to knowledge platforms with lessons gained from the project and replicating best practices from countries and regions shared through the platform. A specific output (3.1.2) is dedicated to establishing these linkages and ensuring bi-lateral engagement between the project and global and regional platform to leverage synergies and support scalability and replicability of best practices developed under the project.

This project will also ensure coordination with the GIZ TRANSfer III project. The GIZ project supports the Thai government in the design and the creation of Thai Clean Mobility Program (TCMP). TCMP is a national program that supports city administrations in their efforts to plan and implement Sustainable Urban Transport Projects, thereby reducing GHG emissions and air pollution stemming from transport in Thai cities. The GIZ project includes setting up a national Sustainable Urban Transport (SUT) Fund to finance SUT projects in other Thai cities.

The proposed project will coordinate with the GIZ project regarding the National SUT Fund to finance SUT projects in the EEC to complement the proposed project, as well as to share experiences and lessons learned from the proposed project with the GIZ project in order to use the Fund to support scale-up and replication of electric mobility in other cities in Thailand, if applicable. The potential for collaboration with the GIZ project can be further explored during the PPG phase, when there are more results and outputs of the GIZ project that are relevant to the proposed project.

Legal context:

The Kingdom of Thailand agrees to apply to the present project, mutatis mutandis, the provisions of the Revised Standard Technical Assistance Agreement concluded between the United Nations and the Specialized Agencies and the Government on 4 June 1960.

Transfer of assets:

Full or partial ownership of equipment/assets purchased under the project may be transferred to national counterparts and/or project beneficiaries during the project implementation as deemed appropriate by the government counterpart in consultation with the UNIDO Project Manager.

7. Consistency with National Priorities

Is the Project consistent with the National Strategies and plans or reports and assessments under relevant conventions

Yes

If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc

Thailand submitted its Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat on the first of October, 2015. Thailand communicated that it intends to reduce its greenhouse gas (GHG) emissions by 20% from the projected business-as-usual (BAU) level in 2030 (approximately 111 MtCO_{2e} of projected 555 MtCO_{2e} BAU total). The level of contribution could increase up to 25% subject to adequate and enhanced access to technology development and transfer, financial resources and capacity building support through a balanced and ambitious global agreement under the UNFCCC. As a framework for developing an action plan of implementation to meet the GHG mitigation target in 2030, Thailand's NDC Roadmap on Mitigation 2021-2030 (NDC Roadmap 2021-2030) was prepared. The NDC Roadmap 2021-2030 was approved by the cabinet in May 2017 and included GHG reduction measures in three sectors, i.e., the energy and transportation sector, the industrial process and product use sector, and the waste management sector, as these three sectors were considered as major sectors that have the potential and the readiness to meet the GHG mitigation target in 2030.

With regard to the transportation sector, one of the key sectors for achieving the mitigation target, the NDC Roadmap on Mitigation 2021-2030 states a total mitigation target of 41 MtCO_{2e}. The Thai government has considered electric mobility as a low GHG and Particulate Matter (PM) emissions transport solution, and a potential alternative to vehicles with internal combustion engines (ICE). Therefore, in 2015, the Thai government, by the Ministry of Energy, proposed measures to reduce the country's energy intensity, one of which is to reduce energy use in the transportation sector through the adoption of electric vehicles, and made a plan and set the target of the adoption of plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) to be 1.2 million vehicles in 2036. In addition, the NDC Action Plan in the transportation sector approved by the cabinet in 2018 thus includes projects and plans on an expansion of electric vehicles. This project's focus on low emission transport solutions will directly support reaching the target in the transportation sector of the country's NDC Roadmap 2021-2030.

