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CES-MED

CLEANER ENERGY SAVING MEDITERRANEAN CITIES

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Lebanon
Municipality of Baakline
Sustainable energy action plan (SEAP)

This document was produced as part of the CES-MED project activities (**EuropAid/132630/C/SER/MULTI**), managed by a Consortium led by Hulla & Co. Human Dynamics KG, and with the active participation of the National Authorities in Lebanon and the municipality of Baakline. It was prepared by a Consortium of consultants from VIA-HABILIS ingénierie – V. MEYRAND- France; Georges B. Tabet – Lebanon, Oussama Kassamani – Lebanon, with the direct support of CES-MED's experts.

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Sustainable Energy Action Plan (SEAP)

Municipality of Baakline

- Lebanon -

Integral document of the sustainable energy action plan

بعقلين
إتحاد بلديات الشوف السويجاني

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LIST OF SYMBOLS

BEI Baseline Emissions Inventory

BDG Backup Diesel Generators

CAS Central Administration for Statistics

CCU Climate Change Unit

CEDRO Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon

CES-MED Cleaner Energy Saving Mediterranean Cities project

CoM Covenant of Mayors

EDL Electricité Du Liban

GHG Green House Gas

LCEC Lebanese Center for Energy Conservation

LCPS Lebanese Center for Policy Studies

MoE Ministry of Environment

MoEW Ministry of Energy and Water

MoIM Ministry of Interior and Municipalities

NCG National Coordination Group

NEEAP National Energy Efficiency Action Plan

NEEREA National Energy Efficiency and Renewable Energy Account

SEAP Sustainable Energy Action Plan

SWH Solar Water Heater

UNDP United Nations Development Program

WB World Bank

IPCC Intergovernmental Panel on Climate Change

UNFCCC United Nations Framework Convention on Climate Change

Acknowledgements

This report has been prepared for the Municipality of Baakline through its participation in the CES-MED programme, which is financed through EU . One of the main objectives of the CES-MED programme is to support the local and national authorities in joining the Covenant of Mayors, as well as preparing Sustainable Energy Action Plans. The preparation was undertaken to support the local authority through several training and technical assistance in formulating and applying sustainable policies in the city.

The CES-MED programme is established to support local authorities in the ENPI South, in responding more actively to sustainable policy challenges and developing their capacities to formulate and implement more sustainable local policies, such as renewable energy solutions, energy efficiency measures to reduce CO_2 emissions, efficient water and waste management and environmental-friendly public transport. The programme also represents a step towards making National Authorities more aware of and responsive to the need for a strong involvement of cities in policy issues, which have a direct impact on them, as well as the related advantages. These issues include the local waste and water management, urban mobility and transport, and local energy use.

The CES-MED programme is managed by Human Dynamics, in a consortium with the Centre for European Policy Studies (CEPS), Pescares (part of HCL group) and the Institute of Communications and Computer Systems (ICCS), the EURO MED cities Network, the Assembly of European Regions (AER) and the Associated Consulted Engineers (ACE)

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The report was drafted by the Consortium Georges B. Tabet and Vincent Meyrand from Via Habilis Ingénierie and Oussama Kassamani, the SEAP Consultant, with the support from the Municipality of Baakline and under the guidance of Dr. Naguib Amin, the Team Leader for CES-MED project and Dr. Alexandra Papadopoulou, the CES MED Energy Expert.

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We are looking forward to a city that undertakes sustainability and works towards a healthy future, with clean power, clean air and clean water for its people to live and work in.

Executive Summary

Lebanon has been characterised for many years by its strategic location as the crossroad between the East and West in a unique blend of both cultures. It is a country heralded with remarkable religious diversity whose citizens live together with one fate, and is well-known for its natural resources and cultural heritage.

However, Lebanon is among the countries that are affected by Climate Change, one of the global environmental issues and greatest challenges of our time. This issue requires immediate attention as it is already having discernible and worsening effects on communities worldwide including Lebanon. Thus, the poorest and most vulnerable populations of the world are most likely to face the harshest impact and suffer disproportionately from its negative effects.

Climate Change forecasts suggest that Lebanon will see more intense rainfall and unprecedented flash floods. More extreme weather conditions including longer periods of dryness are also expected to severely affect the country's third biggest industry-agriculture- which employs 15% of its population.

Lebanon has acknowledged this issue and committed itself to be a part of the global fight against climate change. It has ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1944 by virtue of Law 359, with a primary objective of achieving the stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic activities from interfering with the climate system. One of the essential tools to fight against climate change, hence, is to improve our national knowledge on the matter and build our development and environmental policies on solid ground.

Through CES-MED project to support selected municipalities in Lebanon on their effort towards energy sustainability and with the support from the Ministry of Interior and Municipalities as focal point of the project, the Municipality of Baakline, one of the 9 municipalities in the Chouf Souayjani Region, has taken the opportunity to play a key role in supporting the city in its target for sustainability.

The municipality of Baakline plays a vital role in the achievement of energy consumption and climate objectives, in protecting the environment, directing investments and implementing energy efficiency regulations. It has made a commitment to reduce the CO_2 emissions to 20% by 2020 compared to 2013. This pledge is to be achieved through the joint collaboration between the consortium GT &VH and the municipality through the CES- MED program which is financed by the European Neighbourhood Partnership Instrument (ENPI).

The Mayor of Baakline, Dr. Nouha Ghoussaini Abu Ajram, sees the opportunity of the Covenant of Mayors (CoM) as her mission to make Municipality of Baakline a leader in Lebanon towards sustainability, considering that Baakline is the first Lebanese city committed to the CoM.

The local authorities intend to make Baakline a city of great interest for visitors seeking to discover the unique experience of its local heritage and natural resources. Their local long-term perspectives on how to develop a sustainable city include the improvement of water and electricity supplies, the development of the infrastructure for waste water, better parking infrastructure, sustainable transportation with reliable services and the reduction of environmental impacts along with better waste management.

The city's energy strategy provides a list of planned measures executed by all stakeholders and sectors to promote sustainable development and achieve a healthier, more liveable, and safer community. These measures concerning sustainable energy use in public procurement are targeted towards the municipality and residential buildings, usage of renewable resources, more efficient lighting and transportation.

Making Baakline a sustainable community needs local, national and international collaboration and cooperation to ensure a future where its citizens can enjoy the benefits of their city.

The total target of the SEAP implementation is to reduce the Carbon footprint of the city by 8,139 tCO_2 by 2020, which represents more than 25% of the city's total emissions.

For the implementation of the SEAP, the total budget is approximately € 19,101,000. The Municipality of Baakline will contribute to the total budget with around 10% of the total needs. The rest of the financial needs of the SEAP will be fulfilled from EU Funding Schemes. The municipality will look for other finance sources either through private funds or through support from governmental programmes.

Based on the Baseline for GHG Emission Inventory, the following report presents the municipality road map to mitigate the GHG emission and to prioritize its actions towards a clean environment to fit in line with the municipality's vision for Baakline to be a sustainable smart city.

The main objectives of this report lie in:

- Creating the base for building up a strategic framework to enhance and better coordinate the energy and climate policies.
- Defining, creating and translating short- and long term solutions for the main trends and the biggest challenges in terms of CO_2 emission reduction.
- Making sustainable energy policy part of all key activities of the local authority.

The method used in the BEI calculation is 'standard' emission factors in line with the Intergovernmental Panel on Climate Change Guidelines 2006 (IPCC, 2006) and comply with the United Nations Framework Convention on Climate Change (UNFCCC) reporting system. The base line year is 2013.

CO_2 emissions from energy consumption within the territory of the local authority will be calculated either directly due to fuel combustion within the local authority or indirectly via fuel combustion associated with electricity and heat/cold usage within the area. The emissions of CH_4 and N_2O will not be calculated. CO_2 emissions from the sustainable use of biomass/biofuels, as well as emissions of certified green electricity, will be considered zero.

The sectors which will be covered by this report include:

- Municipal Buildings, Facilities, Equipment
- Tertiary Buildings, Facilities, Equipment
- Residential buildings, Electrical Consumption, Fuel for Heating Consumption
- Public Lighting - Municipal street lighting
- Transport within Municipal area, Municipal Fleet, Public Fleet, Private and Commercial Transport

Chart 1 below shows the energy consumption in the city, which indicates the **Residential Buildings** and the **Private and Commercial Transportation** as the two major sectors in consumptions.
The **Public transportation** doesn't exist and the **Private and Commercial Transportation** represents the majority in consumptions. The commercial transport represents the private sector which takes care of public transport due to the lack in its service.
The **Municipal fleet** represents small parts in consumptions, however the new responsibility for collection of solid waste added more pressure on the fuel consumptions of the municipality.
The **Municipal Building and Facilities Sector** includes the municipality's buildings and the water pumping stations, the latter one being the most important consumer.
The **Municipal Public Lighting** represents the street lights where Baakline extended to areas and ramified roads.
The **Residential Sector** represents the majority in energy consumptions, where the electricity represents 23% of energy consumptions and the heating represents the rest 77%.

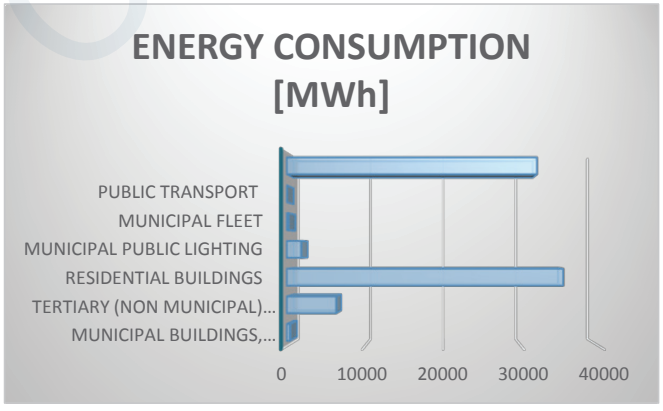


CHART 1: ENERGY CONSUMPTION IN MWH- MUNICIPALITY OF BAAKLINE

The **Tertiary Sector** represents the **Commercial Building Equipment and Facilities Sector** where the electricity accounts for 59% of the energy consumptions and the heating 40%.

There are no local electricity production facilities or heating/ cooling production installations in the municipality of Baakline.

The **Solid Waste Management,** at the time of the report's preparation, was part of the national responsibility. Solid Waste was collected and taken to Beirut city where it was sorted out and then sent back to landfills out of the city. The current situation is different. The solid waste is sorted out at source with around 60% of city demand and then sent back for more sorting in a factory out of the city.
The total emissions for Baakline are presented in table 1 below.

TABLE 1: BASELINE EMISSION INVENTORY SUMMARY (t CO_2)

Sector of Energy Consumptions	Electricity	Diesel	Gasoline	Total
Municipal buildings, equipment/facilities	254	19		273
Tertiary (non-municipal) buildings, equipment/facilities	2,625	688		3,313
Residential buildings	5,436	7,360		12,796
Municipal public lighting	1,215			1,215
Municipal fleet		35	25	60
Public transport	-	-	-	-
Private and commercial transport		195	7,783	7,978
Total in t CO_2	**9,530**	**8,297**	**7,808**	**25,635**

The municipality's representatives, through the BEI identification, acknowledged the most significant sectors affecting the Municipality's carbon footprint. The residential sector contributes the most, with almost (50%) of the total emissions, followed largely behind by the Private and Commercial Transportation (31%) and the Tertiary sectors (13%).

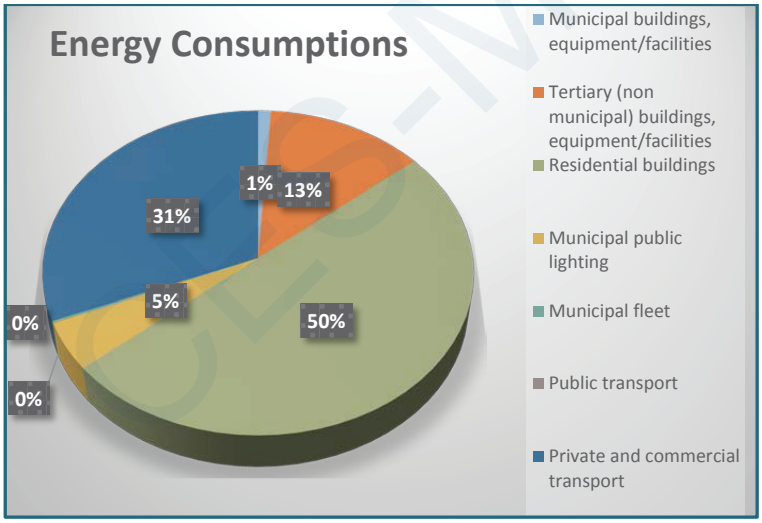


CHART 2: ENERGY CONSUMPTIONS BY SECTORS IN %

According to the Baseline Emissions Inventory and the JRC Guidelines for the Southern Municipalities, the projection of the emissions for the 2020 in the Municipality of Baakline was realized according to the **Business as Usual (BAU)** scenario.

For the Municipality of Baakline, the total emissions for the baseline year (2013) were 25,635 t CO_2 and th national coefficient K for 2013 in Lebanon is (1.27). Therefore, the forecasted emissions for 2020 are

Emissions CO_2 = 25,635 x 1.27 = 32,556.45 t CO_2

The actual reduction target undertaken by the municipality fulfils the CoM requirements and is set to 25% corresponding to an overall reduction of 8,139 t CO_2 by 20 each sector included in the BEI. Each sector's contribution, in line with the adopted actions, is presented in the chart 3 below.

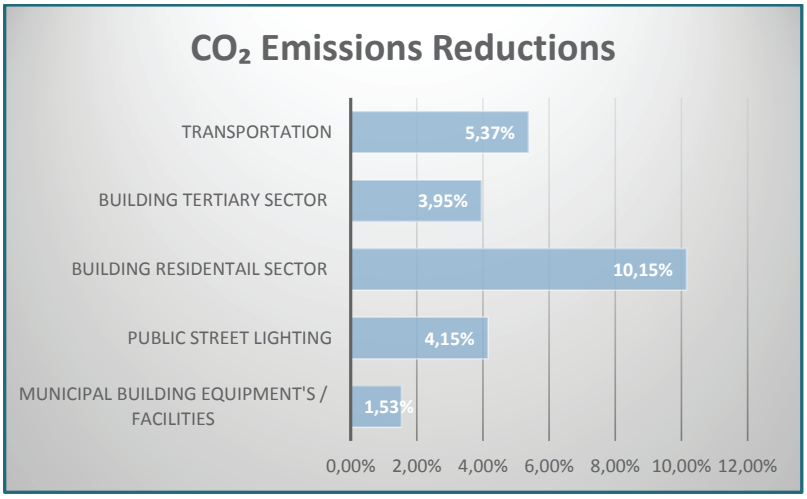


CHART 3: CO_2 EMISSIONS REDUCTIONS IN BAAKLINE MUNICIPALITY

The municipality of Baakline has planned a set of actions for each sector. The actions consist of both awareness raising activities for the different stakeholders and the public, and of actions related to energy efficiency and energy production. The awareness raising activities are expected to have a significant contribution to the reduction of the carbon footprint, while promotion of recycling among the residents is a priority for the municipality.

As far as the energy efficiency is concerned, substitution of old electrical devices is included in the proposed actions for the Municipal and Residential Buildings. In addition, the installation of Solar water heaters & photovoltaics on the rooftops of the Municipal, Residential and Commercial Building will be promoted, in order to reduce the electricity consumed from the grid and take advantage of the high solar potential the southern municipalities have.

The transportation action considers sorting out the main issues in the main roads around the City hall and the schools which are located in the main city road by providing parking areas to increase the main road capacity.

The total list of actions is provided in the Table 2 below.

TABLE 2: TOTAL LIST OF ACTIONS IN MUNCIPALITY OF BAAKLINE

SECTORS & fields of action	Action No	KEY actions/measures	Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a		
MUNICIPAL BUILDING			**17.15**	**11.80**	**0.04%**	**€ 310,000**
Short Term Action	1	SEAP Unit				€ 267,000.00
	2	WEB site for SEAP				€ 5,000
	3	Energy Saving Instruction	8.9	6.2	0.02%	€ 5,000
	4	Awareness and training campaign	2.2	1.5	0.00%	€ 5,000
Long Term Action	5	Replacing the FCL lamps with LED lamps.	1.7	1.1	0.00%	€ 10,000
	6	Replace the Air Condition with A+++ Inverter type when new air condition by end of life (10 years)	2.7	1.8	0.01%	€ 10,000
	7	Install lighting motion sensors in building.	0.7	0.5	0.00%	€ 3,000
	8	Public procurements of products and services	0.95	0.7	0.00%	€ 5,000
WATER SUPPLY			**217.8**	**185.9**	**0.57%**	**€ 1,396,000**
Short Term Action	9	awareness campaign	17	14.75	0.05%	€ 3,000
	10	Water saving tools for the faucet (Tap)	17	14.75	0.05%	€ 10,000
	11	Water collection through raining season	10.4	8.85	0.03%	€ 3,000
	12	Routine maintenance	104	88.5	0.27%	€ 10,000

	13	Install water meters in main feeders and main branches	34.7	29.5	0.09%	€	120,000
Long Term Action	14	Install water meters for each user	34.7	29.5	0.09%	€	1,250,000
WASTE WATER TREATMENT						**€**	**7,000,000**
Long Term Action	15	Update the municipality policy				€	3,000
	16	Include in new construction the reuse of treated water to feed the flush water supply				€	3,000
	17	Infrastructure for wastewater management.				€	6,994,000
SOLID WASTE MANAGEMENT			**580**	**155**	**0.48%**	**€**	**3,540,000**
Short Term Action	18	Ensuring capacity development and enhancing public awareness				€	30,000
	19	Enhance the plan for sorting solid waste from source	580	155	0.48%	€	10,000
	20	Developing waste strategy plan				€	10,000
	21	Purchasing new fuel saving truck for solid waste collection,				€	740,000
Long Term Action	22	Rehabilitation of the existing landfill				€	2,000,000
	23	Upgrade the existing waste sorting plant				€	750,000
PUBLIC STREET LIGHTING			**2,070**	**1,351**	**4.15%**	**€**	**1,062,000**
Short Term Action	24	Public street lighting	237	154	0.47%	€	30,000
	25	Master street lighting drawing assign number for each pole				€	20,000
	26	Identify each feeder pillar by number and install new KWh meters				€	5,000
	27	Prepare the maintenance check form				€	1,000
	28	define the main roads and sub main roads and branches				€	1,000
	29	Technical training for the maintenance staff				€	3,000
	30	Monitoring process				€	2,000
Long Term Action	31	Install new led lighting	1523	995	3.06%	€	750,000
	32	Install new smart feeder pillars	58	38	0.12%	€	125,000
	32	Install remote monitoring and control	252	164	0.50%	€	125,000
LOCAL RENEWABLE ENERGY PRODUCTION			**143**	**98**	**0.30%**	**€**	**281,000**
Short Term Action	34	The community hall (Beit Baakline) under SUDEP	36	23.4	0.07%	€	130,000
	35	Water pumping station under SUDEP	36.4	26.7	0.08%	€	40,000
	36	The natural reserve under SUDEP	3	2	0.01%	€	20,000
	37	The municipality building under SUDEP	17	11.36	0.03%	€	16,000
Long Term Action	38	The central Library	17	11.36	0.03%	€	25,000
	39	BAAKLINE secondary school	17	11.36	0.03%	€	25,000
	40	BAAKLINE intermediate school	17	11.36	0.03%	€	25,000
BUILDING RESIDENTAIL SECTOR			**6,115**	**3,304**	**10.15%**	**€**	**310,000**
Short Term Action	41	Workshop with local Neighbourhoods committees	508	345	1.06%	€	10,000
	42	Workshop with local NGO's	508	345	1.06%	€	10,000
	43	The open Solar day	1016	690	2.12%	€	30,000
	44	Public awareness campaign in schools and colleges	508	345	1.06%	€	30,000
	45	Increase the initiatives for solar water heaters for low income homes	1016	690	2.12%	€	200,000
Long Term Action	46	Building code	2127	596	1.83%	€	15,000
	47	Include solar water heating system in new building	432	293	0.90%	€	15,000.00

