



Lebanon Sustainable Low-emission Transport Systems

Part I: Project Information

GEF ID

10358

Project Type

FSP

Type of Trust Fund

GET

CBIT/NGI CBIT NGI**Project Title**

Lebanon Sustainable Low-emission Transport Systems

Countries

Lebanon

Agency(ies)

UNDP

Other Executing Partner(s)

Ministry of Energy and Water, Ministry of Public Works and Transport

Executing Partner Type

Government

GEF Focal Area

Climate Change

Taxonomy

United Nations Framework Convention on Climate Change, Climate Change, Focal Areas, Influencing models, Stakeholders, Paris Agreement, Climate Change Mitigation, Technology Transfer, Renewable Energy, Sustainable Urban Systems and Transport, Transform policy and regulatory environments, Demonstrate innovative approaches, Strengthen institutional capacity and decision-making, Convene multi-stakeholder alliances, Beneficiaries, Communications, Public Campaigns, Education, Awareness Raising, Behavior change, Civil Society, Non-Governmental Organization, Academia, Private Sector, Large corporations, SMEs, Local Communities, Type of Engagement, Participation, Consultation, Partnership, Information Dissemination, Gender Equality, Gender results areas, Participation and leadership, Knowledge Generation and Exchange, Capacity Development, Gender Mainstreaming, Capacity, Knowledge and Research, Knowledge Generation, Knowledge Exchange, Innovation, Enabling Activities

Rio Markers**Climate Change Mitigation**

Climate Change Mitigation 1

Climate Change Adaptation

Climate Change Adaptation 0

Duration

60 In Months

Agency Fee(\$)

337,532

Submission Date

10/7/2019

A. Indicative Focal/Non-Focal Area Elements

Programming Directions	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
CCM-1-2	GET	3,552,968	82,488,000
	Total Project Cost (\$)	3,552,968	82,488,000

B. Indicative Project description summary

Project Objective

Promotion of sustainable transport in Lebanon through transport demand management and low carbon vehicles

Project Component	Financing Type	Project Outcomes	Project Outputs	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
1. Institutional and policy support for the promotion of sustainable low emissions transport systems	Technical Assistance	Strengthened policy environment to support the promotion of sustainable low emissions transport systems	<p>1.1 Legal, financial and regulatory framework for the transport sector assessed and improved. This will also include an analysis of national progress on NDC transport targets and updating the NAMA initiatives.</p> <p>1.2. A roadmap developed for sustainable low-emission transport systems and prioritise sector needs.</p> <p>1.3 Developed guidelines and standards (including financing strategy) to support the implementation of sustainable low emissions transport programmes at national and local level. e.g. infrastructure and standard for electric vehicles (EV), electric vehicle supply equipment (EVSE), guidelines and regulations for related e-waste, modal shift to public transport and non-motorized transport, comprehensive urban planning.</p> <p>1.4 Research and innovation in sustainable transport systems and low-emission vehicles expanded for the Lebanon context</p>	GET	770,750	1,088,000

2. Improved environment for deployment in sustainable low-emission transport systems and support services.	Technical Assistance	Electrification of Public Transport System and Integration of Renewable Power with EV Charging	2.1 Innovative financing models designed and assessed to support deployment of low emissions vehicles for public and private transport.	GET	500,000	5,000,000
2. Improved environment for deployment in sustainable low-emission transport systems and support services.	Investment	Electrification of Public Transport System and Integration of Renewable Power with EV Charging	2.2 Investment in low emission vehicles and RE-integrated charging stations for mass transit system and intermediate transport services expanded. 2.3 Sustainable O&M systems and viable models for EV charging stations introduced based on pilot systems.	GET	1,402,629	75,000,000

3. Knowledge management, capacity development and awareness raising	Technical Assistance	Sustainable low emissions transport programs with improved awareness of benefits of low emissions transport and modal shift	3.1 Coordination mechanism established among agencies/stakeholders involved in sustainable low emissions transport systems to ensure comprehensive approach 3.2 Coordination with the thematic working groups, and Support and Investment Platform of the Global e-Mobility Program "Global Programme to Support Countries with the Shift to Electric Mobility" 3.3 Communication and public awareness campaigns targeting end users (drivers, operators) including on behaviour/social norms (including road safety) and low-emission transport (including public and non-motorised modes of transport) implemented based on lessons learnt and best practice 3.4 Capacity of municipal planners and managers of public transport systems built for the promotion of low-emission transport (including non-motorized transport and carpooling), traffic control and management (e.g. parking management, vehicle-use control)	GET	710,400	1,000,000	
Sub Total (\$)					3,383,779	82,088,000	
Project Management Cost (PMC)							
					GET	400,000	
					Sub Total(\$)	169,189	400,000
Total Project Cost(\$)					3,552,968	82,488,000	

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(\$)
Government	Ministry of Environment	In-kind	Recurrent expenditures	200,000
Government	Railways and Public Transport Authority (RPTA)	In-kind	Recurrent expenditures	200,000
Donor Agency	Greater Beirut Bus Rapid Transit (World Bank)	Loans	Investment mobilized	50,000,000
Donor Agency	Urban transport Tripoli (through European Investment Bank)	Grant	Investment mobilized	1,000,000
Private Sector	WeGo Public Bus Initiative	Equity	Investment mobilized	29,800,000
GEF Agency	UNDP (through RPTA support)	Grant	Recurrent expenditures	1,088,000
GEF Agency	UNDP	Grant	Investment mobilized	200,000
			Total Project Cost(\$)	82,488,000

Describe how any "Investment Mobilized" was identified

All "investment mobilized" were identified in consultation with the government, private sector, development banks and universities. A workshop was held on 29 March 2019 in Beirut on "The Road to Sustainable Mobility Conference". Related co-financing letters will be provided during the PPG phase.

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(\$)
UNDP	GET	Lebanon	Climate Change	CC STAR Allocation	3,552,968	337,532	3,890,500
Total GEF Resources(\$)					3,552,968	337,532	3,890,500

E. Project Preparation Grant (PPG)

PPG Amount (\$)

100,000

PPG Agency Fee (\$)

9,500

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

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)	24618	0	0	0
Expected metric tons of CO ₂ e (indirect)	49236.14	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)	24,618			
Expected metric tons of CO ₂ e (indirect)	49,236.14			
Anticipated start year of accounting				
Duration of accounting				

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	0.20			

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	700,000			
Male	700,000			
Total	1400000	0	0	0

Part II. Project Justification

1a. Project Description

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

1.1. *Impacts of the current transportation system*

Lebanon is a middle-income country with a population of 4.5 million people in 2015, in addition to approximate 0.935 million registered Syrian refugees[1] and 450,000 Palestinian refugees[2] living in the country. Real gross domestic product (GDP) growth for 2016 was estimated at 1.8 percent, reflecting the impact of regional turmoil and the absence of reforms[3]. The growth in the Lebanese economy between 2000 and 2015 was at around 88% in real GDP terms. This additional economic activity and production was coupled with a population increase of nearly 500,000 between 2006 and 2016 in addition to an influx of displaced Syrians since 2011. This growth led to an increase in demand for various services, which were not met with sufficient investments in respective infrastructure[4]. The transport sector is one of the most underinvested sectors and is not meeting the speed of population growth and urbanization and the influx of displaced people from Syria, hindering economic development and growth while increasing environmental impacts.

The Lebanese transport sector is the second largest consumer of energy in Lebanon, depending entirely on gasoline and diesel, and contributing to approximately **23% of the nation's greenhouse gas (GHG) emissions**[5], more than 60% of all NOx and NMVOC emissions, 99% of all CO emissions, 5% of all SO₂ emissions and other pollutants such as particulate matter (PM10 and PM2.5), VOC, copper, zinc and lead[6]. The car fleet in Lebanon is very old and fuel intensive, with around 54% of it manufactured before 2001 (MoE & UNDP, 2016). As for the contribution of the different vehicle categories, passenger cars have the highest share of the emissions with 58.38% of the total transport GHG emissions while light-duty vehicles (LDV), heavy-duty vehicles (HDV), and motorcycles account for 17.46%, 23.81%, and 0.35% respectively[7].

Air quality degradation and impacts (on human health in particular) in Lebanon is estimated to be approximately 1% of gross domestic product (GDP), and a significant portion of this is attributed to the transport sector[8]. It is estimated that air pollution from polluting old cars costs at least \$ 200 million of economic loss per year resulting from morbidity, adult mortality, child mortality and discomfort, which does not include the cost from health care services[9]. A substantial additional impact is that of congestion. Driven by high penetration of the passenger cars, lack of reliable public transport, uncoordinate public works and urban design, congestion in the cities leads to an estimated increase of travel time, where one estimate puts the burden of congestion at 8% of GDP per annum[10].