Furthermore, the proposed project complements nicely with two key strategies of a master plan for national energy reform, the strategy number 12 and 16. The master plan for national energy reform 2018 currently being considered by the cabinet aims at reforming all aspects of energy governance and fuel options (energy use in various sectors). The master plan for the national energy reform constitutes 6 elements with 17 strategies to fulfill the 6 elements. The first strategy to which the propose project contributes is the strategy number 12 under the 4th element on alternative energy promotion. The strategy number 12 is objected to achieve the 20-year- reform of energy used in transport. The strategy includes a structural change and change of ecosystem of energy used in the transport sector for national-wide adoption of alternative fuels in the transport sector. This ecosystem might include relevant regulation, and downstream production and investment of alternative fuels used in the transport sector such as biofuels This proposed project contributes to the sectoral transform on vehicles using alternative fuels. In addition, the proposed project also fulfils the strategy 16 on electric vehicle promotion under the 6th element on innovation, technology and infrastructure. The strategy 16 focuses only on the promotion of both production and use of the electric vehicles. Therefore, the implementation of this proposed project would contribute to the country's plan on the reform of the energy use and energy governance with specific to electric vehicles (songthaews) both on the investment promotion as well as the promotion of usage.

8. Knowledge Management

Outline the Knowledge management approach for the Project, including, if any, plans for the Project to learn from other relevant Projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

Knowledge management and scale-up is a key part of the project with a dedicated component to knowledge exchange and scale-up. In particular, the component ensures direct engagement with the Asia and Pacific Regional Support and Investment Platform run by the Asian Development Bank and the Global Programme. This project stands to contribute lessons learned and best practices to the programme's four thematic working groups, in particular the working groups on Charging Infrastructure and Grid Integration as well as batteries. The project also aims to take advantage of the platform by ensuring national stakeholders are the beneficiaries of technical support, the networks and communities of practice, training and capacity building and information from global working groups provided under the platform.

A comprehensive set of activities will ensure scale-up of lessons learned from the EEC to the national level. A critical piece is the inclusion of key stakeholders (listed under 2b) in the design of this proposal. These stakeholders will be further included during the project's formulation during the PPG phase and involved in the project steering committee during the project's implementation. This level of engagement is fundamental for ensuring the project meets the existing needs of stakeholders and that the project responds as necessary to needs as they evolve. This ownership also contributes to the long-term sustainability and scale-up of the project's outcomes.

Additionally under this component, several activities are envisioned: i) Documentation of best practices and solutions; ii) Peer to peer learning within relevant stakeholders; iii) Communication strategy around the planning process and production of well-designed and easy to understand materials; iv) Tailored trainings for key actors in the planning and management process; v) Awareness-raising ; vi) Training, resources, and technical assistance to cities on data collection strategies, validating the information, and other analytic tools required for investment analysis; and vii) Media/communications, outreach, stakeholder engagement.

9. Environmental and Social Safeguard (ESS) Risks

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

Overall Project/Program Risk Classification*

PIF

CEO Endorsement/Approval MTR

TE

Medium/Moderate

Measures to address identified risks and impacts

Provide preliminary information on the types and levels of risk classifications/ratings of any identified environmental and social risks and potential impacts associated with the project (considering the GEF ESS Minimum Standards) and describe measures to address these risks during the project design.

UNIDO has completed an initial Environmental and Social Screening Assessment. Based on this process, UNIDO has identified the proposed project is likely to have less adverse impacts on human populations or environmentally important areas than those of Category A projects. Likely impacts will be few in number, site-specific, and few if any will be irreversible. An ESMP will need to be completed as per UNIDO and donor requirements. UNIDO has also reviewed the project with respect to what relevant operational safeguards should be considered for this project and included this as an attachment.

Supporting Documents

Upload available ESS supporting documents.

Title	Submitted
Thailand GHG calculations	
Theory of Change	
UNIDO_ESSPP_Thailand_180285_signed	

Part III: Approval/Endorsement By GEF Operational Focal Point(S) And Gef Agency(ies)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the Operational Focal Point endorsement letter with this template).

Name	Position	Ministry	Date
Mr. Jatuporn Buruspat	Permanent Secretary	Natural Resources and Environment	9/28/2020

ANNEX A: Project Map and Geographic Coordinates

Please provide geo-referenced information and map where the project intervention takes place

The overall project targets Thailand as a country (13° 44' 12.1812" N, 100° 31' 23.4696" E) with the technology demonstration expected to happen in Thailand's Eastern Economic Corridor and its corresponding provinces: Chon Buri (13.3611° N, 100.9847° E); Rayong (12.7074° N, 101.1474° E); Chachoengsao (13.6904° N, 101.0780° E).

Thailand's Eastern Economic Corridor