BUILDING TERTIARY SECTOR			**3,143**	**1,286**	**3.95%**	**€ 130,000**
Short Term Action	48	Public awareness campaign	508	345	1.06%	€ 30,000
	49	Certification for Green Cedar certification	508	345	1.06%	€ 70,000
Long Term Action	50	Building codes in new buildings	2127	596	1.83%	€ 30,000
TRANSPORTATION			**7,007**	**1,748**	**5.37%**	**€ 4,370,000**
Short Term Action	51	Smart master plan for transportation	2060	514	1.58%	€ 2,000,000
	52	Conduct awareness campaign on ECO drive	20	5	0.02%	€ 10,000
	53	Conduct a marathon day	204	51	0.16%	€ 20,000
	54	Conduct a bike day	204	51	0.16%	€ 20,000
Long Term Action	55	Regulate the public / private bus transportation	409	102	0.31%	€ 20,000
	56	Allocate and provide bus stop station in the city	822	205	0.63%	€ 100,000
	57	Assign and provide green /smart bus stop stations	822	205	0.63%	€ 200,000
	58	Parking area in Baakline community hall	822	205	0.63%	€ 400,000
	59	Parking area for school	822	205	0.63%	€ 600,000
	60	Parking area for citizens	822	205	0.63%	€ 1,000,000
Total			**19,293**	**8,139**	**25.00%**	**€ 18,399,000**

Section I: Overall Strategy

1.1 Baakline 2020 Targets

The table 3 below shows the amount of emission that the country contributes, which is considerably low compared with the global one; however, Climate Change forecasts for Lebanon suggest the country will see more intense rainfall and unprecedented flash floods. More extreme weather conditions including longer periods of dryness are also expected to severely affect the country's third biggest industry-agriculture- which employs 15% of its population.

TABLE 3: LEBANON KEY INDICATORS FOR 2014

United Nations
Climate Change Secretariat

UNFCCC Country Brief 2014:
Lebanon

A. Key Country Indicators

	Global Rank	Global share	
CO2 emissions from fuel combustion[1] (2012)	78	0.07%	21 Mt CO2 Eq.
Population[2] (2013)	123	0.06%	4.47 Million
CO2 emissions / Pop.[1] (2012)	59		4.75 tCO2 per capita
GDP Size[2] (2013)	84	0.08%	Based on PPP
GDP Size[2] (2013)	85	0.06%	Based on exchange rates
UNDP human development index[3] (2012)	72		
GDP Structure[2], % (2013)	Agriculture: 7, Industry: 20, Services: 73		
Share of GDP[2], % (2013)	Imports: 76, Exports: 63		

The Municipality of Baakline plays an important role in leading the trend towards environmental protection. Being a town that mediates many towns around it, Baakline activities in the environmental movement are continuously tracked. The town is directly dependent on the economic movement that backed clean environment with availability of rivers and construction movement activists. The city was and is still encouraging the transition towards clean and renewable energy, and there are a lot of attempts in the spectrum area.

The city of Baakline has moved forward and started the implementation of actions after launching the SUDEP project, which was to the city, the opening door to start mitigations of its emissions.

CES-MED project's perspective is to support selected municipalities in Lebanon on their effort towards energy sustainability and thus has opened the gate for the municipality of Baakline to join the CoM and allowed it to share the experience with more than 5,000 municipalities that already have joined the CoM.

The overall target being set by the municipality is the reduction of CO_2 emissions to 25% by 2020 compared to the baseline year 2013. The municipality will take all the necessary measures and utilize opportunities in collaboration with various local and national sectors to develop solutions to the carbon reduction and safeguard its community against the impacts of climate change.

The municipality cannot by itself reach this target without support from the international donors as the resources are limited and cannot handle the cost. Therefore, the municipality will work closely with CES-MED to identify the finance for those actions.

1.2 Current Status

1.2.1 Geographical Location and Sites

Baakline an ancient town located in the heart of Mount Lebanon was and still is a prominent country in the Chouf region. Lying on seven hills, Baakline is 45 kilometres southeast of Beirut covering an area of 14 square kilometres at an altitude ranging between 850-920 meters high.

Baakline is one of the Chouf regions, lying astride the main lines of communication between the nearby villages. The region is bordered by the villages of Aynbal, Symkanieh, Beit Eddine, Deir Dourit, Deir El Qamar, and Jahlieh.

Founded in the 12th century by the Maan emirs, Baakline served as the capital of Maani emirates until the early 17th century when its most famous Emir Fakhreddin II, moved to Deir el Qamar. Under the Ottoman rule, Baakline came back to the forefront as one of the "Qasabat" or major towns.

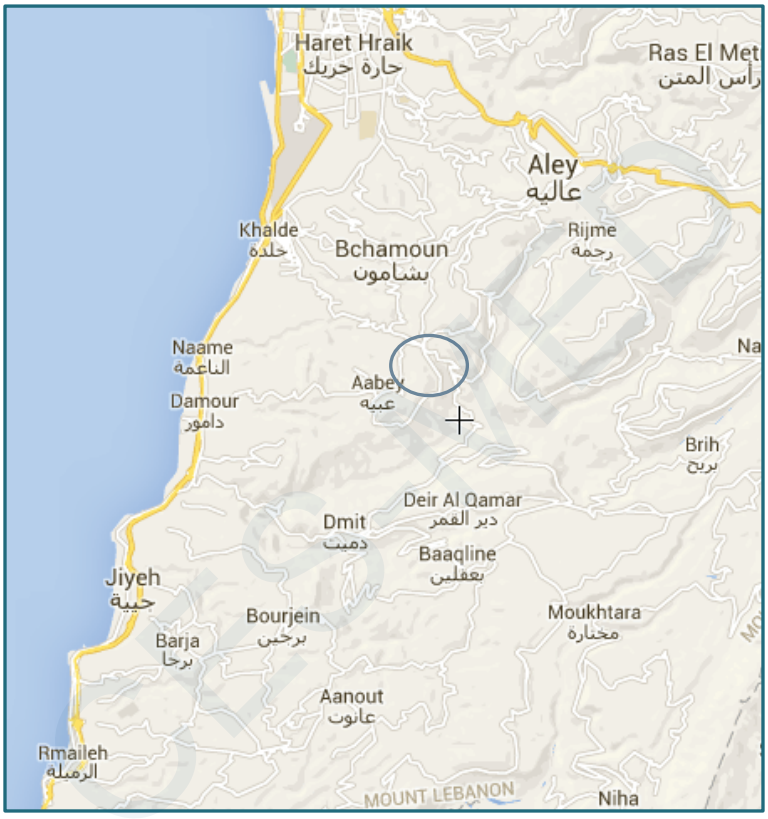
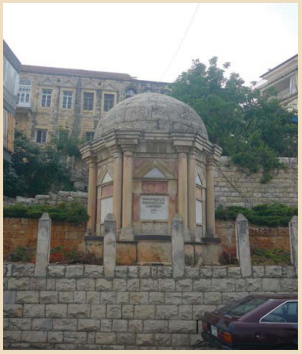
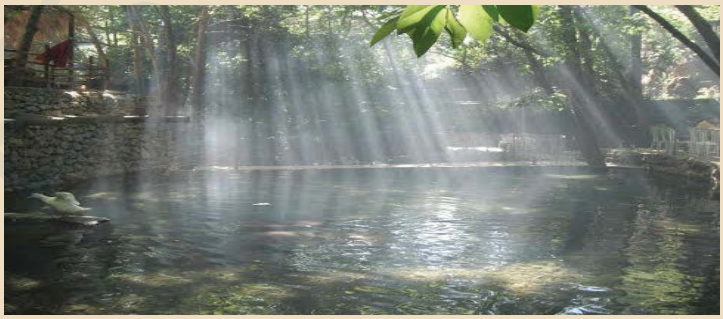


FIGURE 1: MAP OF BAAKLINE CITY

Baakline presents a very rich combination of cultural, historical and natural heritage which is not included in the traditional tourist market. Among the outstanding archaeological sites are:

- The church dating back to the early eighteenth century, known as the Church of Mar Elias.
- The Palace of Al Hamadeh, at the heart of Baakline, known later as Dar Sheikh Hussein.
- The Grand Serail, the main administrative building of Baakline and a prison before World War II, has been restored and transformed into a public library in 1987.
- Spring water of Baakline River and Baakline Forest. These natural resources are conserved and adapted to include tourism in a friendly way





Baakline is an area that includes a wide diversity of agricultural lands and productions that constitute its main economy. Baakline has many markets for several kinds of local produce, including olives, olive oil, and local crafts including production of soap. Other food items are locally produced including jam and preserves.

1.2.2 Demographic Tendencies

Baakline is the home for 17,000 inhabitants distributed among 2,870 homes. Today Baakline is an important Druze town and seat of the sect's religious leader.

The population of Lebanon comprises Christians and Muslims. No official census has been taken since 1932, reflecting the political sensitivity in Lebanon over confessional (religious) balance.

According to information from the municipality of Baakline, demography has increased by 25 % due to the Syrian displacement crisis, thus resulting in serious challenges that can threaten the national economy.

1.2.3 Climatic Characteristics

Baakline enjoys a moderate climate with hot, warm summers with an average highest and lowest temperature 31°C-25°C and rainy, cold winters with an average highest and lowest temperature 17°C- 9°C and even below 0°C. Snow is likely to fall due to the region high altitude, see the below Figure 3.

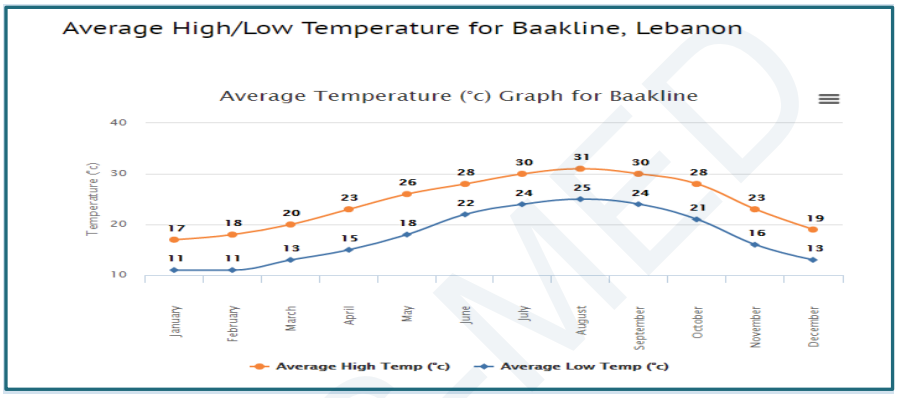


FIGURE 3: BAAKLINE AVERAGE TEMPERATURE

1.2.4 Employment

Due to its agricultural nature, thus Baakline's labour force is fundamental in the domestic production. The employment status is linked to many factors that influence the number of people in the workplace, the economic base and employment opportunities available in the region, the education level and skill base of the people.

According to a report drafted by a World Bank team under the general title " *Lebanon: Economic and Social Impact Assessment of the Syrian Conflict",* it is stated:

"With the escalation of the Syrian conflict, spill overs onto Lebanon have rapidly moved beyond the humanitarian to the economic and social spheres where large, negative, and growing spill overs are occurring".

FIGURE 2: BAAKLINE MUNICIPALITY IN PICTURES

In summary, this report finds that during the 2012-2014 period, the conflict may

(1) Cut real GDP growth by 2.9 percentage points each year, entailing large losses in terms of wages, profits, taxes, or private consumption and investment.
(2) Push approximately 170,000 Lebanese into poverty (over and above the 1 million currently living below the poverty line) and double the unemployment rate to above 20 percent, most of them unskilled youth.
(3) Depress government revenue collection by USD1.5 billion while simultaneously increasing government expenditure by USD1.1 billion due to the surge in demand for public services, bringing the total fiscal impact to USD2.6 billion.

It can be figured out that although Baakline does not have actual study on the conflict, it has been affected by this crisis as other cities in Lebanon.

1.2.5 Existing Infrastructure

The total number of recorded houses in the city is around 2,870 households, most of which are private owned houses with average 2 – 3 floors. Real stone was the main building material used in the city's old buildings. Last year, and as part of the city's development and expansion, many additional floors were added to the old buildings with a roof top making the average number of floors increase to 3-4.

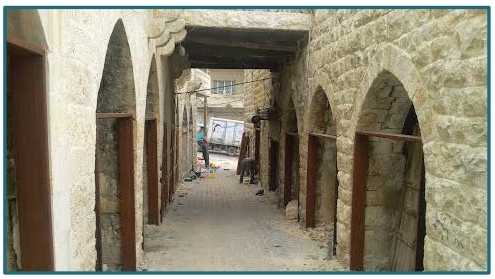


FIGURE 4 : OLD SOUK OF BAAKLINE

The town's service infrastructure is thoroughly modern with medical centres, telephone and communication services and financial centres. There are branches of three main banks in Lebanon Bank of Beirut and Arab Countries, Al Mawarid Bank and FransaBank. Private and public schools and universities have well-deserved reputations for the provision of high quality of education. The city also houses the Agricultural Research Institute, the Agricultural School, the police station, the Court, the Centre of the Judicial Police and Criminal Records, Druze sectarian Court, EDL offices in addition to many others.

However, many obstacles and considerable challenges are facing Baakline as it spreads over long areas and in direct direction. Each direction has its own hills which add more technical challenges to be resolved.

Among the challenges are:

- The infrastructure for the waste water is still not covered for the total city though part of it starts benefiting from the first phase.
- The increase amount of solid waste is challenging municipality's ability to sustainably manage it all. One of the municipality's plans is to be able to manage solid waste independently finding solutions adapted to their needs.
- The old infrastructure of the drinking water supply suffers from unmanaged supply and shortage in summer.
- The main roads suffer from low maintenance due to the lack in finance from the government.
- The electricity as well suffers from daily cut-off around 12 hours and the network is unstable which brings the diesel generator as part of life with all kind of pollution it produces. Currently the PV plants of different sizes are starting to be installed in order to supply energy during the cut-offs.

1.2.6 Complementarity with Municipal Plans and other related actions

Due to the growing concern over current environmental issues, the Municipality Council of Baakline engages national and international parties, concerned with environmental matters, in programs to help promote a more sustainable community for this and future generations. These parties are:

- CES-MED Cleaner Energy Saving Mediterranean Cities
- CoM Covenant of Mayors.
- ASCIMER Assessing Smart City Initiatives for the Mediterranean Region, is a 3-year research project supported by the European Investment Bank under the EIB University Research Sponsorship Programme (EIBURS).The overall goal of this research program is to develop a comprehensive framework to help public and private stakeholders to make informed decisions about Smart City investment strategies and to build skills to evaluate and prioritize these kinds of projects, including solving difficulties regarding deployment and transferability.

The project will address the following objectives:

- To define the Smart City concept and to understand how it can contribute to meeting urban development priorities.
- To develop a methodology to assess and prioritize Smart City projects.
- To develop guidelines to implement and manage Smart City Projects.
- To characterize Mediterranean City challenges and develop a transferability strategy of Smart City projects. This objective will be part of the other three above

- USAID United States Agency for International Development

- UNDP United Nations Development Programme
- SUDEP Sustainable Urban Demonstration Energy Projects

The European Neighbourhood Partnership Instrument (ENPI) financially support CES-MED Programme, in which the Municipality Council part of, to face the challenges related to urban development, energy supply, and environmental management.

All those in line with the governmental strategy which ratified the UNFCCC in 1994 and Kyoto Protocol in 2006 with law No.359 and 738 respectively. Followed by NEEAP the Lebanon's National Energy Efficiency Action Plan, which has been approved by the Lebanese Council of Ministers.

1.2.7 Complementarity with national actions

Lebanon has committed itself to be a part of the global fight against climate change. It has ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1944 by virtue of Law 359, with a primary objective of achieving the stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic activities from interfering with the climate system. One of the essential tools to fight against climate change, hence, is to improve our national knowledge on the matter and build our development and environmental policies on solid ground.
Through CES-MED project's support to selected municipalities in Lebanon on their effort towards energy sustainability and with the support from the Ministry of Interior and Municipalities as focal point of the project, the Municipality of Baakline, one of the 9 municipalities in the Chouf Souayjani Region, has taken the opportunity to play a key role in supporting the city in its target for sustainability.
The municipality of Baakline plays a vital role in the achievement of energy consumption and climate objectives, in protecting the environment, directing investments and implementing energy efficiency regulations. It has made a commitment to reduce the CO_2 emissions to at least 20% by 2020 compared to 2013. This pledge is to be achieved through the joint collaboration between the consortium GT &VH and the municipality through the CES-MED program.

1.2.8 Vision for the Future: "Smart and Sustainable City"

Baakline, an ancient town located in the heart of Mount Lebanon, was and still is a prominent county in the Chouf region lying astride the main communication line between its nearby villages.
Due to the growing concern about its sustainability, the Municipality of Baakline contributes to strengthen the city's capacities and improve the quality of life of its citizens through its engagement in projects financed by the EU, such as CES-MED.
In order to develop the SEAP, a baseline emission inventory has been developed with precise analysis of the current consumption of energy in the city and the usage of renewable resources in the residential, commercial, street lighting and transportation sectors. Based on the resulting data, a number of actions in each sector are formed to reduce energy consumption and CO_2 emissions.