1.2. *Current status of the transportation system*

A sustainable and efficient transport system, including effective and reliable public transport options, is currently missing. According to the World Economic Forum's Competitiveness Index, Lebanon's infrastructure is the second main constraint to growth and its supply and quality is materially below various sets of comparator countries[11]. Lebanon's significant road network of 22,000 km² is in an overall poor condition and has not been significantly expanded or improved since the 1960s. Bottlenecks and traffic congestions are a daily occurrence at entrance points of the greater Beirut area as all north-south traffic passes through Beirut's central streets. The underdeveloped roads are unable to accommodate the growing number of vehicles, which is driven by lack of reliable public transportation system as well as population growth, urbanization and centralization of activities[12].

With respect to the public transport system, it currently consists of unreliable, unsafe and low-capacity public and private buses, private minibuses, and shared-taxis, which are operating on an ad-hoc basis without coordination. These public transport systems are perceived to be of poor quality and unsafe, as many of these vehicles are old, fuel intensive and polluting. There are no fixed stops and bus shelters in the country, information/schedules are difficult to find, coverage is limited, and the bus travel times are much longer than the car travel time as buses have no dedicated lanes and therefore compete with private vehicles on very congested roads[13]. The occupancy rate of these mass transport systems is very low in Lebanon, with about 1.2 passengers per vehicles for shared taxis, 6 for vans, and 12 for buses in the Great Beirut Area. The market share of the public transport in the Greater Beirut Area is estimated at 30%, splitted into 14% for shared taxi, 8% for vans and 8% for buses while private passenger vehicle including exclusive taxis accounts for 70% of the market. The low occupancy and limited market share of the public transport indicates its inefficiency, inconvenience, lack of safety, unreliability, and other customer-preference factors compared to the attractiveness of owning a private vehicle (social norm). That being said, to address these issues, a few new businesses and initiatives are being developed by entrepreneurs and civil society. Their services/initiatives intend to either improve the experience and reliability of existing public buses by mobile/web application or increase the occupancy of vehicle occupancy rate through carpooling scheme. While these new mobility services have the potential to bring about social benefits such as reduction of use of private passenger vehicles, they are still nascent and may need significant behaviour changes of customers (i.e. sharing car vs private car ownership) and enabling environment (i.e. fiscal and non-fiscal incentives). While ride-hailing service is getting popularity and already widely accepted, the service providers are not supplying a carpooling option.

The absence of attractive and reliable public transport has shaped behaviour habits of the people, magnifying GHG emissions. Most of the Lebanese population now rely on their own cars for their mobility needs. The rate of car ownership is very high at 4.34 individuals per car when compared to neighbouring countries like Turkey (2.53 per car) and Jordan (1.66). Moreover, the average vehicle occupancy rate is about 1.3 passengers per car, further contributing to GHG emissions (World Bank, 2018). Strikingly, 50% of total trips have a total distance lower than 5 km and 75% lower than 12 km, with an average trip distance of 9.6 km[14]. In addition, 25% of stops are below 2 seconds and 75% below 10 seconds while stop time corresponds to more than 15% of travel time. Consequently, peak-hour speeds range between 30 km per hour on main highways and arterials to less than 10 km per hour on local streets. These inefficient operation of internal combustion engines is causing a high rate of fuel consumption and pollutant emissions. The fact that the car fleet in Lebanon is very old and fuel intensive, with around 54% of it manufactured before 2001 makes the situation worse. Spending on transportation represents about 15 % of household expenditures (which is excessively high compared to other countries in the region)[15]. In fact, a Lebanese passenger traveling one kilometre in a passenger vehicle, and when considering externality components of pollution, travel time, congestion, and accident, costs around US\$48/km[16].

The below table provides further information on the baseline characteristics of the transport sector in Beirut (base year 2013).

Table 1. Characterizing the transport sector in Beirut – base year 2013

General Index	Characteristics	Reference
Passenger transport system index	0.1	MoE/UNDP/GEF, 2015
Environmental culture index	0.2	MoE/UNDP/GEF, 2015
Travel time in the Greater Beirut Area (GBA) is lost in delays due to traffic congestion	70%	Abou Zeid and Hassan (2016))
Average reported intermodal road speed	11 km per hour	Abou Zeid and Hassan (2016))
Car speed	9.4-13.5 km/hour	Abou Zeid and Hassan (2016))
Bus speed	6.5-9.3 km/hour	Abou Zeid and Hassan (2016))
minibus	7.5-10.8 km/hour	Abou Zeid and Hassan (2016))
taxi speed	8.6-12.3 km/hour	
Modal split in Beirut		
Private car	80.6%	IBI Group and TEAM (2009)
Bus capacity (capacity 24-33 passengers)	1.75%	IBI Group and TEAM (2009)
Minibus or van (capacity 14 passengers)	10.9%	IBI Group and TEAM (2009)
Shared taxi (capacity 4 passengers)	6%	IBI Group and TEAM (2009)
Private taxi	0.7%	IBI Group and TEAM (2009)
Walk, bike, motorcycle	0.05%	IBI Group and TEAM (2009)
Fuel efficiency		
Average car fuel efficiency	170 km/20 liters of fuel 0.1176 liter/km	IBI Group and TEAM (2009)
Buses and minibuses fuel efficiency	0.25 liter/km	MoE/UNDP/GEF, 2015
Energy consumption in passenger transport 2013 (toe/year)	1,582,540.759	MoE/UNDP/GEF, 2015

Plate passenger cars		
Small cars	16.24%,	MoE/UNDP/GEF, 2015
Midsized cars	51.35%,	MoE/UNDP/GEF, 2015
Large cars	32.41%.	MoE/UNDP/GEF, 2015
Age of cars		
Manufactured before year 2000	51.25%	MoE/UNDP/GEF, 2015
Manufactured after 1999	48.75%	MoE/UNDP/GEF, 2015
Occupancy		
Car occupancy rate including taxi	1.7	IBI Group and TEAM (2009)
Bus occupancy rate	11.20	IBI Group and TEAM (2009)
Minibus occupancy rate	5.93	IBI Group and TEAM (2009)
Shared and exclusive taxi occupancy rate (excluding driver)	1.18	IBI Group and TEAM (2009)
Buses		
Number of buses per day	275	WB, 2017
Number of minibuses/day	991	WB, 2017

Even though half of the trips in Great Beirut Area (GBA) are over distances of less than 5 km, non-motorized transport or “micro-mobility” such as walking, bicycle, scooters and their sharing services is still negligible. The low share of trips on non-motorized transport might be attributed to lack of dedicated lanes/sidewalks, road safety, illegal parking, reckless and irresponsible driving behaviour, many hills and hot and humid weather, and social norms on non-motorized transport. However, since electric-bikes and electric-scooters are rapidly gaining popularity in several cities as a short ride (“last/first-mile”) solution, emerging new micro-mobility service including e-bike/scooter sharing may have a potential to be accepted in the Lebanese market and complement motorized transport including upcoming public transport (see Baseline Scenario section). In fact, an e-scooter sharing service is now operational and expanding within Beirut.

1.1. Institutional structure of the transport sector

The transport sector in Lebanon is subjected to fragmented responsibilities. The planning and regulation of public transport is undertaken by **the Ministry of Public Works and Transport (MPWT)**. This includes the licensing of companies to undertake public transport services, fare setting, and planning. The MPWT, through the Directorate General of Roads, oversees the construction and maintenance of the national highways and road networks. The MPWT is also the guardian of the state-owned enterprise, **the Railways and Public Transport Authority (RPTA)**. The RPTA was established to manage and invest the public transportation, and the Lebanese railways network including all related funds, supplements and stores according to the Law issued by the decree no. /6479/ on the 14th of April 1961. The RPTA is a Public Institution under the tutelage of the MPWT with a semi-independent legal identity with financial and administrative autonomy. The RPTA consists of two directorates. Railways Directorate and the Bus Transport Directorate. The RPTA, however, has not been able to effectively play its role due to the destruction of railways, tramways, and most of the buses that were once under its management. As the RPTA should become the Authority organizing the public transportation, the current existing staff do not have the requirements or the profile. Indeed, the RPTA has a wide array of assets, including old locomotives, wagons, 47 buses, 37 of which operate on nine lines, equipment, buildings and land throughout the country, wherever stations were established, exceeding 8 sq. km. For the past few years, and in order not to witness the furthering of the deterioration of the assets, the authority, has been investing its assets, and generating resources.