Through setting a number of short and long term actions, the municipality will jointly work with the local community sectors, NGOs and its citizens to achieve a clean, smart and sustainable living.
Its planned actions serve the following objectives:
1. Enhance and better coordinate the energy and climate policies
2. Make the sustainable energy policy part of all key activities of the local authority
3. Reduce the economic expenditure on energy
4. Reduce the city's CO_2 emission
5. Increase Baakline's share of renewable and sustainable energy systems
6. Invest in public transport to support a strong infrastructure and liveable communities
7. Reduce electric demand through conservation and smart grid technology
8. Encourage a healthier, safer and more liveable environment that supports wellbeing for its citizens

As a result, Baakline vision is to reduce its greenhouse emissions by 20% by 2020, and thereby positioning itself as a "Smart and Sustainable municipality" in renewable energy and energy saving actions in Lebanon.

1.2.9 Organizational and Financial Aspects

1.2.9.1 COORDINATION WITH NATIONAL AND LOCAL AUTHORITIES

During the SEAP implementation, the municipality will work closely with other municipalities that have signed the CoM, with local and national authorities, community sectors and NGOs.

1.2.9.2 ADAPTATION OF ADMINISTRATIVE STRUCTURES

Baakline Sustainable Energy Action Plan analyses the city's energy use and introduces a headline target to reduce energy consumption and mitigate GHG emission by at least 20% by 2020 through greater efficiency in areas such as residential and commercial buildings, street lighting and transportation along with local renewable energy production.
Looking towards the future, this report identifies a set of actions that puts Baakline on track with a wide range of mitigation policies and strategies to become a pilot and sustainable smart city. Therefore, it is essential that we act together with our partners to achieve a clean, and smart economy, resulting in sustainable living for our families, and the future generations to come.

The Municipality of Baakline and the Shouf Souayjani Federation of Municipalities provide great examples of how a successful partnership between the European Union and the local authorities of Lebanon functions. These municipalities have been involved in a number of EU-funded projects that contribute to strengthening their capacity and to improve the quality of life of the citizens. Their determination to be sustainable, environmentally friendly municipalities with broad democratic participation of their citizens and with plenty of opportunities for work, education and access to health care is exemplary.

Section II: Methodology for BEI

2.1 The Methodology for Calculation the Baseline Emission Inventory

Introduction:

The following section explains the way the Baseline Emission Inventory will be processed & explained along with the rules and standards for data collection.

The method of calculation will also be identified along with procedure and resources.

Method:

- The method used in BEI calculation will be considered as 'standard' emission factors in line with the Intergovernmental Panel on Climate Change (IPCC) principles and comply with the United Nations Framework Convention on Climate Change (UNFCCC) reporting system.
- CO_2 emissions from energy consumption within the territory of the local authority will be calculated, either directly due to fuel combustion within the local authority, or indirectly via fuel combustion associated with electricity and heat/cold usage within the area.
- The emissions of CH_4 and N $_2$ O will not be calculated.
- CO_2 emissions from the sustainable use of biomass/biofuels, as well as emissions of certified green electricity, will be considered zero.
- The standard emission factors will be based on the IPCC 2006 Guidelines (IPCC, 2006).

TABLE 4 : THE SECTORS TO BE COVERED WITH BEI

	MUNICIPALITY	TERTIARY	RESIDENTIAL BUILDINGS	PUBLIC LIGHTING	TRANSPORT WITHIN MUNICIPAL AREA
BUILDINGS					
FACILITIES					
EQUIPMENT					
ELECTRICAL CONSUMPTION					
FUEL FOR HEATING CONSUMPTION					
ELECTRICAL BACKUP GENERATOR					
MUNICIPALITY STREET LIGHTING					
MUNICIPAL FLEET					
PUBLIC FLEET					
PRIVATE AND COMMERCIAL TRANSPORT					

Procedures

- Interview with data resources & evaluation of the available data.
- Collection and processing of quantitative data.
- Establishment of indicators.
- Gathering of qualitative information using document review and interviews/workshops with municipality.
- The selection of data sets will be based on criteria that are agreed on with the municipality, who are then actively involved in contributing data.

Resources

- Municipalities.
- Ministry of Environment.
- Ministry of Public work and Transportation.
- Ministry of Energy and Water.
- Ministry of Interior and Municipalities.
- Electricité Du Liban (EDL).
- Data collection from the following departments in the Municipality & Governorate
  - Department of Traffic.
  - Department of services water, Electrical & Lighting.
  - Department of Backup Generator.
  - Department of facility and building. /Financial Division
- LCEC: Lebanese Centre for Energy Conservation. The Lebanese Centre for Energy Conservation (LCEC) is a national organization affiliated to the Lebanese Ministry of Energy and Water. *www.lcecp.org.lb*.

FIGURE 5: BAAKLINE MUNCIPALITY BUILDING

Methodology

- Identify the needed data for the baseline emission.
- Interview with data resources' representatives.
- Select the relevant data for the inventory.
- Assessment & validation of collected data.
- Checking level of accuracy & reality of collected data.
- Sorting the collected data.

2.2 Calculation of the power provided by BDG according to the Fuel Consumption

In the following section, we will set the base of the electrical power generated from BDG according to the Fuel consumptions.
The BDG fuel consumption depends on many factors, for example, the capacity of Diesel Generators BDG in KVA, load ratio to capacity of BDG, fuel, years of operation, the status of the engine and how often it is maintained, in addition to other facts. The following link explains the effect for the capacity of BDG on fuel consumption with load ratio: *www.dieselserviceandsupply.com* e.g.: 250kw Generator consumes according to the following table 5:

TABLE 5: THE CAPACITY OF BDG ON FUEL CONSUMPTION WITH LOAD

BDG	1/4 load	1/2 load	3/4 load	Full load
250 KW	5.7(Gal/Hour)	9.5 (Gal/Hour)	13.6 (Gal/Hour)	18 (Gal/Hour)

In order to evaluate the actual GHG emission, we need to define and assume some factors to help calculating the GHG emission.
By consulting BDG provider and suppliers, the recommended maximum load share is 70% of the BDG capacity, for more efficient use and long term operation.
In our assumption, we will consider the 75% load ratio, which is: 13.6 Gal/hours for load of 187KW.
(One Gal = 3.78541 litres).
So, each KWh load consumption will consume 0.275 litre and the same figure had been given by the BDG provider.

1 KWh =» 0.275 litre of Diesel.

The above figures will be used to convert power generated by the BDG from data available for the fuel consumptions.

2.3 Power provided by BDG

The power consumed by BDG can be calculated from data provided by the BDG provider and the Fuel supplier, and analysing it by the residential classification which can be built according to the following process.
A classification of the residential buildings can be obtained from the EDL Database, through daily average power consumption and with the support of a model adapted by Ruble and Karaki in 2013 which gave the daily

electricity consumption of an average Lebanese household by 14.77 KWh. For the tertiary sector a similar power consumed as to EDL records is also assumed.

2.4 Heating and Cooling power consumption BEI methodology for the residential sector

The weather in Baakline is moderate in summer and cold in winter; the use of A/C in summer is limited.
In order to calculate the amount of electricity consumed in utilizing A/C we used the model adapted by Ruble and Karaki, 2013 which gave the daily electricity consumption of an average Lebanese household by 14.77 KWh and A/C usage represents 35% of total usage,
For heating, the fuel is the principal product used, and according to the municipality's database we have approximate values which can be compared with the data provided by the Fuel stations, on the amounts of diesel fuel sold for heating purposes.

2.5 Street Lighting Power Consumption BEI Methodology

Due to the shortage of power from EDL in daily base, the EDL database doesn't not reflect the actual power consumption during cut-off time, so there is a need to define the way to calculate the real power consumptions for the street lights by including the cut-off time power consumptions according to sunrise and sunset.
The future actions should indicate the actual issues and solutions with the assumption of the availability of EDL power for 24 hours as normal situation.

The cut-off time in Baakline city is about 12 hours daily as listed in Table 6 below:

TABLE 6: THE CUT-OFF TIME IN BAAKLEEN CITY ABOUT 12 HOURS DAILY - THE YELLOW COLOR INDICATES THE CUTOFF TIME FROM EDL

Baakleen																							
.	Time																						
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1																								
2																								
3																								
4																								
5																								

Time of operation for street lights
Any action on the street light depends on operation of light photo cells which operate according to the existing light level, and according to sunrise and sunset. For this reason, the sunrise and sunset data, which can be taken from the following source, will help defining the timing of operation:
http://www.timeanddate.com/sun/lebanon/zahle?month=2&year=2015

Although the timing is changed at a daily base, it is more convenient to have the average time for each month as a calculation base. To this end, the variations due to the type of photo cell used and light sensitivity will be considered minor in order to have a simple and as accurate as possible way for the calculation.
The following table summarizes the hours of operation all over the year.

TABLE 7: SUMMARIZES THE HOURS OF OPERATION ALL OVER THE YEAR

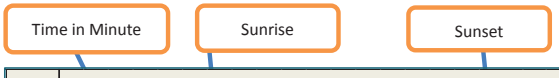
MONTH	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
average daily Time calculated from sunset to sunrise	13.63	13.5	12	11.20	10.27	9.8	10.14	11	12	13	13.73	14.2
number of days per each month	31	28	31	30	31	30	31	31	30	31	30	31
Total hours of operation per month	422.53	370	372	336	318	294	314	341	360	403	412	440

Total operation hours per year is 4 382.53; we will consider it 4 400 as round figure.

Time of operation for street lights with cut-off time from EDL

The following table 8 explains the calculated cut-off time in one selected month. The cut-off time is 207 out of the 422 hours, which is about 49% for the month of January.
Similarly, the month of December is calculated at 50%, and, considering the rest of the months for the whole year, the cut-off time is calculated at 50%. Thus, we will consider in the upcoming calculations this factor. The total operation time is 4400 hours a year, and according to the above information, the EDL data will indicate only 50% of actual power consumptions.

TABLE 8: CUTOFF TIME IN ONE SELECTED MONTH



Jan	Time																												
day	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	16.5	17	18	19	20	21	22	23	24	Total hour of operation	HOUR OF OPERATION WITH EDL	CUTOFF TIME
1	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
2	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
3	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
4	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
5	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
6	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
7	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
8	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
9	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
10	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
11	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
12	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
13	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
14	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
15	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
16	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
17	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
18	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
19	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
20	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
21	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
22	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
23	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
24	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
25	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
26	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
27	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
28	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
29	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
30	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	2.63	11
31	60	60	60	60	60	30												8	60	60	60	60	60	60	60	60	13.63	11	2.63
																										Total Hours	422.63	215.50	207.13

The

Green colour indicates the availability of EDL, the white colour indicates the cut-off time.
So, the actual power consumption for the street light in Baakline will be as follows:

$$E_{ST} = (2 \times E_{EDL})$$

E_{ST}	Actual power consumptions for street lights in MWh.
E_{EDL}	EDL database for power consumptions for street lights in MWh.

2.6 Tertiary BEI methodology for electricity

The EDL database can help calculating the power consumption during the EDL operation and also can be analysed to calculate the power consumption on cut-off time from backup diesel generators.
The reason is that the tertiary sector will continue to consume power as EDL is available without reduction in consumption during the cut-off time.

2.6.1 Emissions from EDL power

The EDL provides the actual power consumption within a year.
The calculation for GHG emission from power consumptions of the tertiary sector are realized in line with the equation below:

$$ECO2 = ET \times NEFE.$$

ECO_2	CO_2-e emissions of Electrical Consumption in year t CO_2-e
ET	Actual power consumption for tertiary sector in KWh.
NEFE	National Emission Factor for electricity [t/MWh] (0.65).

2.6.2 Emission from BDG

The power consumption from BDG will be the same as that from EDL, as the cut-off time is 12 hours daily. The assumptions presented in the above sections (Backup Diesel Generator BDG Fuel Consumption & BEI Methodology) can then be adopted, namely

1 KWh =» 0.275 litre of Diesel.

The above figures will be used to convert power consumption for the BDG for:

Fuel = power consumed from BDG in MWH x 0.275 x 1000

The calculation of GHG emissions for fuel consumption for BDG can be calculated with the following formula in accordance with IPCC guidelines:

$$EFC = EFf \times Fuel \times NCV \times D \times 10^{-6}$$

Where :

EFC	CO_2-e emissions for fuel combustion in year tCO_2-e
Fuel	Amount of Fuel of type a (Diesel) in litre consumed in a year
EFf	Emission Factor of Fuel (Diesel) in tCO_2-e/TJ Diesel = 74.1 tCO_2-e/TJ t
NCV	Net Calorific Value of Diesel which is equal to 43.TJ/Gg
D	Density of Diesel equal to 0.8439 Kg/litre
10^{-6}	To convert from Gg to Kg

(*Values obtained from Table 1.2, table 1.4, chapter 1, Volume 2, IPCC 2006 inventory guidelines).*

2.6.3 Emissions from Transportation

In Baakline City, the transportation doesn't represent an important source for GHG emissions. The calculation of the emissions will be realised based on data on the traffic count that the municipality has provided, and more specifically:

- Distance in Km.
- Average consumption litre / Km
- Percentage of Passenger cars and taxis;
- Percentage of Heavy and light-duty vehicles;
- Percentage of Buses and other vehicles used for public transport services;
- Percentage of Two-wheelers.

The default fuel consumption values that will be used are:

- 10Km / litre for gasoline vehicles.
- 5Km/litre for Diesel vehicles.

The calculation of GHG emissions from fuel combustion in the transportation can be calculated with the following formula in accordance with the IPCC guidelines:

$$EFC = EFf \times Fuel \times NCV \times D \times 10^{-6}$$

Where :

EFC	CO_2-e emissions for fuel combustion in year tCO_2-e
Fuel	Amount of Fuel of type a (Gasoline /Diesel) in litre consumed in a year
EFf	Emission Factor of Fuel (Gasoline /Diesel) in tCO_2-e/TJ Gazoline 69.3 tCO_2-e/TJ t - Diesel 74.1 tCO_2-e/TJ t
NCV	Net Calorific Value of gasoline is equal to 43.TJ/Gg, Diesel is 43.TJ/Gg
D	Density of Gasoline 0.7407 Kg/litre Diesel 0.8439 Kg/litre
10^{-6}	to convert from Gg to Kg

(Values obtained from Table 1.2, table 1.4, chapter 1, Volume 2, IPCC 2006 inventory guidelines)

Section III: Base emissions inventory

3.1 BEI for Electrical Power Consumptions from EDL and BDG

In this section, we assess the effect of backup generator and EDL on CO_2 emissions from the Electrical Sector in Lebanon.
Lebanon enjoys a large degree of electrification close to 100%,yet the electrical supply is unreliable and characterized by frequent and lengthy power cuts. Electricité Du Liban (EDL) is the sole official provider of electricity in Lebanon and is 100% owned by the government. The demand exceeds supply due to insufficient capacity.
The subsequent rationing of demand, translated into lengthy daily power cuts, has led to the gradual development of an off-grid parallel network.
This network has been estimated roughly 33% to 38% (in 2008) and about 60% by 2015 of electricity demand/consumption in Lebanon.
The power consumption of Baakline for the years 2012 and 2013 is analyzed and studied according to the database provided by EDL, the annual fuel consumption for the BDG generators along with the estimation of fuel consumption/kwh and the fuel suppliers with the amount of fuel sold to the BDG providers. In other words, the overall information in this section has a multi approach to confirm the accuracy of the given figures.
Table 9 shows the summary of electrical power consumption for different sectors in Baakline.The total electrical consumption for electricity from the two sources EDL and BDG is about 14 GWh/a year in 2013, excluding the industrial sector, which represents a small amount. The BDG represents 33.6% of the total consumptions. The total emission for electrification is about 9.5 $MtCO_2$ in 2013, where the BDG consumes about 1.3 Million Litres of Diesel Oil and counts for about 36% of total emission.
The Residential sectors represent the 57% of total electrification emissions; the tertiary and municipality sectors represent about 27.5% and 15.4% respectively.

The methodologies Followed for calculation:
The emission factor for EDL is considered to be 0.65 tCO_2/MWh according to LCEC, and the emission calculated according to following formula:

Emission from EDL power

$$ECO_2 = ET \times NEFE$$

ECO_2	CO_2-e emissions of Electrical Consumption in year t CO_2
ET	Actual power consumptions in MWh.
NEFE	National Emission Factor for electricity [t/MWh] (0.65) (4)

The Power produced from BDG according to the actual power produced through BDG
The actual energy produced form BDG is not officially recorded. The information are obtained from BDG, which shows each KWh consumes 0.275 Litres of Diesel fuel. This information had been ascertained before in this report.

1 KWh =» 0.275 litre of Diesel.

Emission according to Gas Oil Diesel Fuel consumptions for BDG
To calculate the emission of Diesel Fuel consumption for generator, we had two methods both of which gave almost similar results:

First method:
The following formula has been obtained from source Guide book for Covenant of Mayors for (5) p73, 62

$$ECO_2 = Fuel \times Ne \times EFf \ / \ 1000.$$

ECO_2	Emissions of Fuel Consumption in year t CO_2
Fuel	Amount of Fuel of type a (Diesel) in litre consumed in a year
Ne	Conversion factor KWh/L from Table 7 (For diesel fuel 10.0KWh/L (5) p. 73)
EFf	Emission Factor of Fuel (Diesel) in t CO_2 /MWh
	Table 4 Gas Oil Diesel = 0.267 tCO_2-e/TJ t

Second method:
The calculation for GHG emission for fuel consumption for BDG can be calculated with the following formula in accordance with IPCC guidelines:

$$EFC = EFf \times Fuel \times NCV \times D \times 10^{-6}$$

EFC	CO_2e emissions for fuel combustion in year tCO_2-e
Fuel	Amount of Fuel of type a (Diesel) in litre consumed in a year
EFf	Emission Factor of Fuel (Diesel) in tCO_2-e/TJ (Diesel = 74.1 tCO_2-e/TJ t)
NCV	Net Calorific Value of Diesel which is equal to 43.TJ/Gg
D	Density of Diesel equal to 0.8439 Kg/litre
10 - -6	To convert from Gg to Kg

(Values obtained from Table 1.2, table 1.4, chapter 1, Volume 2, IPCC 2006 inventory guidelines).

TABLE 9 : ELECTRICAL POWER CONSUMPTION IN BAAKLEEN TOWN FROM EDL AND BDG FOR YEAR 2013 WITH CALCULATED GHG

		Electrical Power Consumptions in KWh		BDG Diesel Fuel Consumption in Liter	Emission in t CO_2/year		Emissions per Sector
		EDL	BDG		EDL	BDG	
Residential		5,266,993	2,740,494	753,636	3,424	2,012	5,436
Tertiary	Commercial	1,623,142	1,623,142	446,364	1,055	1,192	2,625
	Others	131,576	131,576	36,183	86	97	
	Hospitals	141,429	141,429	38,893	92	104	
Municipality	Municipality Building	17,279	17,279	4,752	11	13	1,470
	Water Pumping Stations	277,493	68,000	18,700	180	50	
	Public Street lighting*	1,869,730	0	-	1,215	-	
	Sub Total	**9,327,642**	**4,721,920**	**1,298,528**	**6,063**	**3,467**	**9,530**

Total GHG emission in 2013 by Electrical power is 9,530 tCO2/year

* for street lighting figures with assumption that no cutoff time from EDL

3.2 BEI for Heating

The weather in Baakline in summer is moderate and cold in winter; there is no central heating / cooling system in the town. The emission for cooling is already covered within the EDL or BDG consumptions.
Fuel oil is the main fuel that is used extensively in the heating during the winter season in Baakline; there are small wood parts from trim trees, Peat from olive residue & the remnants casing of pine. According to Baakline municipality data & Fuel station, most of the users, about 95% of them, use Diesel Fuel for heating. The emission from wood residual will be considered as null, as the life time of trees overcome the emission of the burning.

The input information from the local people, the municipality, fuel stations & EDL database are as follows

- The residential sector represents the majority of heating consumptions for Diesel fuel and can be summarized in two main parts:
  - The consumption of the majority of household heat with only one main room varies according to the weather condition, but, in general, the average consumption is 1 400 to 1 600 litres / year.
  - The remaining household has central heating system, for the entire house with average consumptions 3000 Litres / year.
- Baakline municipality consumes 7 000 litres/ year.
- The fuel stations data estimate the consumption by 3,000,000 litres / year as an average for the total town, including the municipality.
- The fuel consumptions for schools and hospitals, and some other parts of the tertiary sector, are estimated about 256,000 litres / year.
- The EDL database had assorted the residential sectors according to the average annual EDL power consumptions. The amount of consumption for heating is converted to suit the energy consumption.

  - 14.77 KWh/year estimated consumption of fuels 3000 litres / year
  - 7.97 KWh/ year estimated consumption of fuels 1600 litres / year
  - 4.64 KWh/ year estimated consumption of fuels 1400 litres / year

According to table 10, the results obtained from the fuel consumption for heating seem close to the input information given by the fuel suppliers. The 7% difference can occur due to the heating that depends on the average weather conditions.

TABLE 10 : FUEL CONSUMPTION FOR HEATING

Residences Category	Average EDL Power Consumption KWh/Year	Counts	KWh/ day	EDL in KWh/year	consume Diesel Fuel Liters/Year	Total Fuel consumption / year in Liters
NON Equipped Housing	0	472	0.00	0		
Rarely used Seasonal House	32	137	0.20	4,448		
Rarely used Seasonal House	240	227	0.66	55,215		
Seasonal House	650	347	1.78	223,554		
Seasonal House	1050	189	2.87	198,330		
House with low energy consumption	1600	79	4.40	757,286	wood from trim trees, Peat from olive residue	
House with low energy consumption	3230	395	4.40	757,287	1,400	553,000
House with normal energy consumption	3230	946	8.85	3,052,767	1,600	1,513,600
House with Hi energy consumption	6213	151	17.00	938,193	3,000	453,000
					Sub Total	**2,519,600**
		Commercial	1		170,000	170,000
		Others	1		80,000	80,000
		Hospital	1		6,000	6,000
		Municipality	1		7,000	7,000
					Sub Total	**263,000**
					Total	2,782,600

FIGURE 6: AL HAMADA CASTLE IN BAAKLINE

The methodology used for the calculation -of GHG emissions for heating is as follows:

The calculation for GHG emission for fuel consumption for BDG can be calculated with the following formula in accordance with IPCC guidelines:

$$EFC = EFf \times Fuel \times NCV \times D \times 10^{-6}$$

EFC	CO_2e emissions for fuel combustion in year tCO_2-e
Fuel	Mount of Fuel of type a (Diesel) in litre consumed a year
EFf	Emission Factor of Fuel (Diesel) in tCO_2-e/TJ (Diesel = 74.1 tCO_2-e/TJ t)
NCV	Net Calorific Value of Diesel which is equal to 43.TJ/Gg
D	Density of Diesel equal to 0.8439 Kg/litre
10	To convert from Gg to Kg.

(Values obtained from Table 1.2, table 1.4, chapter 1, Volume 2, IPCC 2006 inventory guidelines).

In table 10, the fuel consumption estimated for residential sectors is 2,519,000 litres, whereas the fuel station suppliers gave total sales of 3,000,000 litres. If we consider that, we are sure about the other sectors' consumption. The remaining 218,000 litres represents about 8.6% of the residential fuel consumptions, which can be assumed as a reasonable number for temperature variations. Thus, we will consider the fuel supplier data in our calculation and replace the residential one.

The following table 11 summarizes the total emission for heating in Baakline, taking in consideration that total fuel consumption is 3,000,000 litres / year.

TABLE 11: THE FUEL CONSUMPTION IN BAAKLEEN TOWN USED FOR HEATING FOR YEAR 2013 WITH CALCULATED GHG EMISSION.

Fuel Consumption on Heating			
		Count of Fuel for heating in Liters	Emission in tCO_2/year
Residential	Residential	2,737,000	7,360
	Commercial	170,000	457
Tertiary	Others	80,000	215
	Hospitals	6,000	16
Municipality	Municipality Building	7,000	19
Total	**GHG emission in 2013 by tCO_2/year for Heating**		**8,067**

3.3 BEI for Transportation

Baakline's location represents a key link with the rest of the villages and towns in the Chouf region, and is a vital corridor linking the city of Beirut, Sidon and Bekaa:

- Deir Dourite, Kfarhim, Dmit heading towards Damour ,the main connection between Beirut and Sidon the two main traffic roads.
- Ainbel, Aatrine, Gharifi, Hasrout towards the south.
- Semkania, Baqaata Chouf, towards Moukhtara, Barouk
- Beiteddine, Deir Al Qamar.
- Jahliye, Benouaiti.

FIGURE 7: SCHOOL BUS

Due to its location the daily traffic flow can be counted according to the traffic from neighbouring towns in addition to that from Baakline towards Beirut City and Sidon.

The input data provided by the **Fuel station** indicates the daily fuel consumption by:

- 20,000 litres/ day for Gasoline, yearly consumption 7,300,000 L/ year (this includes travel outside Baakline)
- 2,000 litres/ day for Diesel oil, yearly consumption 730,000 L/ year (this includes travel outside Baakline)

The Municipality Fuel consumption

- 11,030 litres/ a year for Gasoline
- 13,250 litres / a year for Diesel oil

The number of trips in Baakline calculated according to the input data from the municipality is:

- 9600 car /day (gasoline vehicles) with 10 Km/ day travelling distance for each car.
- 70 trips truck/ Bus (Diesel oil) with 10 Km/ day travelling distance for each truck/bus.

Table 12 represents the data collected for road transportation from the municipality of Baakline and the fuel stations.

TABLE 12: ACTIVITY DATA FOR ROAD TRANSPORTATION IN BAAKLINE

CALCULATION OF ACTIVITY DATA FOR ROAD TRANSPORTATION						
	PASSENGER CARS	LIGHT Duty Vehicles	HEAVY duty Vehicles	BUSSES	TWO WHEELERS	TOTAL
Mileage (million km) from activity data collection						
Total						35.24
Fleet distribution from activity data collection (as % of mileage						
Total mileage	**87.0%**	**11.0%**	**0.1%**	**1.4%**	**0.5%**	**100.0%**
Gasoline	87.0%	10.0%		1.0%	0.5%	98.5%
Diesel	0.0%	1.0%	0.1%	0.4%		1.5%
Average fuel consumption from activity data collection (l/km)						
Gasoline	**0.096**	**0.130**			**0.040**	
Diesel	**0.069**	**0.098**	**0.298**	**0.292**		
Calculated mileage (million km)						
Gasoline	30.66	3.52	0.00	0.35	0.18	34.71
Diesel	0.00	0.35	0.04	0.14	0.00	0.53
Calculated consumption (million l fuel)						
Gasoline	2.94	0.46	0.00	0.00	0.01	3.41
Diesel	0.00	0.03	0.01	0.04	0.00	0.09
Calculated consumption (GWh)						
Gasoline	27.08	4.21	0.00	0.00	0.06	31.36
Diesel	0.00	0.35	0.11	0.41	0.00	0.86

- **CONVERSION FACTORS FOR THE MOST TYPICAL TRANSPORTATION FUELS (EMEP/EEA 2009; IPCC, 2006)**
  Gasoline 9.2 KWH/L
  Diesel 10.0 KWH/L
- **Total consumption**
  Total Gasoline Consumption is 3.4084128 Million L
  Total Gas oil, diesel Consumption is 0.08619704 Million L
- **STANDARD CO_2 EMISSION FACTORS (FROM IPCC, 2006)**
  Motor Gasoline STANDARD EMISSION FACTOR 0.249 t CO_2 /MWh
  Gas oil, diesel STANDARD EMISSION FACTOR 0.267 t CO_2 /MWh

The calculated GHG emission:

{Calculated consumption for Fuel in Litre x Fuel Conversion Factor (KWH/L)} /1000X Conversion of Fuels from Mass to Energy units (IPCC, 2006) in Net Calorific value (MWh/t) } / 1000

Total Consumption for Motor 7977 t $CO_2$for Private Transportation

- Gasoline 3,397,382 L x 9.2 KWH/L x 0.249 t CO_2 /MWh / 1000 to convert from KWh to MWh =7782.72 t CO_2
- Gas oil, diesel 72947 L x 10 KWH/L x 0.267 t CO_2 /MWh / 1000 to convert from KWh to MWh = 194.768 t CO_2

Municipality fuel consumptions

- 11,030 litres/year for Gasoline produce 25.267 t CO_2
- 13,250 litres /year for Diesel oil produce 35.377 t CO_2

TABLE 13 TRANSPORTATION ANNUAL CONSUMPTION FUEL FOR YEAR 2013 WITH CALCULATED GHG EMISSION

	Fuel Consumption For Transportation				
	Gasoline Fuel in Litre	Emission in tCO2/year	Diesel Fuel in Litre	Emission in tCO2/year	Total Emission tCO_2/year
Private Transportation Cars & Truck	3,397,382	7,783	72,947	195	7,977
Municipal Fleet	11,030	25	13,250	35	61
Public Transport			Not Available		
Total	**3,408,412**	**7,808**	**86,197**	**230**	
Total GHG emission in 2013 by tCO_2/year for Transportation					**8,038**

3.4 RESULT AND SUMMARY

3.4.1 Residential Sector

According to the EDL database, the residential sector has about 2943 customers, compared to the number of houses or flats, which also match with the municipality counts. Those houses or flats are split according to the EDL power consumptions in Table 14.
There are about 1373 houses/part of houses, without or with minor consumption. This is due to the unequipped or seasonal houses whose total consumption is 481,547 KWh/year (EDL 2013) and represents 9.2% of total EDL residential consumptions.

The remaining 1571 houses consume 4,748,246 KWh / year (EDL 2013) and count for 90.8% of the EDL residential consumption in Baakline.
The electrification in the residential sector emits 57% of the total GHG emissions, which represents the main amount to be addressed. The sustainable energy action plan SEAP should cover this main sector in CO_2 emissions suggesting measures to mitigate the GHG emissions and reduce the power consumption.

Energy Efficiency in Household appliances:

The Energy Efficiency in general represents one of the main issues which need to be addressed. In the following section, we will define the estimated power consumption in the household appliances based on the EDL database and the studies carried out previously.
In order to analyse the concerned parts of the appliances in consumption, we used (Karaki el al 2009) and (Ruble and Karaki 2012) model in reference to the main appliances in the houses, with little modification, to fit into Baakline's criteria. According to the information collected from the municipality, Baakline has a moderate climate in summer, the Air Conditioning A/C is not equipped by all households and the central heating system consumption had been included for certain number of users.
The analyses results listed in Table 14 show the different house models according to the power consumptions related to the appliances.
House model A is the base model to summarize the three main houses models in Baakline:

- House model B consumes 17.27 KWh/day
- House model C consumes 8.87 KWh/day
- House model D consumes 4.43 KWh/day

FIGURE 8: MAIN HALL IN BAAKLINE

TABLE 14 : SHOWS THE DIFFERENT HOUSE MODELS ACCORDING TO THE POWER CONSUMPTIONS WITH RELATED TO APPLIANCES.

House Model	Appliance Type	Power rating (W)	Hours of operation per day	Energy KW h/day	Appliances per household	Energy (%)	Energy KWh/ month	Energy KWh/ year
A	*Average consumption for Lebanese house hold according to Karaki et al 2009*							
	Lights	50	6	3	10	20%	90	1095
	Fridge/ Freezer (14 CF)	300	6	1.8	1	12%	54	657
	Washing machine (7kg)	1800	0.65	1.17	1	8%	35	427
	A/C(12,000 BTU)	1300	4	5.2	1	35%	156	1898
	Boiler	1000	3	3	1	20%	90	1095
	Others	100	6	0.6	1	4%	18	219
	Total			**14.77**			**443**	**5391**
B	*Average consumption for Lebanese house hold in Baakleen*							
	Lights	50	6	3	10	17%	90	1095
	Fridge/ Freezer (14 CF)	300	6	1.8	1	10%	54	657
	Washing machine (7kg)	1800	0.65	1.17	1	7%	35	427
	A/C(12,000 BTU)	1300	4	5.2	1	30%	156	1898
	Central heating system	500	5	2.5	1	14%	75	912.5
	Boiler	1000	3	3	1	17%	90	1095
	Others	100	6	0.6	1	3%	18	219
	Total			**17.27**			**518**	**6304**
C	*Average consumption for Lebanese house hold in Baakleen*							
	Lights	50	6	2.4	8	27%	72	876
	Fridge/ Freezer (14 CF)	300	6	1.8	1	20%	54	657
	Washing machine (7kg)	1800	0.65	1.17	1	13%	35	427
	A/C(12,000 BTU)	1300	0	0	0	0%	0	0
	Central heating system	500	0	0	0	0%	0	0
	Boiler	1000	3	3	1	34%	90	1095
	Others	100	5	0.5	1	6%	15	183
	Total			**8.87**			**266**	**3238**
D	*Average consumption for Lebanese house hold in Baakleen*							
	Lights	50	5	1	4	23%	30	365
	Fridge/ Freezer (14 CF)	300	6	1.8	1	41%	54	657
	Washing machine (7kg)	1800	0.35	0.63	1	14%	19	230
	A/C(12,000 BTU)	1300	0	0	0	0%	0	0
	Central heating system	500	0	0	0	0%	0	0
	Boiler	1000	0.5	0.5	1	11%	15	182.5
	Others	100	5	0.5	1	11%	15	183
	Total			**4.43**			**133**	**1617**

Table 14 explains the consumption part for each appliance that is simplified in Table 15 through calculating the estimated power reduction by implementing energy efficient scenario for household appliances.

Through implementing energy saving, according to (Table 2 from Ruble and Karaki energy policy) 52(2013) 608-617 report, which indicates the energy saving amount for each appliance, saving in electricity consumptions through the replacement of conventional appliances by their EE counterparts can be achieved.

TABLE 15 : CALCULATE THE ESTIMATED POWER REDUCTION BY IMPLEMENTING ENERGY EFFICIENT SCENARIO FOR HOUSEHOLD APPLIANCES

Appliance	Energy saving with A rating (%)
Refrigerator/Freeze	50
Air-Conditioning Split Unit	23
Washing Machine	19
Lighting / CFL	77

Table 16 from (Ruble and Karaki energy policy) 52(2013) 608- 617 report, indicates the electricity consumptions for A and A+++ rated Refrigerators.

TABLE 16 : RUBLE AND KARAKI ENERGY POLICY

Type of 14 CF refrigerator/ Freezer	Yearly consumption
Conventional	864
A rated	432
A+++ rated	173

In EE plan 1, of table 17 below, we consider an A rated refrigerator, and in EE plan 2, the energy efficiency is calculated by using an A+++ refrigerator/Freezer.
For the boiler, we consider using SWH and the consumption power shows an average of 3 months during cloudy and cold weather.

For lighting, LED lights were proposed instead of CFL and GLS lights. The results obtained are satisfactory, since by applying Energy Efficient (EE) for housing appliances 50% reduction in electrical power consumption has been achieved.

TABLE 17 : EE PLAN 1 WE CONSIDER AN A RATED REFRIGERATOR, AND IN EE PLAN 2 CALCULATED BY USING AN A+++

	House Model								Energy efficiency	
	B		C		D		Total count	Total consumption KWh / year	EE plan 1	EE plan 2
	Count	Energy KWh/year	Count	Energy KWh/year	Count	Energy KWh/year			Energy KWh/year	Energy KWh/year
Lights	151	1095	946	876	474	365	1571	1,167,051	700,231	700,231
Fridge/ Freezer (14 CF)	151	657	946	657	474	657	1571	1,032,147	670,896	273,519
Washing machine (7kg)	151	427	946	427	474	230	1571	577,470	467,751	467,751
A/C(12,000 BTU)	151	1898	946	0	474	0	1571	286,598	220,680	220,680
Central heating system	151	912.5	946	0	474	0	1571	137,788	110,230	110,230
Boiler	151	1095	946	1095	474	183	1571	1,287,720	321,930	321,930
Others	151	219	946	183	474	183	1571	292,219	292,219	292,219
		6304		**3238**		**1617**		**4,780,993**	**2,783,936**	**2,386,560**

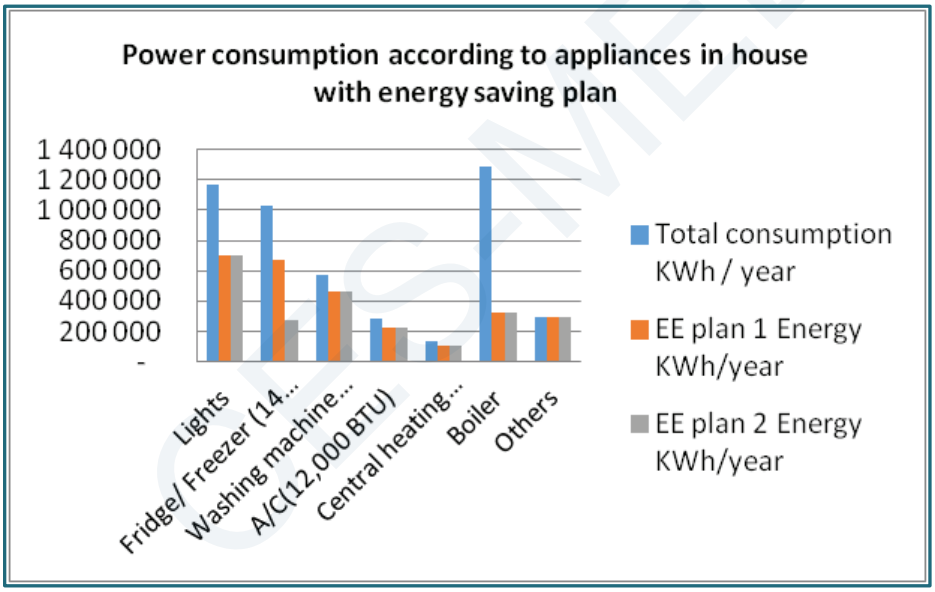


CHART 4 : THE ENERGY SAVING RESULTS WITH TWO ENERGY SAVING PLANS

Solar Water Heater SWH and replace Electrical Water Boilers:

The Domestic solar water heating system is a cost effective and mature technology that benefits from an increasing popularity around the world. In Lebanon, the average daily solar radiation reaches around 5.15 kWh/m2, the average temperature of distributed water is 20 °C and the average household requires 200 Litres of hot water per day, throughout the year (CUB/LCEC, 2011). Based on the available solar data and the average water temperature, 70% of the yearly hot water needs can be satisfied through the use of a SWH system. The count for solar water heater in Lebanon is around 5.1% to total number of dwellings (2012); by implementing SWH in Baakline, the expected reduction in power consumption is estimated around 1 GWh/year, which represents 21% of the total electrical consumptions.