The **Ministry of Interior and Municipalities (MoIM)**, on the other hand, licenses vehicles and drivers and undertakes the overall management of vehicle inspections, in addition to the responsibility for the enforcement of traffic law, including on public transport, through the Internal Security Forces. Municipalities are also assigned some public transport competences through the Municipal Law while also being responsible for planning and implementation of urban projects.

Finally, **the Council for Development and Reconstruction (CDR)** has competencies in national planning, including transport planning, and the execution of large infrastructure projects such as road and transport through project-specific mandates by the Council of Ministers[1].

1.2. Legislation of the transport sector

Legislation governing the transport sector is scattered under legislation related to air pollution, fuel standards, and other legislation related to traffic management, financial incentives, and customs. Legislation can also be divided into approved/ratified legislation or legislation awaiting parliament approval. The draft law proposal (Decree 8942, dated 21/09/2012) aims to ‘incentivize the public transport sector (public transport vehicles and buses)’ through various exemptions and government support for low interest loans. However, this draft law awaits parliamentary approval. In 2005, the MOE prepared a draft law on the Protection of Air Quality, the Clean Air Act (CAA), that was approved by the Council of Ministers (COM) in 2012 (Decision No. 34) and ratified by the Lebanese Parliament by law 78 (dated April 2018). The CAA includes an assessment of the state of air pollutants and intends to define limits for ambient air quality and air pollutants as well as emission limits of stationary and mobile sources. It aims to define emission limit values for mobile sources for several criteria pollutants, define methodologies and techniques for the measurement of emissions from mobile sources, define harmful substances in fuel, and set methodologies for testing the conformity of imported fuels[2].

In 2001, the GOL approved and implemented Law 341 (dated 06/08/2001) on “Reducing air pollution from the transport sector and encouraging the use of less polluting fuel”. It was amended by Law 380 (14/12/2001) and Law 453 (16/8/2002). Specifically, the law banned (1) the import of minivans and buses (<15 passengers + driver) operating on diesel oil, (2) the import of old and new diesel engines for private passenger cars and minivans, (3) the use of diesel in private vehicles, and (4) the use of leaded gasoline in all vehicles. It also made catalytic converters a mandatory requirement in all vehicle categories and reinstated the mandatory vehicle inspection (*Mécanique*) for gasoline engines (annual inspection) and diesel engines (every six months). The inspection includes examination of brakes, lights, and tailpipe emissions using Lebanese pass-or-fail values for CO, CO₂, and HC.

In 2002, the COM enacted Decree 8442 (dated 13/08/2002) which defined standards for gasoline and diesel oil used in vehicles including their sulphur content; 0.05% by weight in gasoline 92, 95 and 98 Octane and 0.035% by weight in diesel oil. However, to date there is no legislation related to the regulation of passenger vehicle emissions. In 2012, the GOL issued Law 243 (dated 25/10/2012), the “New Traffic Law”, which reinstated the installation of catalytic converters in all gasoline vehicles (Article 89; Item 3) and exempted new vehicles from inspection for the first three years after registration (Article 159). Moreover, vehicles older than eight years cannot be imported (Customs Decision).

Finally, article 55 of Law 79 (dated 18/04/2018) reduces and/or exempts hybrid and electric vehicles from certain taxes and fees. Under the new law, car buyers wishing to purchase a hybrid vehicle will now have to pay only 20 percent customs for a vehicle of any value, if that vehicle is for private use, and 10 percent for public use. Meanwhile, electric vehicles (EVs) will be exempted from customs altogether. In addition, owners do not pay registration nor the first *Mécanique* fees for both hybrids and EVs. Although the new tax exemptions will encourage people to purchase EVs, Lebanon has neither charging stations across the country nor long-term strategic plan and legal framework to deploy them and promote electric mobility business and private investment. Moreover, the new law also raises a critical challenge about how Lebanon with such poor electricity infrastructure can deal with charging from EVs while promoting electric mobility. Thus, longer-term planning and establishment of legal framework are prerequisite to adapt to the development of mobility technologies represented by EVs and charging infrastructures given its rapidly changing landscape and lengthy process for Lebanon’s policy implementation.

1.3. National strategies and plans for the transport sector development

While the Government of Lebanon is focused on upgrading its road networks and overhauling its mass transit systems through various initiatives outlined in the National Strategy for Public Transport, proposed by the Ministry of Public Works and Transport’s Railway and Public Transport Authority (MPWT & EU, 2016), and other plans set out by the MPWT’s Directorate General of Land and Maritime Transport (e.g. rapid transit services on main routes within and between cities, Bus Rapid Transit from Beirut to the North of the country, Tripoli Bus Network...), a lot of work remains to be done with respect to influencing the purchasing choices and behavioral characteristics of Lebanese consumers towards more efficient options (e.g. existing public transport, car-sharing and micromobility) and conduct in transport through policy instruments, initiation of infrastructure requirements, knowledge building and communication.

Sustainable public transport technology choices and/or modes, fuel efficient vehicles operating on internal combustion engines (ICE), hybrid vehicles and electric mobility (plug-in hybrid vehicles - PHEV - and fully electric plug-in vehicles - PEV) offer one important pathway towards the eventual de-carbonization of the transport sector. Even though the purchase prices of hybrid- and electric-vehicles are generally higher than conventional ones, their Total Cost of

Ownership (TCO) is very competitive, especially for high utilization cases such as public transport and shared mobility. Therefore, encouragement and uptake of public transport and shared mobility will reinforce the adoption of such fuel-efficient vehicles as high vehicle mile travelled (VMT) favours the economics of hybrid- and electric vehicles due to its to its fuel-saving and low-maintenance cost.

These choices need to be encouraged through various actions tailored to each choice, through legislation, policy incentives (including fiscal), and market creation, support and awareness, possibly in collaboration with emerging mobility service providers. The project consists in supporting the Government of Lebanon, and in specific the Ministry of Public Works and Transport, in removing the barriers that (1) inhibit more sustainable choices of transport technologies (e.g. incentivizing more environmentally sensitive options for public transport), (2) influencing behavioural choices through fiscal instruments and awareness, and (3) initiating the market for electric mobility.

1.4. Barriers hindering the Transformation toward Sustainable Mobility

Despite of the above-mentioned legal context and the baseline activities (described in next section), the Lebanese transport sector still faces numerous challenges of its transformation toward sustainable mobility. The barriers are as follows:

a. Limited institutional capacity and weak coordination among various stakeholders and activities for comprehensive approach toward sustainable low emission transport

Overall, the sector still lacks technical capacity and remains institutionally weak, particularly in terms of coordinating all the activities related to transport, let alone sustainable transport. An analysis of all the planned and on-going projects related to transport infrastructure, roads and highways, traffic management systems, local level programmes and needs, legislation and polices is needed. Furthermore, the systematic integration of sustainability is missing particularly considering the NDC commitments of the government and the potential for the introduction of alternative modes of transport, electric and hybrid vehicles in both the public and private spheres. All the above needs require technical, legal, and financial studies to determine best approaches and most suitable technologies to determine the best policy options that are available. Decision makers currently have a limited and fragmented overview of the sector.

b. Limited state budget for necessary infrastructure investment and incentives

Financing needs transport sector, and particularly in relation to public, non-motorised and sustainable mobility infrastructure needs have not been assessed. The government as per its most recent investment plan usually presents financing needs only in terms of expansion of road networks as can be seen in the latest CEDRE conference paper of 2018. An integrated approach to financing is missing. Private sector involvement in the transport sector has increased in the past years but additional financing needs to be encouraged. The absence of a financing strategy that looks at the various options available in an integrated manner would set up the needed enabling environment for the country. Moreover, the current state revenue structure heavily depends on fuel consumption and vehicle purchase, negatively affecting the transition toward sustainable transport. Thus, the adaptation or proactive shift of the taxation structure will be required.

c. *Charging infrastructure and Grid Integration*

From a technical perspective, although the national market has seen a growing appetite for electric vehicles, with certain car importers advertising that these technologies are now available in the market and some gas stations have constructed electric car charging stations, little is known about the electricity infrastructure needs, the technical needs for recharging stations, the capacity of the grid, the safety and maintenance needs of these types of vehicles. More research in this field is needed and the piloting of such technologies would highlight the practical technical needs on the ground.

d. *High upfront cost and incentives*

In addition, the upfront costs of e-cars or hybrid-cars remain high which means that incentivising the more environmentally-friendly technologies and disincentivising the use of large more gasoline consuming vehicles needs to be assessed.

e. *Awareness and social norm toward choice of transport options (e.g. car vs walking for short distance, small car vs SUV, private car vs ridesharing, etc)*

To reconfirm the major barriers in the transport sector, Lebanon has seen an increase in momentum from civil society groups that are lobbying to promote the enhancement of public transport, to improve road safety and traffic management, to encourage modal shift in transportation practices and to revitalise the railway system. Public awareness on the options available and the need to change behaviour however remains limited. There are many misconceptions in the sector and the choice of transport mode by the population at large is still far from being sustainable. Knowledge and capacity building are also needed to shift consumer choices in terms of vehicle purchases away from larger, less efficient cars towards lower-emission vehicles or e-cars. Information about the various types of technologies, their applicability in the local context and impact is still limited and needs to be raised.