Photovoltaic Solar Energy:

Baakline fits in Climatic Zone 2: Western Mid-Mountain, with an Average Daily Direct Normal Irradiation (5034.7Wh/m2) according to TSBL (LCEC). There are some PV system installed by private sector. Their calculated reduction in GHG emission is 0.067 t CO_2

FIGURE 9: PHOTOVOLTAIC SOLAR ENERGY

Section IV: BAU Scenario

Baakline consumes 76,269MWh/y as counted in year 2013 which corresponds to 96,861MWh/year in 2020, according to JRC expectation for Lebanon if no action has been applied. Though the increase is considered, this doesn't reflect the current situation as the number of Syrian refugees is increasing which counts for 25 % of the original population in Baakline.

TABLE 18 : ENERGY CONSUMPTIONS IN BAAKLINE WITH BAU 2020

	Energy Consumptions in MWh/year	
BUILDINGS,EQUIPMENT/FACILITIES &TRANSPORTAION	**Base 2013**	**2020 as BAU**
Municipal buildings, equipment/facilities	450	572
Tertiary (non municipal) buildings, equipment/facilities	6,352	8,067
Residential buildings	35,378	44,930
Municipal public lighting	1870	2,375
Municipal fleet	234	297
Public transport	0	0
Private and commercial transport	31,985	40,621
Total	76,269	96,862

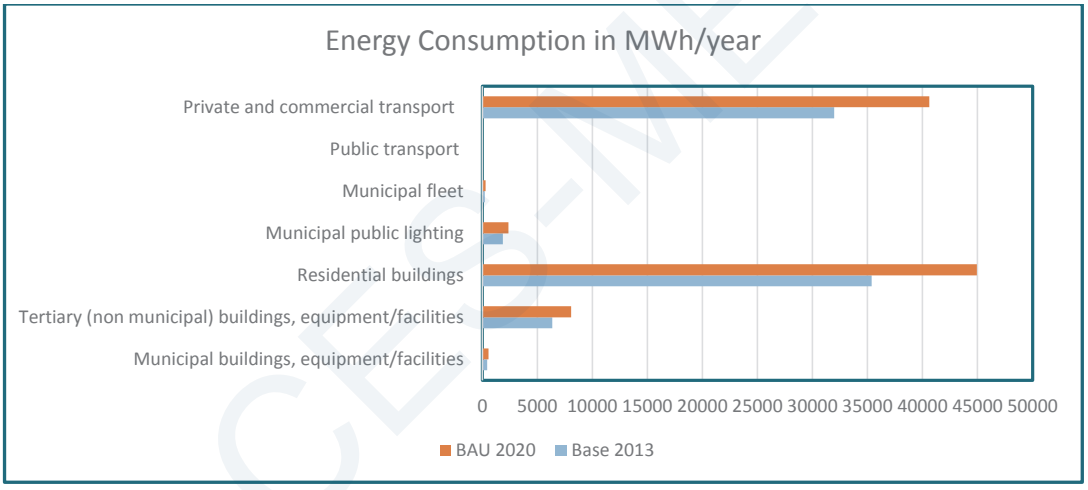


CHART 5 : ENERGY CONSUMPTIONS IN BAAKLINE WITH BAU 2020

The corresponded GHG emission for the energy consumptions is 25,635 tCO_2 (2013) and it is expected to reach 32,556 t CO_2 by 2020. Without applying any actions in energy conservation or increasing renewable energy sources, the emission per person will be 1.28 t CO_2/year.

TABLE 19 : GHG EMISSION FOR THE ENERGY CONSUMPTIONS WITH BAU

	Emissions in t CO_2	
BUILDINGS,EQUIPMENT/FACILITIES& TRANSPORTAION	**Base 2013**	**2020 as BAU**
Municipal buildings, equipment/facilities	273	347
Tertiary (non-municipal) buildings, equipment/facilities	3,313	4,208
Residential buildings	12,796	16,251
Municipal public lighting	1215	1,543
Municipal fleet	60	76
Public transport	0	0
Private and commercial transport	7,978	10,132
Total	**25,635**	**32,556**

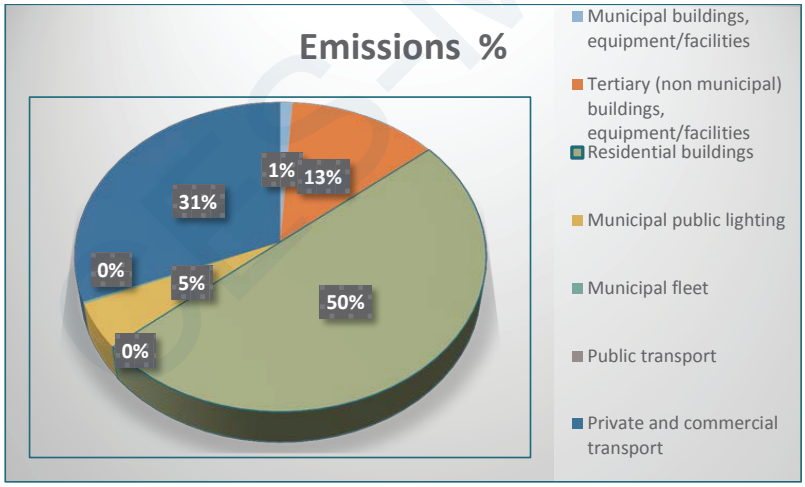


CHART 6 : PERCENTAGE OF GHG EMISSION FOR THE ENERGY CONSUMPTION OF EACH SECTOR IN THE CITY

TABLE 20 : SUSTAINABLE ENERGY ACTION PLAN SEAP TEMPLATE

Covenant of Mayors
Committed to local sustainable energy

Sustainable Energy Action Plan (SEAP) template

BASELINE EMISSION INVENTORY

1) Inventory year: 2013

? Instructions

For Covenant signatories who calculate their CO2 emissions per capita, please precise here the number of inhabitants during the inventory year: 17000

2) Emission factors

Please tick the corresponding box:

- [x] Standard emission factors in line with the IPCC principles
- [ ] LCA (Life Cycle Assessment) factors

Emission reporting unit

Please tick the corresponding box:

- [x] CO2 emissions
- [ ] CO2 equivalent emissions

3) Key results of the Baseline Emission Inventory

Green cells are compulsory fields

Grey fields are non editable

A. Final energy consumption

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	380.051					70										450.051
Tertiary (non municipal) buildings, equipment/facilities	3792.294					2560										6352.294
Residential buildings	8007.487					27370										35377.487
Municipal public lighting	1869.73															1869.73
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	14049.562					30000										44049.562
TRANSPORT:																
Municipal fleet						133	101									234
Public transport						0	0									0
Private and commercial transport						729	31256									31985
Subtotal transport						862	31357									32219
Total	**14049.562**					**30862**	**31357**									**76269**

Municipal purchases of certified green electricity (if any) **[MWh]:**	0
CO2 emission factor for certified green electricity purchases (for LCA approach)**:**	0

B. CO2 or CO2 equivalent emissions

Please note that for separating decimals dot [.] is used. No thousand separators are allowed.

Category	CO2 emissions [t]/ CO2 equivalent emissions [t]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biofuel	Plant oil	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	254					19										273
Tertiary (non municipal) buildings, equipement/facilities	2625					688										3313
Residential buildings	5436					7360										12796
Municipal public lighting	1215															1215
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	9530					8067										17597
TRANSPORT:																
Municipal fleet						35	25									60
Public transport						0	0									0
Private and commercial transport						195	7783									7978
Subtotal transport						230	7808									8038
OTHER:																
Waste management																
Waste water management																
Please specify here your other emissions																
Total	**9530**					**8297**	**7808**									**25635**

Corresponding CO2-emission factors in [t/MWh]	0.678					0.269	0.249									
CO2 emission factor for electricity not produced locally [t/MWh]	0.65															

Section V: Planned Actions and Measures

5.1 Municipal building

5.1.1 OVERVIEW

The municipality of Baakline manages an area of around 14 Km². Before moving into the new municipality building which has more space and larger area, the energy consumption for the municipality building and facilities reached 14,049 MWh/y (2013), 35 MWh/y of which was consumed by the municipality building itself.
The municipality plays a crucial role in implementing the sustainable energy action plan, which represents the pilot project for the municipality and stakeholders. To be successful, SEAP should be developed in close cooperation between the local authorities and stakeholder groups who will be involved in implementing new actions. This would allow them to expertise the changes in consumption and giving positive feedback on the attitude of the staff and visitors. It would also show how the staff capacity is increased and involved in practical implementations.

In order to reach a sustainable municipality, the following actions should be considered:

- Using high efficient light. The new municipality building had conventional lighting, and still hasn't identified high efficient light in its design study. This issue rises up the importance of using lamps replacement with high efficient ones when lamps reach an end-of-life.

- Utilising lightning control system. The new building had no lighting control for occupancy in offices or in corridors. If lightning control is implemented, this could save a lot of power when offices are empty. It could also help in reducing the power consumptions, mitigating the emissions and reducing the unseen cost.

- Raising staff awareness. This has its impact on their changing behaviour which will help in reducing consumptions. The staff should be aware not to keep the PC and monitors on when they are out of office and turn off A/C or other electrical equipment or appliances.

- Identifying the set temperature for air-conditioning cooling and heating will help in reducing the power consumptions.

- Updating the procurements policy and procedures to include the sustainability conditions and rating for efficiency for the new purchase of equipment. This is essential in maintaining SEAP implementation plan.

- Installing Power Analyser in the building. It will help in identifying the power consumptions and support the municipality in its plan for monitoring consumptions and identifying the required steps in the plan to mitigate the consumptions and reduce the billing cost.

5.1.2 SHORT TERM ACTION

The municipality has to involve local stakeholders and show them how certain implementations for sustainable energy action plan in their facilities are performed. In the process of saving energy, the following short term actions are proposed:

- Set up SEAP Unit inside the municipality. This unit should monitor the implementation of SEAP, the process of the actions and achievement progress.
- Setup a Website for the SEAP implementation, and create a page on Facebook and other social media. Link the website and Facebook page to the local city citizens, update them with the latest projects and get their feedback.
- Implement Energy Saving Instruction for employees to fulfil the reduction and unseen consumption as follows:
    - Switch off the light while leaving the office.
    - Fix the Air-condition thermostat on 22°C to24°C in winter/ summer.
    - Utilize as possible day lights through windows and reduce using artificial lights as possible.
    - Set the PC monitor on sleep mode for maximum 2 minutes of ideal condition.
    - Switch off PC, UPS and printer when leaving the work.
    - Minimize the usage of printing as possible.

- . Raising staff awareness and holding training campaigns are essential actions in the implementation of SEAP and that would be achieved through various and successive steps with the participation of NGOs representatives from the local community

The expected reduction in power consumption in the municipality depends on the effectiveness of the staff behaviour, the monitoring tools and the efficiency of the awareness campaigns held for the municipality staff. Such process will be well-monitored by the SEAP unit that sets incentives and gives appreciation to maintain successful results.
The SEAP unit is established and controlled by energy engineers from the local area who are in charge of leading the actions, supporting the implementation and assuring the compliance with proper actions and measures.
The SEAP unit costs consist of the additional work carried out by the staff of the municipality employees, supported by an expert who guides them in the implementation process. The expert has to be present in the municipality each month in order to prepare the progress report, monitor the achievements and guide the team in the process of work. In case the expert is out his office, communication can be done by phone call or email exchange.

5.1.3 LONG TERM ACTION

In the short term phase, the municipality would have the SEAP unit setup completed. The procurements department had also started processing the work in line with the municipality policy to mitigate the GHG emissions and reduce the energy bill.
The municipality employees, through the short term phase, will recognize the importance of the development of the approach for a low- carbon economy transition.
In the long term phase, the municipality will continue implementing actions set in the first phase and will support it with additional actions to achieve the final target- the reduction of power consumptions.

- Use of LED lamps. The municipality building contains lamps with energy saving one and CFL Fluorescent with lumen output equal to 60 to 70 lumen /watt. By replacing those lamps with LED lamps, this could increase the efficiency to 100-144 lumen per watt and reduce the power consumptions. 50% in power reduction for the lighting will be achieved.
- Install motion lighting sensors. This will support the mitigation of energy by turning off lights when they are not needed.
- Air-conditions units consume high energy especially the non-saving model one. The new technologies of power saving A/C would save 30% less than the ordinary types; the replacement of the A/C with Rated A+++ would be a good solution to be implemented by the end of the life cycle of the existing units.

The actions can be summed up as follows:
Energy saving implementation can be achieved by converting lamps, A/C, and the installation of motion sensors.

1. Start replacing the Fluorescent and CFL lamps with LED lamps when needed to be replaced
2. Replace the Air Condition with A+++ Inverter type when new air condition is needed to be replaced
3. Install lighting motion sensors in building

5.1.4 PUBLIC PROCUREMENTS OF PRODUCTS AND SERVICES

The Sustainable Procurement Policy embedded in the municipality process is intended to be an efficient public policy that saves natural and financial resources and promotes sustainable patterns of consumption and production. By identifying the reliable and efficient energy saving products through purchasing, setting an example and choosing more sustainable options, the municipality can positively reach effective environmental and social outcomes.
Such green procurement could also be promoted in local schools, the central library and other local municipality or governor offices.

The expected results for such an action would be an estimated reduction in around 3% in the future of increase demand. Such estimated figure will be precisely identified in later measures.

The SEAP Unit is not included in the financial study as it serves the total project.

5.1.5 EXPECTED REDUCTION IN CONSUMPTIONS FOR SHORT & LONG TERM ACTIONS

TABLE 21 : EXPECTED REDUCTION IN CONSUMPTIONS FOR MUNICIPLAITY BUILDING IN SHORT & LONG TERM ACTIONS

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
MUNICIPAL BUILDING			**571**	**347**	**17.15**	**11.80**	**0.04%**	**€ 310,000**
Short Term Action	1	SEAP Unit						€ 267,000.00
	2	WEB site for SEAP						€ 5,000
	3	Energy Saving Instruction			8.9	6.2	0.02%	€ 5,000
	4	Awareness and training campaign			2.2	1.5	0.00%	€ 5,000
Long Term Action	5	Replacing the CFL lamps with LED lamps.			1.7	1.1	0.00%	€ 10,000
	6	Replace the Air Condition with A+++ Inverter type when new air condition by end of life (10 years)			2.7	1.8	0.01%	€ 10,000
	7	Install lighting motion sensors in building.			0.7	0.5	0.00%	€ 3,000
	8	Public procurements of products and services			0.95	0.7	0.00%	€ 5,000

5.1.6 FINANCIAL ANALYSIS AND PROPOSAL SOLUTION

TABLE 22: FINANCIAL ANALYSIS AND PROPOSAL SOLUTION FOR MUNICIPALITY BUILDING

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 7,840	/year	€ 78,402	€ 62,037
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
2,106	17	>20 YEARS	6,980	€ 0.12/Kwh
Time schedule for implementation of the Short and long term action				
YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5.2 Water supply

The human demography has increased by more than twenty-five percent in the city due to the high number of displaced Syrian refugees. This has resulted in increasing pressure on water consumption. The city suffers from shortage in water supply due to the limited water resources, old infrastructure, and scarcity of rainfall compared with the increase in water consumption, in addition to other issues. The municipality is trying to find out additional water resources to balance the supply with the demand; however, without knowing the real demand and supply, the municipality will not be able to see the total picture. The action will concentrate on regulating the water consumption, maintaining the infrastructure and monitoring the consumptions with supply.

5.2.1 SHORT TERM ACTION

It is essential to start solving the problem from the source which means from the water demand, the possibility to rationalise that demand and regulate water consumption.
The short term action suggests various measures to be considered:

- Baakline consumes electricity to pump the water around 345.5 MWh/year and emits 230 t CO_2 with 18,7K L fuel for diesel generator due to the shortage in EDL capacity which added more costs on the municipality. The municipality is working on converting part of the water pumping station to operate on PV solar system through EU fund SUDEP program. This will save the high cost in electrification and reduce the dependence on fusel fuels. The project will provide 36.4KWP production around 70MWh/year which will reduce the emission by 47 t CO_2
- ❖ Conduct awareness campaign to enhance the water conservation and regulate the water consumption.
- ❖ Distribute water saving tools for the faucet (Tap).
- ❖ Encourage citizens to collect rain water in the winter season to reduce the high season demand in summer. The expected result will be 3% reduction according to the availability of water tanks in the houses.
- ❖ Conduct routine maintenance and check the water leak in main feeder piping. This could rescue the loss of water by 30 %.
- ❖ Install water meters on the main water supply and main branches to monitor water consumptions.