Weak enforcement of traffic rules results in illegal parking and reckless driving, undermining road safety and exacerbating congestion. In addition to the issues of road safety, lack of supportive infrastructure such as quality pedestrian zones and parking facilities is hindering the promotion of non-motorized transport. Overall, the available of reliable data about the sector is still a barrier that hinders the growth of the sector in a sound and sustainable way. Finally, the lack of scrappage scheme as well as mandatory inspection and maintenance contributes to the persistent use of high number of pollutive old cars in Lebanon.

2. the baseline scenario and any associated baseline projects

The Government of Lebanon, with support of different partners, is now making a significant commitment toward the revitalization of national public transport including bus networks and railway networks in strategic areas. The ongoing key projects are as follows:

a. Institutional Support to the RPTA

This project is a UNDP managed project implemented for the Railways and Public Transport Authority (RPTA) having the overall objective “Institutional capacity development of the Railway and Public Transportation Authority”. The project is funded by the Government of Lebanon and has a total budget of to \$1,288,300. The RPTA is a Public Institution under the tutelage of the Ministry of Public Works and Transport with a semi-independent legal identity with financial and administrative autonomy. It consists of two directorates: The Railways Directorate and the Bus Transport Directorate.

The project aims to develop a strategy to enhance the work of the authority and provide support through the later phases for the preparation, implementation and monitoring of the reform plan and strategy. The project will also ensure sustainability of its work by transferring knowledge and abilities to the authority's administration. The expected outputs of the project include the development of the public transportation strategy, updating the institutional and technical structural abilities of the RPTA, promoting the public transportation sector in Lebanon with the provision of technical studies and exploring options for resource mobilisation.

b. Greater Beirut Public Transport (Bus Rapid Transit, BRT) Project

With a US\$ 295 million concessional finance package agreed with the Government of Lebanon^[3], the World Bank is implementing the first phase of a comprehensive national public transport program. The time frame is 2019 – 2023. The comprehensive public transport program will consist of a BRT network of three trunk BRT lines in the center of the highway on the Northern, Southern, and Eastern approaches to Beirut, with BRT lines extending within Beirut to connect the three trunk lines and to improve connectivity between Beirut and the regions as well as within Beirut. The BRT network will also be complemented by about 20 lines of a regular and feeder bus network as well as investments to improve access (bus stops, sidewalks, park and ride facilities). The required bus fleet for the whole program is over 1,000 buses. The program will be executed in three phases/stages with phase one being a BRT on the Northern Highway and on the outer ring road of Beirut with complementary feeder lines/buses (the proposed project); phase two being a BRT on the southern highway and two major arterials in Beirut connecting south, with complementary feeder lines/buses; and phase three being a BRT on the eastern highway and additional arterial within Beirut with its feeder lines/buses.

The CDR (Council for Development and Reconstruction) is responsible for executing all project-related infrastructure (e.g. roadworks, bridges, stations, and land acquisition) and procurements. The Railway and Public Transport Agency (RPTA) is in charge of subversion and oversight of the private operators that will undertake the system operation and maintenance of the buses, stations, ITS and fare collection. The PPP arrangement for the operation and maintenance of BRT will be applied to channel the government contribution, which will be financed from the World Bank loan, to operators through the CDR. The CDR will lead the selections of the operators in close collaboration with the RPTA and will transfer contract management to the RPTA. While feeder/regular buses will be fully financed by the Government, BRT fleets will be co-financed by the private operators.

The BRT network will benefit the Lebanese and Syrians living in Beirut, Mount Lebanon, and Northern Lebanon, which represent between 50 percent to 70 percent of all Lebanese and Syrians in Lebanon. By the end of the project (2023), the BRT network is expected to attract about 300,000 passengers per day and halve the commuting time between Beirut and its northern suburbs by public transport.

c. Bus Transportation Public-Private Project.

The project is being implemented by We-Go, an enterprise founded by Connex, which is the second largest transportation company in Lebanon and running coach services from Tripoli to Beirut in either direction with 40 buses daily. The scope of the WeGo project is to propose a sustainable high-tech transportation and urban mobility service by addressing the current public transportation limitations in Lebanon. In the first phase (expected to start in 2020), and in partnership with Byblos Municipality, the project will feature the installation of 90 bus-stops in the Byblos district with 7 lines covering the Byblos district and 1 line for the Beirut destination. The bus network will be covered by 40 busses, 6 of which will be electric busses, around every 10 minutes in peak hours, rolling between Barbara (North), down towards Nahr Ibrahim (South). The busses will do the trip between 6AM and 10PM, carrying 30 passenger seats each, all equipped with surveillance cameras, screens, and free public WiFi.

Intelligent Transportation Management System (ITMS) will be implemented to inform its users real-time information about the locations, schedule, and routes to their destination. The central station will be located on the Byblos roundabout, connected to the municipality and to the central town and located 100 m away from the municipal central parking (with capacity for 350 cars).

Total Phase 1 budget is approximately USD\$ 6 million, fully funded by We-Go's equity and debt financing. The Phase 1 is expected to be operational towards the end of 2020, targeting 700,000 tickets by the fifth year of operation. This will be followed by other regions, namely Kesserwan (Phase 2) and Metn (Phase 3) districts will follow in 2022 and 2024, respectively. The project will be fully integrated with and complement the above-mentioned World Bank's BRT project by providing feeder busses network with BRT network.

d. Sustainable Urban Public Transport (Bus) Investment Program in Greater Tripoli.

Tripoli is the second largest city in Lebanon and located at 85 km northeast of the capital Beirut. With the support of European Investment Bank (EIB), RPTA and Ministry of Public works and Transport (MoPT) has initiated the development of detailed design of construction of Tripoli bus network and its terminals and tender documents. The program will update the transport strategy and its implementation plan. The new bus network will have an integrated tariff and ticketing system with reform of concessionary fares and subsidy system. In addition, Tripoli Transport Authority (TTA) will be created under RPTA by reorganizing the transport sector in Tripoli.

On a later stage following the project appraisal, the Bank is willing to provide his financial support to the Lebanese government for (a) the construction of the intermodal public transport hubs (new bus terminal) as Bahsass Transport Center; (b) acquisition of new buses and (b) implementation ITS systems (traffic management, passenger information system, priority of public transport on the roads).

e. Rehabilitation of Beirut-Tripoli Railway Section

The railway between Beirut and Tripoli will create the opportunities to link all major seaport in the Middle East while it will contribute to the reduction of traffic and the environmental pollution at local level. With the support of EIB, the preparation for the reconstruction of the railway between Beirut and Tripoli is ongoing at two stages.

The first phase of the feasibility study was completed with the presentation of encouraging economic and financial results for the rehabilitation of railways on the coastal corridor from Beirut to Tripoli, through which OPEX operational expenses could be easily recovered even with a surplus to pay part of CAPEX capital expenditure. The cost of constructing this project for the Beirut-Tabarja section is about US \$ 1 billion, and the Tabarja Tripoli section is worth US \$ 2 billion. It includes all infrastructure works, double tracks, operational expenditures, acquisition costs and the purchase of all equipment and machinery.

The second phase of the project will prepare tender documents for the Tabarja-Tripoli and expropriation decrees for the whole corridor.

f. Rehabilitation of Tripoli-Abboudieh (Syrian Borders) Railway Section

The proposed project is to rehabilitate/construct the Lebanese section of a rail link from the Port of Tripoli to Abboudieh at the northern Lebanese-Syrian border to connect to the Syrian rail system. It is intended through this 36km link to enable the dispatch of goods (containerized and in bulk) from and to the Port of Tripoli towards regional markets such as Syria, Iraq and beyond.

The feasibility of the project is justified and relies on a number of development projects which are either under way in the city of Tripoli (the major expansion of the Port) or are planned for a new future (such as the establishment of the Economic Zone). If implemented this project can benefit from the Carbon Reduction Plan and can be extended to allow the cement and chemical factories in Chekka and Salaata to reduce their current transport costs by tens of millions of US dollars annually. The project can be implemented based on an agreement signed by the governments of Lebanon and Syria in which the rehabilitation/construction of the railroad is facilitated and its proper operation and its links to the Syrian rail network are confirmed.