5.2.2 LONG TERM ACTION

- ❖ Install water meters for each user with remote reading system.
  The feedback information is required in this stage which shows the actual consumptions. It is not necessary to start billing for water, but knowing where water has been highly consumed is essential to start fixing it

5.2.3 EXPECTED REDUCTION IN ENERGY CONSUMPTION

TABLE 23 : EXPECTED REDUCTION IN ENERGY CONSUMPTION FOR WATER SUPPLY

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
WATER SUPPLY			**571**	**347**	**217.8**	**185.9**	**0.57%**	**€ 1,396,000**
Short Term Action	9	awareness campaign			17	14.75	0.05%	€ 3,000
	10	Water saving tools for the faucet (Tap)			17	14.75	0.05%	€ 10,000
	11	Water collection through raining season			10.4	8.85	0.03%	€ 3,000
	12	Routine maintenance			104	88.5	0.27%	€ 10,000
	13	Install water meters in main feeders and main branches			34.7	29.5	0.09%	€ 120,000
Long Term Action	14	Install water meters for each users			34.7	29.5	0.09%	€ 1,250,000

5.2.4 FINANCIAL ANALYSE AND PROPOSAL SOLUTION

TABLE 24 : FINANCIAL ANALYSE AND PROPOSAL SOLUTION FOR WATER SUPPLY

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 35,285	/year	€ 352,850	€ 279,200
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
23,352	194	15	237,785	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5.3 Waste Water Treatment

Due to the consequent influx of refugees that form more than 25% of the local residents, water consumption and waste water become more serious issues in the city with the lack of implementation of the waste water treatment plant. Hence, any action taken in saving water supply will affect positively the reduction of waste water as both complement each other.

Although the new waste water treatment plant that has been recently built may solve part of the issue, the total city has not been covered yet and even the final termination is not completed.

Some projects which have been executed with standalone treatment plant to serve limited houses are not enough. The city still needs a totalised plan to treat the waste water and this action becomes now a must with the high demand on water which has its effects on the amount of untreated waste water.

The solution should be sustainable, with a considerable low impact on the city taking into account the increase of the city's demography and the refugees' demand.

With the presence of the high number of refugees and lack of national and international support, solving such an issue is crucial. Henceforth, there must be planned actions in order to overcome the main issue.

- Update the municipality policy to include in every new construction a standalone water treatment plant.
- Include a new construction in the reuse of treated water to feed the flush water supply in separate piping. This could save 30% of the supply and reduce waste water by 30%.
- Build an infrastructure for wastewater management. This action will aim to build up the total network which the city needs in order to connect the wastewater to the main treatment plant.

The estimated cost for these actions is €7,000,000. This needs our source fund as the infrastructure cannot be managed by the low income of the municipality and cannot be rated as it is counted for infrastructure.

TABLE 25 : KEY ACTIONS FOR WASTE WATER TREATMENT

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
WASTE WATER TREATMENT								**€ 7,000,000**
Long Term Action	15	Update the municipality policy						€ 3,000
	16	Include in new construction the reuse of treated water to feed the flush water supply						€ 3,000
	17	Infrastructure for wastewater management.						€ 6,994,000

5.4 Solid Waste Management

5.4.1 OVERVIEW

Baakline had a population of 17 thousand people in 2013 that produce 3,650 tons of Municipal Solid Waste (MSW) per year. While the composition of wastes is in majority organic (exceeding 50 %, as well as between summer and winter), it is considered that the MSW generation per capita is around 0.6 Kg/p/d.

The solid waste collection and sorting in Baakline was managed by SUKLINE before its work stopped by the end of 2015.The municipality suffers as many other cities in Lebanon, from this suspension in which the issue becomes a national problem that extended till year 2016.

The municipality of Baakline, through its mayor and municipality members' committee and the support of the local citizens, had worked out an emergency plan to overcome this problem. It succeeded in reopening the sorting factory in the region under the Chouf Souayjani umbrella and set a plan for sorting at the source to support the total plan for solid waste management.

The sorting process at the source was enhanced by many workshops and its implementation was successful in a very short time.

With the very little resources in hand, the total operation results were impressive. In the meantime, to complete the operation and continue the support, there is still a need to provide certain tools like having collection trucks, rehabilitating the landfill, and upgrading the existing sorting plant to increase capacity and efficiency.

The following short and long actions summarize the essential needs to complete this operation.

5.4.2 SHORT TERM ACTION

The short term action proposes a smart waste collection method. It focuses on the changing behaviour in solid waste management and moving on to the smart way in sorting the solid waste at the source.

The sorting of solid waste at the source is important since it helps in reducing the daily trips for the solid waste trucks, the fuel consumption and the maintenance cost for the collection.

Solid waste consists of organic materials which cannot be kept for a long time in houses; whereas, paper, cardboard, glass, metal, and plastics can be stored for days.

The short term action would be accomplished by:

- Ensuring capacity development and enhancing public awareness
- Enhancing the plan for sorting solid waste at the source
- Developing waste strategy plan with waste management plan in order to overcome the high cost in collection and transportation
- Purchasing new fuel saving truck for solid waste collection, providing modern collection garbage trucks, which could save fuel and reduce the cost of operation, as the new technologies will help in reducing fuel consumptions for the trucks.

  By applying Hybrid Drive System with Advanced Technology for Fuel Reduction, it replaces the conventional transmission with a hydraulic transmission to drive the truck off mechanical and hydraulic power, hence reducing the fuel consumption up to 50%. The brake energy recovery also allows the truck to extend brake replacements. If this technology is implemented in Baakline, it will help in mitigation the emission and reducing the operation cost for solid waste management.

5.4.3 LONG TERM ACTION

- Rehabilitation of the existing landfill and converting it to sanitary landfill, which complies with ecosystem standard, protects the underground water and utilizes the produced underground produced gas in the future.
- Upgrading the existing waste sorting plant and increasing the capacity and efficiency, reducing the non-recycling materials to reach less than 10% for the solid waste needed to be defaced.

5.4.3.1 FINANCIAL ANALYSE AND PROPOSAL SOLUTION

The actions are part of building the infrastructure base for the solid waste collection and management, where the base for calculation was not part of the municipality's responsibility, but it was part of a national responsibility and management.
Also, the old setup was based on the collection of the solid waste, sending them to Beirut and then back to Na'emah. This process cost a lot and consumed large quantity of fuel for transportation. The distance covered reached more than 120KM trip daily with high operation cost; whereas, in the new sorting plan, the distance is short consuming only 15Km/day. Assuming 1.5 L/km, the saving daily distance is 105Km/day which counts for 157.5l/day x 365 days=57487.5L/year. This counts for reduction in emission 155 t CO_2 /year which is equal to saving 580 MWh/year in addition to the operation cost which counts for more than 100$/ton.

The estimated cost for actions is as follows:

TABLE 26: FINANCIAL ANALYSE AND PROPOSAL SOLUTION FOR SOLID WASTE

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
SOLID WASTE MANAGEMENT					**580**	**155**	**0.48%**	**€ 3,540,000**
Short Term Action	18	Ensuring capacity development and enhancing public awareness						€ 30,000
	19	Enhance the plan for sorting solid waste from source			580	155	0.48%	€ 10,000
	20	Developing waste strategy plan						€ 10,000
	21	Purchasing new fuel saving truck for solid waste collection,						€ 740,000
Long Term Action	22	Rehabilitation of the existing landfill						€ 2,000,000
	23	Upgrade the existing waste sorting plant						€ 750,000

5.5 Public Street Lighting

5.5.1 OVERVIEW

Baakline sets its vision towards becoming a smart city, and a leading change in Chouf Souayjani Region. Street lighting would be an essential part to establish the smart city platform and enhancing the smart monitoring and management.

The city has amazing natural mountainous sceneries with seven protrusions expanded in all directions, but urbanism reached most of these areas, which added more pressure into the services required for the street lighting.

The mitigation for GHG emission in public street lighting becomes essential with the increase in power demand, thus applying a smart management for this sector would help in reducing power consumption and maintenance cost.

5.5.1.1 LIGHT SOURCE

In Baakline, like any other city in Lebanon, the High Pressure Sodium (HPS) lamps have been the conventional means of illuminating roadways and various public spaces for decades. The total number of street lights reached one thousand five hundred street light luminaries with most of the lamps rated for 400/250 watt.

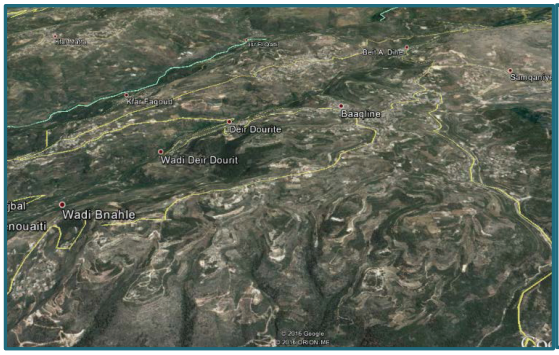


FIGURE 11 : BAAKLINE MAP

FIGURE 10 : BAAKLINE PUBLIC STREET LIGHTING MAP

As now, new LED Street lights technology has been developed enhancing illumination along city streets while providing savings through increased energy efficiency, decreased maintenance needs and longer-rated lifetimes. Potential cost savings in energy consumption could be as high as 40% or more. LED street lights are capable of producing a better quality white light with less energy consumption than HPS. The quality gained from LED lighting improves the perception of more powerful light, while reducing the power of the light that is actually emitted.
Installing LED lights has improved light quality in different regions across Lebanon and has shown overall positive opinions. Respondents generally felt that the facility was cleaner, had better access and mobility, and was generally a safer place to park than it was prior to installation of LED lights.

LEDs are rapidly gaining recognition and acceptance as an alternative means of street lighting primarily for their low power consumption, low maintenance and excellent light quality.
Most demonstration pilot programs using LED street lights record a 40% to 60% reduction in energy consumption. The efficacy of LEDs is approaching that of HPS lamps; some products reaching 100 lumens per watt. Therefore, a comparable lighting output can be achieved through the LED lamps, but with approximately half the power consumption. The estimated life for these products can range from 12-15 years compared with HPS lamps which are 3 to 5 years.

The environmental benefits of LED are not limited to a reduced greenhouse gas emission as a result of lower energy consumption. LED lights are also recyclable and do not contain any heavy metals such as mercury or lead and no toxic gasses that can be found in HPS lamps. This reduces maintenance through less frequent bulb replacement. LED fixtures also do not use tungsten filaments and are, therefore, more rugged than their HPS counterparts.
Replacing the HPS lamps with LED lights would produce reduction in power consumption for around 1700 MWh/year which counts for around 71.5% energy saving (2020). The following table explains the reduction and mitigation in GHG emission when this step is completed.

TABLE 27 : TABLE EXPLAIN THE BAU FOR STREET LIGHTING AND THE EFFECT OF REPLACING THE LAMS WITH LED'S ON ENERGY CONSUMPTIONS

Public Street lighting	2013 Current case HPS	BAU 2020 as Current case HPS	2020 Future plan LED	
Street Light wattage	400/250 watt	400/250 watt	110 watt	70 watt
Number of street lights	1500	1905	500	1405
Total consumption in year	1,870 MWh/Year	2,375 MWh/Year	683 MWh/Year	
GHG emission in t CO_2	1,215 t CO_2	1,543 t CO_2 /	444 t CO_2 /	
CO_2			1,104.5 t CO_2 / year	

5.5.1.2 ASTRONOMIC TIMER

The other part which could also be considered is the switch timing for the street lights that relays on photocell. This can be replaced with **Astronomic timer** which is more accurate and precise timer compared with photocell.
This step will reduce the consumption power by 15% as explained in following chart which shows the sunrise and sunset timing where the photocell acts little before/after timing and counts for loss of around 365 hours of operation per year.

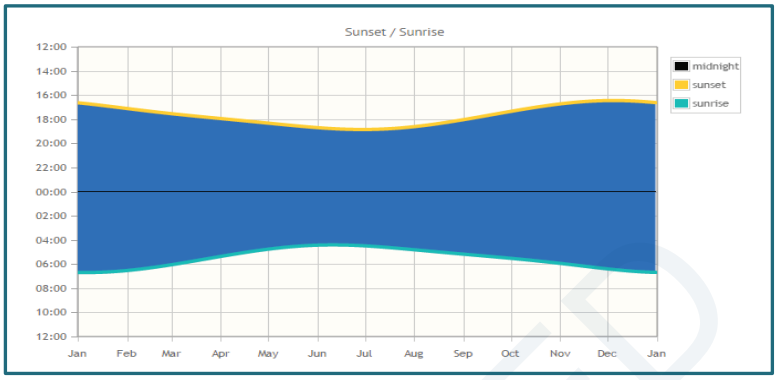


CHART 7 : EXPLAIN THE TIMING FOR SUNSET AND SUNRISE

Astronomic timer use would also help in precise timing for switching and programming the actual operation after 20 min of sun set and almost 30 min before sun rise which is an acceptable trimming as light will be still there.
In Baakline there are twenty-four feeder pillars which control the 1500 street lights through photocells. Replacing the twenty-four photocells by Astronomic timer would support the mitigation in power consumptions.

TABLE 28 : EXPLAIN THE FEATURE OF USING ASTRONOMICAL TIMER ON ENERGY CONSUMPTIONS

Public Street lighting	BAU 2020 as Current case HPS	2020 Future plan LED	2020 Future plan LED with Astronomic timer
Street Light wattage	400/250 watt	100 70 watt	100 70 watt
Number of street lights	1905	500 1405	500 1405
Total consumption in year	2,375 MWh/Year	683 MWh/Y	619 MWh/Y
GHG emission in t CO_2	1,543 t CO_2	444 t CO_2	402 t CO_2 /Yea
CO_2 saving in t CO_2 for Astronomic timer			**42 t CO_2/ year**

5.5.1.3 DIMMING AND CONTROL

The dimming and street lighting control can be employed for HPS lamps with the introduction of new technologies. This step will not be encouraging; as nowadays the LED, as efficient lamps, is available with dimming features. To demonstrate the effects in power reduction, the action will be divided into **two scenarios:**
The first scenario is to set a standalone control gear for the street light which has internal timer. It can dim the lights for 6 hours daily to 50% at midnight as shown in the chart below.

Although it could produce saving in power for around 25% reduction in power consumptions, the internal timer in the control gear of luminary will be affected by the power instruction, which is the main feature of Lebanon's network till we wrote our report.

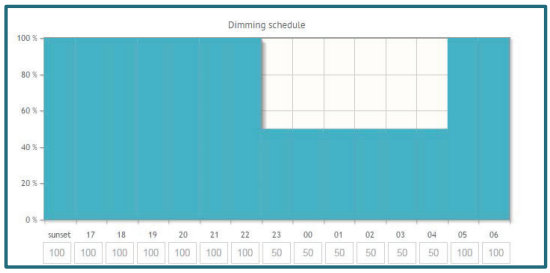


FIGURE 13: DIMMING SCHEDULE SCENARIO ONE

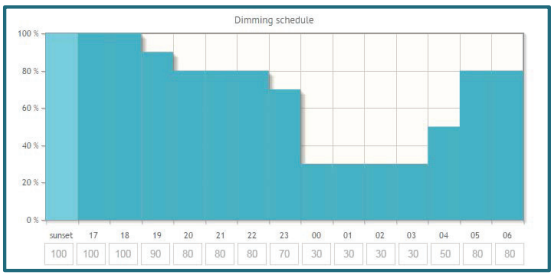


FIGURE 12 : DIMMING SCHEDULE SCENARIO TWO

The **second scenario** is to have a central control and monitoring system for the street lighting. This step will overcome the previous issue in scenario one and will be functioning and operating after the power is back to normal. Also this scenario will set the platform for smart city and increase the range of operation from 10 -12 years to 15 to 20 years.
This solution is best suited as it can reprogram the dimming in different scenarios with different areas, the case that fits Baakline's situation.

TABLE 29 : EXPLAIN THE DIMMING EFECT ON ENERGY CONSUMPTIONS FOR STREET LIGHTING

Public Street lighting	BAU 2020 as Current case HPS	2020 Future plan LED	2020 Future plan LED with Astronomic timer	2020 Future plan LED with Astronomic timer with Dimming and control
Street Light wattage	400/250 watt	100 70 watt	100 70 watt	100 70 watt
Number of street lights	1905	500 1405	500 1405	500 1405
Total consumption in year	2,375 MWh/Year	683 MWh/Y	619 MWh/Y	377 MWh/Y
GHG emission in t CO_2	1,543 t CO_2	444 t CO_2	402 t CO_2 /Y	245 t CO_2 /Y
CO_2 saving in t CO_2 for Dimming & control timer				**157 t CO_2 /y**

TABLE 30 : THE RESULTS COMPARED WITH BAU

Curent situation (2013) 1,215 t CO_2 /y	: 1,870 MWh/y	GHG Emission:
Business As Usual by year 2020 1,543 t CO_2 /y	: 2,375 MWh/y	GHG Emission:
With Led street lighting 444 t CO_2 /y	: 683 MWh/y	GHG Emission:
With Led With Astronomic Timer t CO_2 /y	: 619 MWh/y	GHG Emission: 402
Dimming and control 245 t CO_2 /y	: 377 MWh/y	GHG Emission:

5.5.1.4 THE MAIN CHALLENGES

A set of challenges can be highlighted from the poor maintenance and the network quality to the lack of monitoring process. The following points summarise those challenges and propose the needed actions for them.

- Administrative challenges
  - Infrastructure of the city does not have any master plan for the street lighting. There is also no street lighting standard and policy available.
  - There is no unit responsible for street lighting in the municipality which monitors the work and reports the issues with the maintenance team.
- Technical challenges
  - The identification number on the lighting column is not available. This causes serious issues in the credibility of the maintenance costing and the efficiency of maintenance or technical support.
  - The feeder pillars count for 24 units many of which have faulty metering that affect the monitoring process needed for future evaluation.
  - The main feeder doesn't have power analyser to detect the leakage in power. This may happen due to the weak tightening of wiring, vandalism or line theft.
  - The protection against Earth Leakage and surge protection is not available which affects much the service.

5.5.2 SHORT TERM ACTION

In the short term action, the master plan will be produced along with strategies and policies. The basic measures for consumptions and monitoring process will be established in order to monitor the achievements made with the implementation of these actions:

1. Establish street lighting unit to support the implementation of the SEAP for street lighting sector.
2. Prepare the master street lighting drawing where each pole should have identification number with full data like power and type, and to assign number for each pole in the site as to the master drawing.
3. Identify each feeder pillar by number, install new KWh meters and calculate the total load connected on each feeder. With Data collection for the load consumptions: Each month the data should be taken for each feeder and be verified with the actual connected load.
4. Prepare the maintenance check form which includes the maintenance process, identification number for the street lighting, and type of issues and action made for fixing it along with detail spare parts used in maintenance with time consumed and costing.
5. By using the master plan drawing, the public lighting unit will define the main roads and sub main roads and branches and assign each area with the recommended power for street lights.
6. Conduct a technical training for the maintenance staff to ensure compliancy with the technical and efficiency of work.
7. Monitoring process: Add a page for the municipality web site to include the citizen's feedback on or complaint about any defective street lights as a tool for monitoring the maintenance staff.