The project will require a budget of about US\$ 70.0 million for the completion of the Rehabilitation/ construction of the railroad including a single track for the first stage with the basic infrastructure needed. Its operation and maintenance could be entrusted to a concession holder that will be completing the rail infrastructure where needed, and will be providing the necessary rolling stock and workshops.

3. the proposed alternative scenario with a brief description of expected outcomes and components of the project

Based on the analysis mentioned above, and in order to overcome some of the barriers facing the transport sector in Lebanon, the current proposed GEF funded project proposes several approaches: on one hand to tackle the policy issues and provide technical options for the best way forward to improve the transport sector and to introduce efficient transport technologies to the market. On the other hand, the project will consider piloting a renewable energy pilot application for charging stations or some other modality to determine the applicability of charging electric vehicles. Finally, the project will work with NGOs and universities to promote research on the topic and raise awareness on sustainable transport and modal transport change.

Objective: Promotion of Sustainable Transport in Lebanon using transport demand management and low carbon vehicles.

The concept of sustainable transportation promotes a balance between transportation's economic and social benefits and the need to protect the environment. In further articulating this idea, one definition is a sustainable transportation system as one that: 1) Allows individuals and societies to meet their access needs safely and in a manner consistent with human and ecosystem health, and with equity within and between generations; 2) Is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy; and 3) Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise. Within the context of transportation planning, the term "sustainable" can also refer to a plan itself – whether its objectives are achievable in view of the various financial, political and technical factors that will ultimately influence its success.

Component 1: Institutional and policy support for the promotion of sustainable low emissions transport systems

Component 2: Increased deployment of sustainable low-emission transport systems and support services

Component 3: Knowledge management, capacity development and awareness raising

Component 1: Institutional and policy support for the promotion of sustainable low emissions transport systems

Transport demand management is dedicated to all policies and measures that can reduce the total volume of traffic and/or promote shifts towards more sustainable modes of transport. Given the extensive work already underway with the Railways and Public Transportation Authority, this component will be implemented in close coordination with this administration that falls under the tutelage of the Ministry of Public Works and Transport.

The project will aim to first review the existing legislation, policies, programs that are in place and/or that are planned by relevant public institutions to reduce the demand for transport and/or to shift to more sustainable modes. The project will develop a roadmap for sustainable transport that covers the most immediate and pragmatic steps that could push for a modal shift such as parking controls and management, flex working hours, regulatory controls such as “odd-even” schemes and its variants, physical measures such as pedestrianisation, etc. These recommendations will be based on technical studies that would be undertaken within the other two components of the project, including lessons learnt from the pilot project. The road map would include reference to the larger infrastructure projects that are underway or planned. It will also recommend how sustainability and low emission transport options can be integrated into the on-going initiative and investment programmes in order to ultimately meet the NDC targets of Lebanon.

In addition, the current NAMA initiative on taxi fleet transformation which was approved by the Council of Ministers in 2017 will be revised and the project will initiate its operationalisation in close collaboration with the Ministry of Environment and in close coordination with the Ministry of Finance. The NAMA project has been designed to look into financial mechanisms and operational structures for private sector taxi fleets to accelerate the transformational of the road transport sector. In the PPG phase, the e-taxi fleet proposal (previously presented as a NAMA) will be updated and the steps needed for its operationalisation will be considered to set an action plan for the full project. As an overall objective, the proposal focuses on the establishment of the enabling environment for the car scrappage and replacement program as well as the replacement of polluting taxi cars. This includes the establishment of an institutional framework, assessing and defining appropriate incentive mechanisms for the scrappage programme; building capacities among key stakeholders; and increasing the awareness about the FEVs. In addition, to scale-up the car replacement program in a sustainable manner, the proposal will investigate national financing mechanisms such as additional fuel tax as well as gaining public and political support.

The aim of the first output of this component is to assess and readdress the existing legislative and fiscal regimes (both ‘command and control’ and ‘incentive-based’ instruments) in the country with the objective of nudging choices and behaviour of citizens towards more efficient alternatives, attitudes, and engagements, while at the same time consider both ‘budget neutrality’ and consumer affordability.

The project will adopt a participatory approach with all related stakeholders to assess and recommend the policy command and control and/or incentive based interventions needed for encouraging reduced transport demand and more efficient vehicle fleet including the adoption of hybrid and electric systems, safeguarding budget neutrality, consumer affordability, and reducing any risks of perverse incentives (e.g. lowering the lifetime ownership cost of energy efficient vehicles and increasing these costs for relatively inefficient vehicles will induce a substitution effect, in that people will purchase more energy efficient vehicles, however income effect may lead to more cars being purchased when compared to baseline without the incentives). The scope of this approach will be determined during the project preparatory phase through the preparation of an economic cost-benefit analysis of using more efficient vehicles for the public and private fleets.

Component 2: Increased deployment of sustainable low-emission transport systems and support services

This component will consider three main aspects. First, innovative financing models will be designed and assessed to support deployment of low emissions vehicles for public and private transport. The details of the interventions will be determined in the PPG stage given that more in-depth analysis is needed.

The second aspects of this component will be the investment in low emission vehicles and RE-integrated charging stations. The pilot project will be implemented in partnership with the private sector and the municipality and will investigate mobilising investment such as the programme of WeGo mentioned above. The pilot will serve to highlight mechanisms to promote or improve integrated sustainable transport options that are available. Data and lessons learnt will be collected and analysed to serve the policy recommendations and to design the needed technical guidelines for the sector. To date, there are limited white papers or official recommendations on the transportation sector in Lebanon. Also, investment in public transportation systems through potential piloting of e-vehicles or supporting in e-charging infrastructures to be more sustainable will be explored. This will trigger investments in low emission vehicles and charging systems.

The third aspect of this component will look more at O&M aspects. This will help at promoting the uptake of fuel-efficient electric mobility in Lebanon which still needs considerable technical support, but which is essential for Lebanon to reach the 20% target of energy efficient vehicles by 2030 as per Lebanon's NDC supported target.

One of the most important aspects to consider is the impact of both the current and forecasted quality of service of the Lebanese electricity grid on electric vehicles and the implications of increasing electric vehicle scenarios on the current and forecasted quality of the Lebanese electricity grid. The Lebanese grid is based currently on heavy fuel oil, fuel oil, and diesel, fuels that are excessively costly and environmentally problematic, and characterized by structured blackouts and extensive brownouts. Recent existing studies indicate that electric vehicles promise economic savings and carbon dioxide emission reductions when compared, in particular, to current gasoline vehicles. They also perform well economically and environmentally when compared to assessed alternative options such as liquefied natural gas and compressed natural gas. However, the studies require a more careful methodological approach where the economic costs and benefits are clearly differentiated from the financial costs and benefits of electric mobility, and the environmental assessment is carried out through a first-hand life-cycle assessment. The Lebanese grid capacity and efficiency also needs to be assessed to determine the impact of introducing these types of technologies into the market.

It is unanimously affirmed in the review of countries that have or that are supporting electric mobility that a standardized charging infrastructure, including plugs, services, access, and payment systems, is a pre-requisite to a successful uptake of electric vehicles. The availability and, as importantly, the interoperability of charging stations is an essential component for any successful deployment of PEV and PHEV. Charging stations (slow or fast) requires the use of cables, connectors and communication protocols and are better if standardized (for interoperability). Multiple sets of slow and fast chargers need to be set up in homes, offices, public streets, gas stations, malls... with all associated standardized payment methods (that should be standardized) set up. In Lebanon, combining the charging infrastructure with renewable energy is essential to maximize the environmental benefits of electric mobility.

Component 3: Knowledge management, capacity development and awareness raising

The key to the project's success is the mobilization of the public and private sectors. To this end, cooperation with the concerned ministries and municipalities (particularly the Ministry of Finance, Ministry Energy and Water, and the Ministry of Public Works and Transport – with its relevant Directorates, municipality of Beirut, Jbeil, Tyre, Saida, and Tripoli among others), non-governmental institutions (particularly the Lebanese Association of Car Importers), and private sector participants (car dealers, taxi operators, hotels, companies) is vital to meet the project's objectives of more sustainable transport. All the action plans indicated above, from policy formation to demonstration projects and infrastructure construction will be handled in a participatory approach involved the relevant stakeholders.

The project will engage with local NGOs that are working on the promotion of climate change initiatives as well as those that tackle transportation issues. The Transportation Coactive (TRAC) that is a cooperative of NGOs working to promote public transportation and greener transport infrastructure including railways and bus systems. Engaging with this group would ensure large outreach of awareness raising activities. The project will also engage the relevant NGOs in a consultative manner to ensure the concerns from civil society and the public are integrated.