There will be real reduction in consumption for this action as line theft will be prevented and the maintenance efficacy will be improved which is estimated between 10 to 15 % reduction in consumptions, but as mentioned it will be justified when real measures are taken.

5.5.3 LONG TERM ACTION

In the long term action, a pilot project is to be implemented in order to set the platform for a smart city. Despite the city's specific area, the general plan will be fulfilled when fund total is available.

1. Install new Smart Feeder pillars with full protection and measurement tools required equipment which contain:
   - Outdoor enclosure with security lock
   - Astronomical timer
   - Power analyser/metering
   - Control components
   - Protection devices short circuits, over current, Earth faults, Surge protection
   - Wireless communication with main station
2. Install new LED lighting according to the master plan with dimmable drivers. The LED light should be selected according to the international standard to comply with the safety regulation for the street lighting

and meet the location and site needs. Also the street lighting should have enough space for controller which will be added in the future inside the street light near to the street light driver.

3. Install remote monitoring and control for the system which consist of:
    - Electronic ballast controller designed for carrying out the remote management of a luminary in street lighting installations inside the street lighting with impeded power line controller.
    - Control component inside the feeder pillar to communicate with street lighting and the main station in the municipality.
    - Main station in the municipality with remote software and monitoring and control tools
    - Proper training on the system.

The preferable step in the installation is to complete one phase of the work with around 230 street lighting or (20%) along with their feeder pillars and main control in the municipality building. The total project is estimated to be completed in around twelve years.

5.5.4 EXPECTED REDUCTION IN CONSUMPTION

It is expected that the short term action with part of the long term action will be completed before 2020. The long term action will continue after that till year 2030 when a complete converting of the street lighting to smart system is accomplished. Unless the financing mechanism was solved, implementation period could be minimized accordingly.

TABLE 31 : SHORT AND LONG ACTIONS FOR PUBLIC STREET LIGHTING

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
PUBLIC STREET LIGHTING			**2,375**	**1,543**	**2,070**	**1,351**	**4.15%**	**€ 1,062,000**
Short Term Action	24	Public street lighting			237	154	0.47%	€ 30,000
	25	Master street lighting drawing assign number for each pole						€ 20,000
	26	Identify each feeders pillar by number and install new KWh meters						€ 5,000
	27	Prepare the maintenance check form						€ 1,000
	28	define the main roads and sub main roads and branches						€ 1,000
	29	Technical training for the maintenance staff						€ 3,000
	30	Monitoring process						€ 2,000
Long Term Action	31	Install new led lighting			1523	995	3.06%	€ 750,000
	32	Install new smart feeder pillars			58	38	0.12%	€ 125,000
	33	Install remote monitoring and control			252	164	0.50%	€ 125,000

5.5.5 FINANCIAL ANALYSE AND PROPOSAL SOLUTION

Through SUDEP program adapted and financed by the EU, the municipality of Baakline will apply certain actions, in line with sustainable urban development vision of the city, through certain pilot projects.
One of the projects for the public street lighting would be replacing new 113 HPS lamps by power saving lamps (LED). The estimated completion of the project will be by July 2016.
A financial analysis, shown below, reveals that the investment in street lighting would save €249,167/year with a total invest around €1,062,000. The return of the invest could be made in 7 years which allows for financing mechanism either through banking or through international donors. The costing base on €0.12/KWh where the

government actual cost is €0.16/ KWh which brings the actual saving to €332,222/year will minimise the return of invest to 5.3 years.
The financing mechanism can be performed through either local or international finance mechanised which is to be defined.
Different scenarios can be considered to finance the public street lighting. They are explained in the following steps:

The finance mechanism is as follows:

TABLE 32 : THE FINANCE MECHANISM SCENARIO FOR PUBLIC STREET LIGHTING

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
20%	0%	80%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 101,375 /year		€ 1,073,752	€ 849,630
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
249,167	2070	4	2,981,616	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6 Local Renewable Energy Production

5.6.1 OVERVIEW

Many basic factors contribute to the success of generating electricity on solar energy in Baakline. The presence of three hundred sunny days and the many locations that suit for implementing plans such as the community hall of Baakline (Beit Baakline), the Municipality building, Baakline natural reserve, the water pumping station, the National Library building ,and other areas can all help generate renewable energy power plants. However, some technical and administrative obstacles are encountered.

Technical obstacles: the city suffers from permanent power cut-off, 12 hours a day and at different periods of time. However, the success of the investment in sustainable energy projects must ensure the availability of electricity from the main provider of electricity which is in our case EDL.
The power generation of renewable energy in Baakline is a technical advantage. It will not only help in generating power, but also in saving transmission line power loss due to the long distance from the main generating plant to the city which counts for around 20% of generated power.

Administrative obstacles: there is no law that takes into account the role of municipalities in terms of renewable energy generation that can be linked to the relevant power generation with EDL projects.
The municipality, in coordination with all government departments and public institutions, plays a significant role in overcoming the obstacles and assuring the success of the subsequent steps through promoting the use of renewable energy in all aspects of the city.

The municipality now has a huge opportunity to optimize some of the projects in the city, such as municipal buildings, and the water pumping stations, from which it provides the local needs of consumption that can be linked with the backup diesel generators to provide power and save biofuels.

5.6.2 THE COMMUNITY HALL (BEIT BAAKLINE)

Through SUDEP program adapted and financed by the EU, the municipality of Baakline will apply certain actions and pilot projects, in line with the sustainable urban development vision of the city.
One of the projects will be the establishment of a micro station on the top roof of Baakline community hall. The system would transform solar energy into electrical energy to contribute to the generation of electricity from renewable sources. The power generated will be stored in backup batteries to be used at night. The exceed power will be fed back into the community hall grid. This project will generate a minimum of **36 MWh** per year and mitigate the emission by **-23.39 t CO_2 /year** with a budget of 130,000 Euro. 80% of project budget will be financed by EU through SUDEP program. The programme should be completed by July 2016.

FIGURE 14 : THE COMMUNITY HALL

TABLE 33 : THE FINANCE MECHANISM FOR COMMUNITY HALL

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 2,123	/year	€ 21,231	€ 16,800
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
4,333	36	0	57,872	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6.3 WATER PUMPING STATION

Water pumping station operated on the photovoltaic renewable energy source is another action financed by EU through SUDEP program. The project will generate a minimum of **36.4 MWh** per year and mitigate the emission by **-26.7 t CO_2/year** with a budget of 84,000 Euro. 80% of project budget will be financed by EU through SUDEP program. The programme should be completed by July 2016.

TABLE 34 : THE FINANCE MECHANISM FOR WATER PUMPING STATION

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 2,123	/year	€ 21,231	€ 16,800
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
4,815	36.4	0	65,036	€ 0.12/Kwh
Time schedule for implementation of the Short and long term action				
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6.4 THE NATURAL RESERVE

Baakline Natural Reserve is one of the most natural protected areas in the region. The need for energy in this location will present the overall picture of green areas and reduce the dependence on fossil fuel. This project is also part of SUDEP program. The project will generate a minimum of **3MWh** per year and mitigate the emission by **-2 t CO_2/year** with a budget of 20,000 Euro. 80% of project budget will be financed by EU through SUDEP program. The programme is to be completed by July 2016.

TABLE 35 : THE FINANCE MECHANISM FOR NATURAL RESERVE

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 505	/year	€ 5,055	€ 4,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
361	3	14	3,802	€ 0.12/Kwh
Time schedule for implementation of the Short and long term action				
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6.5 THE MUNICIPALITY BUILDING

The municipality building represents an important location for renewable energy projects Baakline's residents will support and encourage the city's plans towards the implementation of renewable energy in most its areas. This project is also part of SUDEP program. The project will generate a minimum of **17 MWh** per year and mitigate the emission by **-11.36 t CO_2/year** with a budget of 16,000 Euro. 80% of project budget will be financed by EU through SUDEP program. The programme is to be completed by July 2016.

TABLE 36 : THE FINANCE MECHANISM FOR MUNICIPALITY BUILDING

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 631	/year	€ 6,318	€ 5,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
2,046	17	0	28,480	€ 0.12/Kwh
Time schedule for implementation of the Short and long term action				
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6.6 THE NATIONAL LIBRARY

The National Library plays a key role in spreading cultural awareness and calling for recognition of sustainable development. The municipality would like to support this vital facility in reducing power cost and mitigating the emission in the city. The location of the building is in the main area of the city where all people could see the renewable energy example. The project will generate a minimum of **17 MWh** per year and mitigate the emission by **-11.36 t CO_2/year**. The estimated budget will be 25, 000 Euro. The programme is to be completed by the end of 2020.

TABLE 37 : THE FINANCE MECHANISM FOR CENTRAL LIBRARY

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 631	/year	€ 6,318	€ 5,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
2,046	17	0	28,480	€ 0.12/Kwh
Time schedule for implementation of the Short and long term action				
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6.7 BAAKLINE SECONDARY PUBLIC SCHOOL

Baakline Secondary Public School suffers, like any other governmental institution, from shortage of finance. This makes the school encounter many challenges in accomplishing most of the planned actions. Here the municipality plays an important role is supporting the school and making it a sustainable place. By installing PV solar panels on the school top roof could generate clean electricity around **17 MWh** per year and mitigate the emission by **-11.36 t CO_2/year** with estimated budget of 25,000 Euro. Also the electricity cost for the fuel diesel generator can be reduced. This will help in reducing the energy cost and support the mitigation of GHG emission. The action is to be completed by end of 2020.

TABLE 38 : THE FINANCE MECHANISM FOR BAAKLINE SECONDARY SCHOOL

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 631	/year	€ 6,318	€ 5,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
2,046	17	0	28,480	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6.8 BAAKLINE INTERMEDIATE PUBLIC SCHOOL

Another example of similar actions conducted by the municipality to support public institutions can be applied for Baakline Intermediate Public School. The project of installing PV solar panels will generate a minimum of **17 MWh** per year and mitigate the emission by **-11.36 t CO_2/year**. The estimated budget will be 25, 000 Euro. The programme is to be completed by end of 2020.

TABLE 39 : THE FINANCE MECHANISM FOR BAAKLINE INTERMEDIATE SCHOOL

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 631	/year	€ 6,318	€ 5,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
2,046	17	0	28,480	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Long Term Actions			X	X	X

5.6.9 EXPECTED REDUCTION IN CONSUMPTION

TABLE 40 : ACTIONS FOR RENEWABLE ENERGY PRODUCTION

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
LOCAL RENEWABLE ENERGY PRODUCTION			**40,918**	**10,208**	**143**	**98**	**0.30%**	**€ 281,000**
Short Term Action	34	The community hall (Beit Baakline) under SUDEP			36	23.4	0.07%	€ 130,000
	35	Water pumping station under SUDEP			36.4	26.7	0.08%	€ 40,000
	36	The natural reserve under SUDEP			3	2	0.01%	€ 20,000
	37	The municipality building under SUDEP			17	11.36	0.03%	€ 16,000
Long Term Action	38	The central Library			17	11.36	0.03%	€ 25,000
	39	BAAKLINE secondary school			17	11.36	0.03%	€ 25,000
	40	BAAKLINE intermediate school			17	11.36	0.03%	€ 25,000

5.7 Buildings

5.7.1 OVERVIEW

The buildings in the residential and tertiary sectors are responsible for 62.8 % of total city energy consumption and represent the largest energy consumer and CO_2 emitter in urban areas; therefore, setting efficient policies to reduce energy consumption and CO_2 emissions in this sector is essential.

The electrification and heating are the main reasons for those emissions and can be summarized as follows:

- The electrification represents the 31.4% of total GHG emissions of the city (21.2 % in residential sector and 10.2% in tertiary sector).
- Heating in the buildings represents 31.4 % of total city GHG emissions (28.7% in residential sector and 2.7% in tertiary sector).

The municipality, as a prime local authority, can enact a leading role in implementing policies, develop and update legislations for proper implementation of the SEAP.

Good performance of the building envelope makes it a key factor in affecting the energy consumptions for the heating in buildings in addition to the walls insulation and building orientation.

Allowing the policies and measures to promote energy efficiency and renewable energies in buildings is an important step in the mitigation plan. These combined measures have the potential to reduce the city's emissions: Changing behaviour, efficiency of the technical installations, ability to benefit from natural lighting, efficiency of electrical appliances.

The expected scenario for the increase in the GHG emission in 2020 is 27% compared with the base year 2013. Although this figure looks low compared with the current situation and the noticeable increase of Syrian refugees, it makes the challenges in implementing the plans a real fight against the stream. For that it is so important to stuck to the plan and carefully monitor the results.

TABLE 41 : BAU FOR TERTIARY AND RESIDENTIAL BUILDING

Business As Usual Without Action Plan				
	Year 2013		Year 2020 As BAU	
	Consumption in MWH	GHG Emission in t CO_2	Consumption in MWH	GHG Emission in t CO_2
Tertiary buildings	6,352	3,313	8,067	4,208
Residential buildings	35,378	12,796	44,930	16,251
Total	41,730	16,109	52,997	20,459

The short term action focuses on the changing behaviours and the awareness campaigns supported with clear understanding of the beneficiary in reducing costs and saving money; whereas, the long term action focuses on creating policies and rules and looking for initiatives. However, during the implementation, the process can be adjusted according to the achievements and results.

5.7.2 RESIDENTIAL SECTOR

The residential sector represents 49.9% of total city emission. The need for effective citizens' involvement on values, leading to an effective and long term behavioural change, is a key element in the city's mitigation energy plan.
The short term action focuses on conducting awareness campaigns that emphasize on promoting the usage of energy saving technologies and addressing the changing behaviour for citizen.

5.7.2.1 *SHORT TERM ACTION*

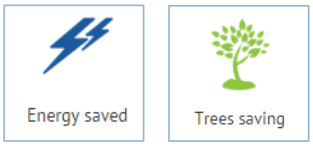
The short term actions for the Residential sector will be as follows:

5.7.2.1.1 WORKSHOPS WITH LOCAL NEIGHBOURHOODS COMMITTEES (LNC)

Baakline is divided into four neighbourhoods; each has an elected committee called the Local Neighbourhood Committees (LNC). These committees work closely with the local citizens in each area to look for their needs, listen to their complaints and raise their demands to the municipal council. For that the LNC is a good contributor to help make the citizen's voice heard and respond to the demands for the public services.
The action planned will focus on preparing the LNC members, along with other volunteers through comprehensive workshop, to increase their sense of responsibility toward the environment. This is achieved by proposing innovative methods in energy conservation and regulating the water consumptions. The workshop will concentrate on changing behaviour towards the environment and natural resources.
The LNC will be able to convey such knowledge to the citizen in the neighbourhood by distributing a set of brochures in line with the general target of the SEAP mainly in energy conservation supported with guidelines and suggested instructions for proper achievement.

5.7.2.1.2 WORKSHOPS WITH LOCAL NGO'S

The local NGO plays an innovative leading role in the city. The action will concentrate on increasing the NGO's capacity and knowledge in reducing the houses' energy and the carbon footprint under the title 'Saving the Environment and Planting Trees.'



Reducing energy is equal to planting trees/year

The NGO will be supported by experts who can train and pass on the knowledge and tools to the citizens.
In the workshop, the municipality could target the changing behaviour and connect it with saving the earth and planting trees knowing the fact that each replacement of electrical water heater with solar water heater is equal to planting twenty trees yearly. The municipality could also request support from the NGO in implementing the plans through their NGO's members and their regular activities in the city.

5.7.2.1.3 THE OPEN SOLAR DAY

Open solar day aims at creating awareness on solar energy as free and clean energy source to the citizen. It focuses on recognizing the benefits of using solar power to create a more sustainable future by relying less on traditional forms of energy.
The Open Day will open the door for citizens to rely more on sun in life and remove the constraints for using the solar energy. The Open Day can be preceded by a series of workshops held for local concerned NGO and finance institutions, supported by LCEC.
The event could be held in a public area like the National Library parking area, with demo kits for solar heaters and PV. A marketing material can be published and distributed throughout the day, which shows the national initiative (BDL is offering $200 per replacement). This day is open to public especially school students who can share in the demonstration of solar system for visitors. Free kids educational games will be set to allow the new generation know about the use of solar heaters. In the event, there will be withdraw on five or more free solar water heaters which can be financed by the event sponsors.

5.7.2.1.4 PUBLIC AWARENESS CAMPAIGN IN SCHOOLS AND COLLEGES

This action plan targets the student to change their behaviour and link it to save money in houses through regulating the power consumptions. It will lead to a long term behavioural change. This can be supported by a guideline instruction that shows the steps to proper and successful achievement in changing behavioural and addressing energy conservation. This part of action is under SUDEP programme.

5.7.2.1.5 INCREASE THE INITIATIVES FOR SOLAR WATER HEATER FOR LOW INCOME HOMES

The municipality could play a good role in increasing the replacement of electrical water heater with solar heaters. This is accomplished through updating their internal laws to offer $200, deduction from the local taxes for each replacement of electrical water by solar water heaters. Following this programme has its advantages.
The municipality of Baakline has issued a local decision No.70 to exempt the local citizen for five years from water fees if they install Photovoltaic solar system ($ 700) and for one year if they install solar water heater which counts for $ 140. The incentives will be increased from only $200 which the BDL offers to $340 which the municipality could propose. The replacement programme will enhance the smooth implementation of solar water heaters in the city. The programme can be enhanced with the support of local banks which can offer short loans offer. The municipality council can search for finance through local or international donors and payment can be deducted from the local taxes for the citizen with defined legal part with the internal laws. This brings the cost down by $500 for Water Solar Heater and the remaining amount can be supported by the bank with an almost zero interest, for two years. The monthly payment would be $20 to $30 per month and this amount is affordable for low income homes.
The estimated cost for this action will be in range of € 200,000. The programme could cover around 1000 houses with most low income one.

5.7.2.2 *LONG TERM ACTION*

The long term can be established in two phases. Phase one will try to implement the building codes in new buildings and the second phase will search for finance to support the replacement of electrical water heater with solar water heater by increasing the initiatives.

5.7.2.2.1 BUILDING CODE

The Building Code for Lebanon is supposed to be set in the coming year, in which a building energy efficiency code will be set for new buildings and major retrofits in Lebanon.
This code is supposed to define the minimum acceptable energy performance for buildings by addressing equipment energy efficiency and enveloping thermal requirements accordingly with Lebanese climatic conditions.