The project will explore the possibility of supporting a Centre of Excellence with the Lebanese American University that aims at guiding academic research on public transport systems and alternative vehicle technologies into applied research. Piloting some of the results of these studies will be considered and explored in more detail during the PPG phase. This work also ties closely with the potential to develop and introduce vocational training programmes for technicians that would complement the existing transport engineering academic programmes at universities to build the capacity of future mechanics and technicians to maintain electric and hybrid vehicles.

Finally, the project will coordinate with Global e-Mobility program submitted under GEF-7 in the June 2019 work program. The collaboration will mainly focus on the Knowledge management products and materials.

In addition, communication through various media portals is essential to spread awareness and confidence in more efficient vehicles and in alternative modes of transport. Various tools will be used (social media, short multimedia videos, TV, radio, newspaper and magazine slots, brochures and other communication material, and race and test-driving events covered by media for example).

4. Alignment with GEF focal area and/or Impact Program strategies

The proposed UNDP-GEF project will be complementary to the baseline initiatives as it addresses barriers that are specifically related to the transformation towards sustainable mobility. The project will work on sustainable and low carbon transportation in Lebanon. By promoting modal shifts, pushing for the increased use of public transportation, piloting solar power for e-bus charging stations and looking at alternative vehicle technologies, the project will trigger a

sustainable and low carbon transport sector. Thus, this project is consistent with the GEF-7 strategy to address climate change (CCM- Program 1 Promote innovation and technology transfer for sustainable energy breakthroughs), especially the Entry point 2 on Electric drive technologies and electric mobility.

5. Incremental/additional cost reasoning and expected contributions from the baseline, GEFTF, and co-financing

<u>Baseline Scenario</u>	<u>Alternative</u>	<u>Global Environmental benefits</u>
<p>Government of Lebanon will continue the development of the national public transport sector, without putting too much emphasis on the environment sustainability. There is no systemic approach in prioritizing electric powered buses. although acknowledging its benefits, electric vehicles and buses will suffer from their upfront high investment cost.</p> <p>Government ministries, municipalities and agencies working on urban planning, transport sector and energy sector will likely continue to work in silos, with little cooperation and coordination in their actions.</p> <p>The transport sector will continue to be public led initiatives, with little participation from Private Sector.</p> <p>Capacities in term integrated management of both transport and environment sustainability are not fully aligned, and need to be strengthened.</p>	<p>A good enabling environment is in place. Key stakeholders from Government, private sector, NGOs and beneficiaries are capable in understanding, managing and implementing sustainable transport initiatives. Transport demand management is fully utilized to reduce the total volume of traffic and promote shifts towards more sustainable modes of transport.</p> <p>Sustainable low-emission transport systems and support services are deployment in a systematic way. Both e-vehicles and in e-charging infrastructures are developed to support low emission on public transportation systems. Fuel-efficiency is improved to reduce significantly the GHG emissions in the transport sector.</p> <p>Knowledge management, capacity development and awareness raising are conducted to promote a better transport sector.</p> <p>Replication of sustainable and low carbon transport systems is happening across the country.</p>	<p>CCM benefits</p> <p>24,618 tCO2 Direct project emission reductions and 49,236 tCO2 Consequential emission reductions.</p>

6. Global Environmental Benefits (GEFTF)

Direct GHG Emissions Reductions:

Direct GHG emission reductions in the project will be achieved through 1) modal shift from passenger vehicle to WeGo bus network system and 2) installation of solar PV and its integration with e-bus charging system.

1) Modal Shift from passenger vehicle to WeGo Bus Network System.

For the calculation of GHG emission reductions from 1) modal shift from passenger vehicle to WeGo bus network system, the CDM methodology AM0031: Bus rapid transit projects was made reference to with some simplification. The baseline emissions are obtained from below equation (1) as follows:

Where:

$$BE_y = EF_{PKM, PV} \cdot D_{PV} \cdot P_Y \cdot S_{PV} \cdot 10^{-6} \text{ equation (1)}$$

Where:

BE_y = Baseline emissions in year y (tCO₂eq)

$EF_{PKM, PV}$ = Emission factor per passenger-kilometre for passenger vehicle (g CO₂eq/PKM)

D_{PV} = Average trip distance travelled by passengers in the project who shifted from passenger vehicle

P_Y = Number of passengers travelled in the project by the project system in year y

S_{PV} = Share of passengers in the project who shifted from passenger vehicle (%)

Whereas the project emissions are obtained from below equation (2):

$$PE_y = EF_{km, P} \cdot DD_P \cdot 10^{-6} \text{ equation (2)}$$

PE_y = Project emissions in year y (t CO₂eq)

$EF_{km, P}$ = Emissions factor per kilometer for buses in year y (gCO₂eq/km).

DD_P = Total distance driven by trunk buses in year y (km)

The yearly GHG emissions reduction will be obtained as follows:

$$\text{GHG emissions reduction (tCO}_2\text{eq)} = BE_y - PE_y$$

The parameters will be monitored/measured from a survey during the project to determine the actual GHG emissions reduction. The parameters and its references used for the ex-ante calculation of GHG emission reductions are as follows:

Parameter	Description	Value	Unit	Reference/Source
$EF_{PKM, PV}$	Emission factor per passenger-kilometre fo	200.3	gCO ₂ eq/PKM	MoE/URC/GEF, (2012). Le

	<p>r passenger vehicle (g CO₂eq/PKM).</p> <p>The emission factor per passenger-kilometre for passenger vehicle is obtained by dividing the average emission factor per kilometre for passenger vehicle with car occupancy rate.</p> <p>The average CO₂eq emissions factor for passenger vehicles is 260.05 g CO₂eq/km (MoE/URC/GEF, (2012)).</p> <p>The car occupancy rate of private passenger vehicle is 1.3 according to the (World Bank, 2018).</p> <p>These numbers will be monitored/measured/updated to the extent possible during the project.</p>			<p>banon Technology Needs Assessment report for Climate Change.</p> <p>World Bank (2018). Project Appraisal Document on GREATER BEIRUT PUBLIC TRANSPORT PROJECT. Various surveys undertaken by the Council of Development and Reconstruction (CDR) and Ministry of Public Works and Transport (MPWT)/Directorate General of Land and Maritime and Transport (DGLMT).</p>
D_{PV}	Average trip distance travelled by passengers in the project who shifted from passenger vehicle. The value will be measured during the project.	12.3	km	WeGo bus network model
P_Y	Number of passengers travelled in the project by the project system in year y . This will be measured by counting yearly ticketing of the WeGo Bus service.	762,545	# of passengers	WeGo bus network model
S_{PV}	Share of passengers in the project who shifted from passenger vehicle (%). Given that there is no functional public transport in the project area (Jbeil District), the share of passengers in WeGo bus network system from passenger vehicle can be estimated to be 100%. The value will be measured during the project.	100	%	

$EF_{km, P}$	Emissions factor per kilometer for buses in year y	662.5	gCO ₂ eq/km	Specification of WeGo Buses
DD_P	Total distance driven by trunk buses in year y	1,282,97	km	WeGo bus network model

Thus, the estimated yearly GHG emissions reduction from modal shift is **1,028.78 tCO₂eq**.

1) Installation of solar PV and its integration with e-bus charging system

The project will install 200 KW solar PV system and integrate with its renewable energy with bus-charging system to demonstrate and optimize electrification of bus network system. The energy produced from the solar farm for the buses would otherwise have to be supplied by the national grid, which has an emission factor of 0.674 tCO₂/MWh. The calculated yearly GHG emissions reductions from the 200 KW solar PV system are estimated to **202.20 tCO₂eq**.

	Yearly (tCO ₂ eq)	10 Years	20 Years
1) Modal Shift from passenger vehicle to WeGo Bus Network System	1,028.70	10,287.04	20,574.07
2) Installation of solar PV and its integration with e-bus charging system	202.20	2,022.00	4,044.00
Sub-Total	1,230.90	12,309.04	24,618.07

A preliminary and conservative estimation of GHG reduction calculations are as below:

- Direct emissions: 24,618.07 tCO₂ (12,272.79/year * 20 years)

- Consequential emissions (post project):

- Bottom up: 24,618.07 * 2 (replication factor of 2) = 49,236.14 tCO₂
- Top down: 24,618.07 * 3 (increase in size) = 73,854.21 tCO₂

The PPG phase will further refine GHG emission calculations, and potentially include the reduction from the WB BRT baseline project, which is estimated at 590,000 tCO₂/year. As a conservative measure, this was not taken into consideration at this stage.

7. Innovation, sustainability, and potential for scaling up

Innovation

The project will look into various aspects of sustainable and low carbon transportation which has not been done in Lebanon yet. By promoting modal shifts, pushing for the increased use of public transportation, piloting solar power for e-bus charging stations and looking at alternative vehicle technologies, the project will introduce new approaches to the country. In addition, the project will engage the UNDP Accelerator Labs which have just been initiated at the Country level; the priority programme already identified based on stakeholder assessments undertaken this past year include the transport sector.

The project will not only work on the design and the investment in equipments and assets but will also explore various operation and maintenance aspects in the low-emission transport sector. The sustainability of these equipments will be considered accordingly. This includes the design of financial mechanisms and models that ensure a return on investment and incorporate the needed maintenance aspects and operation that would also be presented within the overall policies and regulatory framework to the government. The project will support decision makers with the possibilities of splitting investment needs and economic risks when building up the infrastructures. Innovative schemes to finance electric mobility will be developed through Component 3, that will benefit all stakeholders such as municipalities, car dealers, and public transport companies.

Sustainability

The project will engage with various stakeholders including central and local governmental authorities. Institutional strengthening and capacity building are significant components of the project and key for establishing a basis for sustainability. If this is ensured as planned in the project, particularly for the RPTA and Ministry of Public Works and Transport, coordination and monitoring of the sector will be improved so the integration of the BRT and other plans will be ensured into the future.

Several other projects and programmes are also working in parallel to build capacities in other ministries such as the National Determined Contributions Support Project (NDCSP) at the Ministry of Environment and other upcoming climate change projects that is the secretariat of the national NDC committee which could be a platform for engaging other concerned ministries to ensure the sustainability of the action in line with the national agenda and the targets set by Lebanon in its NDC. This is also linked and strengthened further by the Ministry of Environment's work for the development of the MRF systems, the implementation of the transport NAMA and the longer-term sustainability of the action.

The engagement of the international financing institutions, particularly within the national investment plan CEDRE, as well as the momentum seen in the private sector partners, will ensure the long-term financial sustainability and engagement on this programme. So far, investors are showing interest in the sector and if this is maintained and strengthened by the project, the sustainability of e-mobility and public transportation will grow.

Replicability

In engaging with the WeGo programme that will introduce public transport and possibly electric bus systems in the Municipality of Byblos, and the introduction of solar powered charging stations or other environmentally-friendly options, it would provide a good pilot project that can be replicated in other cities in Lebanon. The expected engagement with the academic sector to capture, assess and share technical knowledge and experience from the pilot would also

provide sound technical advice that would be a good basis to use for the expansion of these types of systems to national scale.

[1] World Bank, 2018. Project Appraisal Document on a Proposed Loan in the Amount of \$295 million to the Republic of Lebanon for a Greater Beirut Public Transport Project.

[2] MoE & UNDP, 2016. Nationally Appropriate Mitigation Action in Lebanon's Private Road Transport Sector (FEVs); NAMA Proposal and Design Document. Lebanon's Low Emissions Capacity Building Program (LECB), Beirut, Lebanon.

[3] Council of Ministers Decision 66, 2018/5/16.

[1] <https://data2.unhcr.org/en/situations/syria/location/71>

[2] <https://www.unrwa.org/where-we-work/lebanon>

[3] World Bank, 2018. Project Appraisal Document on a Proposed Loan in the Amount of \$295 million to the Republic of Lebanon for a Greater Beirut Public Transport Project.

[4] Government of Lebanon, 2018. Capital Investment Plan (CEDRE), Beirut, Lebanon.

[5] MoE, UNDP, & GEF 2016. Lebanon's Third National Communication to the UNFCCC, Beirut, Lebanon.

[6] IPTEC et al, 2016.

[7] MoE & UNDP, 2015, Mobility Cost – Case Study in Lebanon.

[8] MoE, UNDP, Ecodit, 2011. The State and Trends of the Lebanese Environment (SOER), Beirut, Lebanon.

[9] MoE & UNDP, 2015, Mobility Cost – Case Study in Lebanon.

[10] World Bank, 2018. Project Appraisal Document on a Proposed Loan in the Amount of \$295 million to the Republic of Lebanon for a Greater Beirut Public Transport Project.

[11] World Bank, 2018. Project Appraisal Document on a Proposed Loan in the Amount of \$295 million to the Republic of Lebanon for a Greater Beirut Public Transport Project.

[12] Government of Lebanon, 2018. Capital Investment Plan (CEDRE), Beirut, Lebanon.

[13] MoE & UNDP, 2016. Nationally Appropriate Mitigation Action in Lebanon's Private Road Transport Sector (FEVs);

[14]. MoE & URC, 2012. GEF--

[15] Government of Lebanon, 2018. Capital Investment Plan (CEDRE), Beirut, Lebanon.

[16] MoE & UNDP, 2015, Mobility Cost – Case Study in Lebanon

1b. Project Map and Coordinates

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

The project site is the cities of Beirut and Jbeil, in Lebanon. Maps are provided as Annex A.

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.

Stakeholders	Roles and Engagement
Ministry of Public Works and Transport	National agency responsible for roads management, transportation policy and infrastructure (for new laws and decrees),
Railways and Public Transport Authority	Under the tutelage of the Ministry of Public Works and Transport but is a semi-independent authority that handles the management of the railways and public transportation issues including public buses.
Ministry of Energy and Water	Public sector that is responsible for setting fuel quality and works on public energy efficiency and renewable energy targets of the country, influences policies in the sector.
Ministry of Finance	Assist the project in terms of innovative fiscal policies, instruments and/or measures that will nudge purchasing and driving behaviour towards more efficient choices, while safeguarding budget neutrality
Municipalities and other Government Agencies	The Project will engage with municipalities and other government agencies to champion energy efficient vehicle choices and infrastructure provision. Municipalities also have the possibility of designing and implementing their own local level public transport systems which will be considered for the pilot project.
Ministry of Environment	Monitor the results (MRV) of the NDC implementation, work on the NAMA, environmental safeguarding and mainstreaming of the environmental considerations and requirements, data management, assessing air pollution and CO2 impacts, standards for vehicle emissions.
Ministry of Interior and Municipalities	Responsible for traffic management and road safety. Is also responsible for data management in terms of traffic flow, car accidents and first responders to traffic accidents.
Association of car importers	Assist the project in mobilizing the car dealers to push forward an agenda for energy efficiency

t dealers	ent vehicles
Car dealers	Assist the project in the promotion/sale of energy efficient vehicles, in standardized electric charging infrastructure and billing protocols, and assist in setting up acceptable fiscal reform to achieve the intended efficiency targets
Taxi Union (Association of taxi drivers and taxi owners)	Union of taxi drivers and owners that works on lobbying for the rights of taxis. Works closely with the Ministry of Public Works and Transport. Will be engaged in the awareness raising activities and for the promotion of PEV and PHEV technology and efficient vehicle types
International and local non-governmental organizations	There are several NGOs in Lebanon working on promoting various aspects of sustainable or improved transport including the promotion of public transport, railways, the improvement of road safety and the use of non-motorised modes of transport. Examples are TrainTrain, Kunhadi and TRACS. There are also several others abroad that can be associated to this project, such as the International Association of Public Transport (UITP).
Private sector taxi companies	Companies that either operate large number of taxi fleets (such as Allo Taxi, Uber, Careem) for transportation purposes or companies that use vehicle fleets for their operation (such as courier services, restaurant delivery services, etc.) will be engaged for awareness raising purposes/
Private sector bus companies	Connex and LCC are two local bus companies that provide public transport services in various cities around the country. The former will be engaged in particular through the companies upcoming Wego programme that will be initiated in the region of Byblos.
Universities (Lebanese American University)	The project will engage universities in brainstorming on the performance and costs and benefits of new policy recommendations and of more efficient choices in vehicle technology. Namely, the Lebanese American University will be engaged given that the department of industrial and mechanical engineering is creating a centre of excellence on e-mobility and sustainable transport.
Media	The project will engage the media (in all its forms) to promote energy efficient purchasing choices and behaviour in transport.
UNDP	GEF Agency for this project. Will coordinate the PPG in close collaboration with all stakeholders.

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).

The use of public transport as well as e-mobility has an important gender angle since these approaches provide women with increased mobility that would improve commuting to work and increase access to the market and independence. The project will ensure that gender perspectives are mainstreamed across the various activities and that there is equal access to the project benefits by both genders. Women's needs will be taken into consideration when designing policy recommendations and awareness raising material, particularly in relation the public transport angle of the project. The Wego initiative for example takes into consideration the quality of the service, comfort and safety of the busses which would cater to the needs of women but also the elderly, disabled and youth as well.

Mainstreaming gender and monitoring project results will be ensured from the project design phase. The project will aim to ensure that both women and men are provided with equal opportunities to take part in and benefit from the project, in particular:

- Efforts will be made to promote the participation of women in training activities;
- For engagement with universities and youth, participation of female students and young women will be encouraged;
- All decision-making processes will consider gender dimensions. At the project management level, the project board will invite observers and gender focal points whenever possible to ensure that the gender dimensions are presented;
- When data is collected or assessments are conducted as part of the project, sex-disaggregated data will be collected such as for example the use of public buses by both males and females; and
- Awareness raising activities and trainings will ensure the use of gender-sensitive language as well as perspectives.

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?

TBD

4. Private sector engagement

Will there be private sector engagement in the project?

Yes

Please briefly explain the rationale behind your answer.

The project is based upon the significant participation of private sector, in specific car dealers and first-mover institutions such as large companies, taxi fleets, and the association of car importers which are all private entities. The project will rely heavily on the contributions of these institutions, such as having the car dealers sell the first number of PEV and PHEV at a subsidized cost, and to likewise invest in the infrastructure of electric charging. The project will also target taxi companies to raise awareness on the use of more efficient vehicles, more efficient routing and changing driving patterns to improve traffic management and road safety.

The project will also engage with a private bus operator, Connex and its WeGo programme, that will be purchasing and operating a new public bus system in the Governorate of Byblos which is a large city located along the coast, north of Beirut. The project will consider partnering with this private sector entity to promote the use of more efficient buses, electric buses, to raise awareness on the benefits of public transport and to lobby at the national level for increased update of similar systems. The lessons learnt and feedback from this partnership will be used to design the needed policies and technical material for more informed decision making in the sector.

5. Risks

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)

P: Probability / I: Impact / rating: from 1 (Low) to 5 (High)

Risk	Rating	Risk mitigation measures
<p>Political risk</p> <p>Instability affects Lebanese political life.</p>	<p>P = 4</p> <p>I = 4</p>	<p>UNDP CO will coordinate closely with concerned ministries to promote the public transport agenda. The project will also prioritize worked with decentralized entities that are less affected in case of instability at Higher (e.g. central) level.</p>
<p>Technical risks</p> <p>Risk 1: Materials developed are not relevant for country context</p> <p>Risk 2: The growing demand from electric vehicles in a country can destabilize the power grid</p>	<p>P = 2</p> <p>I = 4</p>	<p>UNDP will liaise with the technical teams in various ministries and local stakeholders to determine the needs for technical information during the PPG phase and during project implementation</p> <p>The impact from electric vehicle charging on the power grid to be technically assessed before its upscaling. This will be covered during the project implementation and related actions taken with the Ministry of Energy and Water</p>
<p>Market risk</p> <p>High upfront investment competing with cheap second-hand imported vehicles</p>	<p>P = 2</p> <p>I = 2</p>	<p>By working on the national legislation and related policies, the project should be able to mitigate this risk.</p>
<p>Awareness risk</p> <p>Negative perceptions about public and e-mobility technology and the impacts this will bring to society and industry</p>	<p>P = 1</p> <p>I = 2</p>	<p>Awareness raising activities will be designed in line with the current social perception so that the communication is targeted to the specific negative impressions</p>
<p>Climate Change and Environmental risk:</p>	<p>P = 2</p>	<p>(1) Electric vehicles have batteries that have limited duration</p>

Climate Change and Environmental Risk		
<p>Risk 1: Management of obsolete batteries from electric vehicles.</p> <p>Risk 2: Charging stations not resilient enough to Climate change.</p>	I = 3	<p>on of about 5 to 8 years. removal, transportation and replacement of batteries have serious environment challenges.</p> <p>(2) Charging stations may be affecting by climate change effects, especially those located on the streets. Extreme weather such as high winds or floods can be damaging.</p> <p>The technical studies to be worked on by the project will take these issues into consideration to ensure the reduction of this environmental risk. This will include for example, a geospatial study of the best locations for charging stations, the options versus the cost (charging stations covered, or within buildings, etc.).</p>
OVERALL	HIGH	

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.

To date, sustainable public transportation lacks a champion institution and the work is divided among various government entities and there are various donors and international organisations working in this sector. During the PPG phase, the coordination mechanisms will be considered in more detail based on the roles and responsibilities of all the parties. At minimum, the project will ensure coordination among the Ministries of Environment, Public Works and Transport, RPTA, Ministry of Energy and Water and Ministry of Interior and Municipalities given that these are the most concerned entities. It will also reach out to the donor and agencies working in this sector and the NGOs and the academic sector to provide a platform for information sharing, exchange of ideas, priority setting and recommendations.

The project will also liaise with the UNEnvironment led GEF Global e-mobility project particularly on activities that relate to new technologies in this field. The global project will also provide a good platform for the exchange of knowledge and best practices and the project will link it to the research and development programmes within the universities that are partnering with the project.

In addition, the project will liaise with other GEF-funded and UNDP managed projects including but not limited to the on-going National Designated Contribution Support Programme which is globally managed by UNDP and is working on updating the NDCs. An upcoming GEF-funded project that will be engaged is the CBIT project given that it includes the elaboration of MRVs and data monitoring so the results from this project should be linked. The Fourth National Communication and Second BUR have just been initiated in Lebanon with funding from the GEF and will provide good opportunities to connect with this project.

Other UNDP projects with which this project will coordinate include the RPTA Institutional Support Project, the renewable energy and energy efficiency projects that are under design (should funding be secured) and the UNDP gender-related projects.

On institutional arrangements, support services maybe requested during project implementation. Lebanon is middle income country, however support to national implementing partners is needed for various activities including procurement, recruitment and operational transactions in addition to management oversight. The main reason for this is the fact that the specific implementing partner from the Government does not have capacity to implement itself the project (high inefficiency and unclear practices). At PPG stage, further analyses will be performed, for example including HACT assessments, to determine which entity is the best actor to provide these support services and what are the exact associated cost.

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

Lebanon has committed itself to a share of 20% fuel efficient vehicles by 2030 if it is supported by the international community under its Intended Nationally Determined Contribution (INDC) submitted to the Paris Climate Change Agreement. This target is defined as achieving an average vehicle fleet efficiency of 95 g CO₂/km in Lebanon (down from the baseline of 193 gCO₂/km). For heavy duty vehicles, 20% reduction entails (on average) a target of reaching 616 gCO₂/km.

The 2012 law on the Protection of Air Quality, the Clean Air Act was approved by the Lebanese Parliament in 2012 and ratified in 2018. The CAA aims to define emission limit values for mobile sources for several criteria pollutants, define methodologies and techniques for the measurement of emissions from mobile sources, define harmful substances in fuel, and set methodologies for testing the conformity of imported fuels. Furthermore, another law approved in 2001 has the objectives of "Reducing air pollution from the transport sector and encouraging the use of less polluting fuel". Specifically, the law banned (1) the import of minivans and buses (<15 passengers + driver) operating on diesel oil, (2) the import of old and new diesel engines for private passenger cars and minivans, (3) the use of diesel in private vehicles, and (4) the use of leaded gasoline in all vehicles. It also made catalytic converters a mandatory requirement in all vehicle categories and reinstated the mandatory vehicle inspection (Mécanique) for gasoline engines (annual inspection) and diesel engines (every six months).

The National Energy Efficiency Plan of 2016 – 2020 of the Ministry of Energy and Water/Lebanese Centre for Energy Conservation which was adopted by the Council of Minister refers to the need to increase efficiency in the transport sector, to reduce emissions as well as fuel consumption. Among its targets and recommendations is the promotion of cleaner, more environmentally friendly cars, the consideration of financial measures to ensure the import of more efficient vehicles, to work on traffic management and to engage with both the private and public vehicles and transport systems to reduce the financial burden of the transport sector on the general budget.

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.

The entire Component 3 of the project is dedicated to Knowledge Management, capacity building and awareness raising. The project will follow seven elements that are recommended in a knowledge management approach as best practices: 1) Overview of existing lessons and best practice that inform project concept; 2) Plans to learn from relevant projects, programs, initiatives & evaluations; 3) Proposed processes to capture, assess and document info, lessons, best practice & expertise generated during implementation; 4) Proposed tools and methods for knowledge exchange, learning & collaboration; 5) Proposed knowledge outputs to be produced and shared with stakeholders; 6) Discussion on how knowledge and learning will contribute to overall project/program impact and sustainability and 7) Plans for strategic communications. All these aspects will be developed at CEO endorsement request.

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
H.E. Mr. Fady Jreissati	Minister of Environment	Ministry of Environment	9/3/2019

ANNEX A: Project Map and Geographic Coordinates

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