The buildings will typically be constructed to be used for many decades. Improvement of buildings' efficiency at the planning stage is relatively simple, while improvements after their initial construction are much more difficult. The decisions made during a building's project phase will hence determine much of the consumption, if not all, of a building's lifetime.
By applying new expected building code, mitigation of the GHG emissions and supporting the conservation in energy consumption in the new building will be achieved.
It is considered a step forward if the municipality could set new legislation laws for modern buildings to include the energy efficient requirement in the new buildings. This requires:

- Building double walls for external walls in the new building with thermal insulation
- Supporting the new building with thermal study and efficient approach.

5.7.2.2.2 INCLUDE SOLAR WATER HEATING SYSTEM IN NEW BUILDING

The new building should include the solar water heater as part of the building standard. This could ensure the usage of solar water heater in new building.

5.7.2.2.3 SUMMARY AND EXPECTED RESULTS FOR THE SHORT AND LONG TERM ACTION

TABLE 42: EXPECTED RESULTS FOR THE SHORT AND LONG TERM ACTION FOR RESIDENTIAL SECTOR

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
BUILDING RESIDENTAIL SECTOR			**44,929**	**16,251**	**6,115**	**3,304**	**10.15%**	**€ 310,000**
Short Term Action	41	Workshop with local Neighbourhoods committees			508	345	1.06%	€ 10,000
	42	Workshop with local NGO's			508	345	1.06%	€ 10,000
	43	The open Solar day			1016	690	2.12%	€ 30,000
	44	Public awareness campaign in schools and colleges			508	345	1.06%	€ 30,000
	45	Increase the initiatives for solar water heaters for low income homes			1016	690	2.12%	€ 200,000
Long Term Action	46	Building code			2127	596	1.83%	€ 15,000
	47	Include solar water heating system in new building			432	293	0.90%	€ 15,000.00

5.7.2.3 FINANCIAL ANALYSE AND PROPOSAL SOLUTION

TABLE 43 : FINANCIAL ANALYSES FOR RESIDENTIAL BUILDINGS

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 7,840	/year	€ 78,402	€ 62,037
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
736,065	6,115	0	10,926,426	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5.7.3 TERTIARY SECTOR

The tertiary sector is responsible for 13 % of total city emission and 27.5% for electrification emissions, and represents a key element in mitigation process.

5.7.3.1 SHORT TERM ACTION

5.7.3.1.1 PUBLIC AWARENESS CAMPAIGN

Public awareness campaign will be held for tertiary sectors addressing energy conservation, behavioural changes, and energy efficiency. The campaign will concentrate on tools and policies to tune the consumptions patterns, and to allow for strong engagement of tertiary sector on values, leading to an effective and long-term behavioural change.
The awareness campaign will start with a workshop conducted to the owners and administrative staff of the tertiary sector followed by instruction leaflets posted in different locations and yearly meetings to compare the results and get support from experts to overcome any obstacle.

5.7.3.1.2 GREEN CEDAR CERTIFICATION

The action will aim to implement an innovative mechanism to create a kind of competition between society components and the tertiary sectors to indicate their commitment, role, participation and sense of responsibility towards the environment and the community.
The municipality will publish a Green Cedar Certification (GCC) to be presented in tertiary sectors like offices, shops, showrooms, companies, establishments etc.., to those who are willing to participate in this programme. The certification will show in a metaphorical way the quantities of trees which have been saved in an annual base.
The municipality, in coordination with the local NGO and experts in energy and social behaviours, will set the standards to implement the actions and provide the tools for training through holding workshops ,and distributing flyers and brochures.
This action will have its impact on the civil society in reducing the footprint and addressing energy conservation with behavioural changes.

5.7.3.2 LONG TERM ACTION

5.7.3.2.1 IMPLEMENTING BUILDING CODES IN NEW BUILDINGS

This could reduce the expected consumption in energy and support the future plan. The detailed action plan is considered as that of the residential sector.

5.7.3.2.2 SUMMARY AND EXPECTED RESULTS FOR THE SHORT AND LONG TERM ACTIONS

TABLE 44 : SHORT AND LONG TERM ACTIONS PLAN FOR TERTIARY SECTOR

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
BUILDING TERTIARY SECTOR			**8,067**	**4,208**	**3,143**	**1,286**	**3.95%**	**€ 130,000**
Short Term Action	48	Public awareness campaign			508	345	1.06%	€ 30,000

	49	Certification for Green Cedar certification			508	345	1.06%	€ 70,000
Long Term Action	50	Building codes in new buildings			2127	596	1.83%	€ 30,000

5.7.3.3 *FINANCIAL ANALYSES AND PROPOSAL SOLUTION*

TABLE 45 : FINANCIAL ANALYSES FOR TERTIARY SECTOR

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 3,277	/year	€ 32,764	€ 25,925
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
193,435	1,607	0	2,867,647	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Short Term Actions		X	X	X	X
Long Term Actions			X	X	X

5.8 Transportation

5.8.1 OVERVIEW

The transportation sector is responsible for 31 % of the city total emission as it produces 8,038 t CO_2/ year (2013). The municipality fleets produce 0.75 % (60 t CO_2) of the transportation emission and the remaining 99.25 % is caused by private transportation.

5.8.2 MUNICIPALITY FLEET/ PRIVATE TRANSPORTAION

Transportation of Baakline municipality did not show high figures; however, there is a need to prevent further increase in emissions due to the non-consideration of the future effects, especially in the private transportation sector. The transportation is responsible for 31% of city emission which makes it a key factor in fighting against emission and an important action needed to be implemented. The city becomes crowded as all mouton cities which have narrow roads and shortage of parking areas with limited spacing. In addition, the city has more than 8 schools, two collages knowing that that most of the school buildings are near the main roads.

5.8.2.1 *SHORT TERM ACTION*

5.8.2.1.1 SMART MASTER PLAN FOR TRANSPORTATION

In summer, the city is witnessing significant congestion roads, due to the increase in population from expatriates and tourists in addition to the social events which increase in that period. So the need to rehabilitate, expand the roads and create new short or double links for main roads will support reducing the crowding in the main roads. The smart master plan works in creating the safe areas for walking and riding bike, linking different areas inside the city, creating short links and promoting short cuts between the areas to reduce the travelling distance. This will reflect in reducing the fuel consumptions and mitigating the emission due to the congestion and the long distance traveling.

5.8.2.1.2 CONDUCT AN AWARENESS CAMPAIGN ON ECO DRIVE

The campaign conducted for the municipality staff and public concentrates on the eco-drive and explains the recommended drive technique as a modern, smart and efficient way to save fuel and reach the destination. Specific local NGO's & Volunteers will be invited to attend the training delivered by qualified driving instructors allowing them to share the experience with others.

5.8.2.1.3 CONDUCT A MARATHON DAY

The marathon schools' day in Baakline aims to promote the concept of sports, especially walking, and contributes indirectly to break the shyness of the young people to walk in the city and promote changing their behaviour.

5.8.2.1.4 CONDUCT A BIKE DAY

This day aims at changing the citizens' behaviour and encouraging them to ride bicycles. The Bike day in Baakline aims to promote the concept of sports, especially riding bicycles and contribute indirectly to break the shyness of the young people to use the bicycles in the city.

5.8.2.2 *LONG TERM ACTION*

The main obstacle facing transportation in Baakline is the absence of the public transportation, allowing the private sector to take its reign despite the lack of organization and punctuality.

The public transport stations are unprepared and ill-equipped and lack the stimuli and good services commensurate with the modern requirements.
Due to the city features, the distance from the ultimate location to the nearest main street or bus station is 5km and the possibility to bring the bus station much nearer will be difficult and commercial is not accepted as the private sector is providing this service.
The alternative way is to provide a safety parking area for the bikes and electrical the bike / scooters, in which the electrical one will encourage many people to use it if they have the safe location to park their bikes with recharging facility.
The long term action will concentrate on establishing and promoting new vision for the public transportation in cooperation with the private sector. The vision will be modern, attractive and smart to enhance and encourage the citizens to use it.

5.8.2.2.1 REGULATE THE PUBLIC/PRIVATE BUS TRANSPORTATION

The lack of public transport in the city, the uniqueness of the role of private transport in place of the public transport and the lack of a central role for institutions and state departments bring more pressure on the municipality to regulate, organise and control the quality of service to improve the transportation sector.
The action plan to regulate the transport work in coordination with various state departments includes the following needs:

- Regulate the bus operation, direction, covered roads.
- Provide the map with direction and places.
- Provide each bus with a telephone number for feedback and complaints.
- Provide the schedule of buses in all days of the week.

5.8.2.2.2 ALLOCATE AND PROVIDE BUS STOP STATION IN THE CITY

- Assigning proper places with bus station would be very important like public services, governmental building, schools supermarkets, main souk, down town...etc., to ensure the service is available and encourage people to use it.
- Providing safety regulations to ensure the service is a safe protection from car accident by using barriers around the station
- Providing a pedestrian crossing road with marking and stop signs to ensure safe crossing the roads
- Installing bus stop station in all locations
- Providing the bus stop with proper lighting
- Providing maps with timing schedules
- Providing advertising sign to ensure covering the maintenance cost in the future
- Conducting awareness campaigns to enhance using the public transport supported with flyers and brochures.

FIGURE 15 : BUS STOP STATION

5.8.2.2.3 ASSIGN AND PROVIDE GREEN/SMART BUS STOP STATION

FIGURE 16 : SMART BUS STOP STATION

One of the main obstacles which prevents the use of public/private bus transportation is standing in the middle of the roads waiting for them, without comfortable and safe seats or rain or sun shelter. This action will concentrate on assigning Green/ Smart bus stop station in selected places to encourage the usage of public and private bus transportation. The bus stop has to be of an attractive design provided with multi-function services. These services should reflect the daily needs of passengers such as mobile charger system, lights, security camera, charging station for electric bikes and scooters, with bike stand and security lock, in addition to bus schedules and timing with direction and map, comfortable and safe seats, photovoltaic renewable integrated with the bus station. This action will improve the bus service and encourage many people to use it more often.. It will break the ice among citizens as the service quality will be high.

5.8.2.2.4 PARKING AREA IN BAAKLINE COMMUNITY HALL (BEIT BAAKLINE)

The community hall is located in the main city road, and in any events it witnesses overcrowding in the main street. The municipality tried to convert the main road to one direction at crowding time but this doesn't solve the main issues. So establishing parking areas for the community hall becomes an urgent need.

5.8.2.2.5 PARKING AREA FOR SNC SCHOOL

The Shouf National College (SNC) is located on the main entrance of the city road, thus creating daily congestion in the morning and afternoon. The main issue lies in the unavailability of the parking area for buses and cars which makes it as one of the main issues in the city. So the need to parking area becomes urgent.

5.8.2.2.6 PARKING AREA FOR CITIZENS

The other issue which the city suffers from is the shortage in car parking for the citizens who are willing to use buses in their transportation to Beirut city. Many tend to park their cars in the main roads which create additional issue to the city. Creating new, secure parking areas becomes an important action. Preventing parking the cars aside the main roads will also support the smooth movement of cars.

5.8.2.3 SUMMARY AND EXPECTED RESULTS FOR THE SHORT TERM ACTION

TABLE 46 : SUMMARY AND EXPECTED RESULTS FOR THE SHORT TERM ACTION FOR TRANSPORTATION

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
TRANSPORTATION			**40,918**	**10,208**	**7,007**	**1,748**	**5.37%**	**€ 4,370,000**
Short Term Action	51	Smart master plan for transportation			2060	514	1.58%	€ 2,000,000
	52	Conduct awareness campaign on ECO drive			20	5	0.02%	€ 10,000
	53	Conduct a marathon day			204	51	0.16%	€ 20,000
	54	Conduct a bike day			204	51	0.16%	€ 20,000
Long Term Action	55	Regulate the public / private bus transportation			409	102	0.31%	€ 20,000
	56	Allocate and provide bus stop station in the city			822	205	0.63%	€ 100,000
	57	Assign and provide green /smart bus stop stations			822	205	0.63%	€ 200,000

	58	Parking area in Baakline community hall			822	205	0.63%	€ 400,000
	59	Parking area for school			822	205	0.63%	€ 600,000
	60	Parking area for citizen			822	205	0.63%	€ 1,000,000

5.8.2.4 FINANCIAL ANALYSES AND PROPOSAL SOLUTION

TABLE 47 : FINANCIAL ANALYSES FOR TRANSPORTATION

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 102,000	/year	€ 1,020,390	€ 807,407
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
842,593	7,000	0	12,218,612	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5.9 SUMMARY FOR THE SUSTAINABLE ACTION PLAN

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
MUNICIPAL BUILDING			**571**	**347**	**17.15**	**11.80**	**0.04%**	**€ 310,000**
Short Term Action	1	SEAP Unit						€ 267,000.00
	2	WEB site for SEAP						€ 5,000
	3	Energy Saving Instruction			8.9	6.2	0.02%	€ 5,000
	4	Awareness and training campaign			2.2	1.5	0.00%	€ 5,000
Long Term Action	5	Replacing the FCL lamps with LED lamps.			1.7	1.1	0.00%	€ 10,000
	6	Replace the Air Condition with A+++ Inverter type when new air condition by end of life (10 years)			2.7	1.8	0.01%	€ 10,000
	7	Install lighting motion sensors in building.			0.7	0.5	0.00%	€ 3,000
	8	Public procurements of products and services			0.95	0.7	0.00%	€ 5,000
WATER SUPPLY			**571**	**347**	**217.8**	**185.9**	**0.57%**	**€ 1,396,000**
Short Term Action	9	awareness campaign			17	14.75	0.05%	€ 3,000
	10	Water saving tools for the faucet (Tap)			17	14.75	0.05%	€ 10,000
	11	Water collection through raining season			10.4	8.85	0.03%	€ 3,000
	12	Routine maintenance			104	88.5	0.27%	€ 10,000
	13	Install water meters in main feeders and main branches			34.7	29.5	0.09%	€ 120,000
Long Term Action	14	Install water meters for each users			34.7	29.5	0.09%	€ 1,250,000

WASTE WATER TREATMENT								**€ 7,000,000**
Long Term Action	15	Update the municipality policy						€ 3,000
	16	Include in new construction the reuse of treated water to feed the flush water supply						€ 3,000
	17	Infrastructure for wastewater management.						€ 6,994,000
SOLID WASTE MANAGEMENT					**580**	**155**	**0.48%**	**€ 3,540,000**
Short Term Action	18	Ensuring capacity development and enhancing public awareness						€ 30,000
	19	Enhance the plan for sorting solid waste from source			580	155	0.48%	€ 10,000
	20	Developing waste strategy plan						€ 10,000
	21	Purchasing new fuel saving truck for solid waste collection,						€ 740,000
Long Term Action	22	Rehabilitation of the existing landfill						€ 2,000,000
	23	Upgrade the existing waste sorting plant						€ 750,000
PUBLIC STREET LIGHTING			**2,375**	**1,543**	**2,070**	**1,351**	**4.15%**	**€ 1,062,000**
Short Term Action	24	Public street lighting			237	154	0.47%	€ 30,000
	25	Master street lighting drawing assign number for each pole						€ 20,000
	26	Identify each feeders pillar by number and install new KWh meters						€ 5,000
	27	Prepare the maintenance check form						€ 1,000
	28	define the main roads and sub main roads and branches						€ 1,000
	29	Technical training for the maintenance staff						€ 3,000

	30	Monitoring process						€ 2,000
Long Term Action	31	Install new led lighting			1523	995	3.06%	€ 750,000
	32	Install new smart feeder pillars			58	38	0.12%	€ 125,000
	32	Install remote monitoring and control			252	164	0.50%	€ 125,000
LOCAL RENEWABLE ENERGY PRODUCTION			**40,918**	**10,208**	**143**	**98**	**0.30%**	**€ 281,000**
Short Term Action	34	The community hall (Beit Baakline) under SUDEP			36	23.4	0.07%	€ 130,000
	35	Water pumping station under SUDEP			36.4	26.7	0.08%	€ 40,000
	36	The natural reserve under SUDEP			3	2	0.01%	€ 20,000
	37	The municipality building under SUDEP			17	11.36	0.03%	€ 16,000
Long Term Action	38	The central Library			17	11.36	0.03%	€ 25,000
	39	BAAKLINE secondary school			17	11.36	0.03%	€ 25,000
	40	BAAKLINE intermediate school			17	11.36	0.03%	€ 25,000
BUILDING RESIDENTAIL SECTOR			**44,929**	**16,251**	**6,115**	**3,304**	**10.15%**	**€ 310,000**
Short Term Action	41	Workshop with local Neighbourhoods committees			508	345	1.06%	€ 10,000
	42	Workshop with local NGO's			508	345	1.06%	€ 10,000
	43	The open Solar day			1016	690	2.12%	€ 30,000
	44	Public awareness campaign in schools and colleges			508	345	1.06%	€ 30,000
	45	Increase the initiatives for solar water heaters for low income homes			1016	690	2.12%	€ 200,000
Long Term Action	46	Building code			2127	596	1.83%	€ 15,000
	47	Include solar water heating system in new building			432	293	0.90%	€ 15,000.00

BUILDING TERTIARY SECTOR			**8,067**	**4,208**	**3,143**	**1,286**	**3.95%**	**€ 130,000**
Short Term Action	48	Public awareness campaign			508	345	1.06%	€ 30,000
	49	Certification for Green Cedar certification			508	345	1.06%	€ 70,000
Long Term Action	50	Building codes in new buildings			2127	596	1.83%	€ 30,000
TRANSPORTATION			**40,918**	**10,208**	**7,007**	**1,748**	**5.37%**	**€ 4,370,000**
Short Term Action	51	Smart master plan for transportation			2060	514	1.58%	€ 2,000,000
	52	Conduct awareness campaign on ECO drive			20	5	0.02%	€ 10,000
	53	Conduct a marathon day			204	51	0.16%	€ 20,000
	54	Conduct a bike day			204	51	0.16%	€ 20,000
Long Term Action	55	Regulate the public / private bus transportation			409	102	0.31%	€ 20,000
	56	Allocate and provide bus stop station in the city			822	205	0.63%	€ 100,000
	57	Assign and provide green /smart bus stop stations			822	205	0.63%	€ 200,000
	58	Parking area in Baakline community hall			822	205	0.63%	€ 400,000
	59	Parking area for school			822	205	0.63%	€ 600,000
	60	Parking area for citizen			822	205	0.63%	€ 1,000,000
Total			**96,862**	**32,556**	**19,293**	**8,139**	**25.00%**	**€ 18,399,000**

According to the above plan it will be possible to reach 20% reduction in emission by 2020 subject to availability of finance mechanism.

5.10 KEY PERFORMANCE INDICATORS FOR THE SEAP ACTIONS

Action No.	Actions	Key Performance Indicators	Measurement Units
Municipal buildings, equipment/facilities			
1	SEAP unit	• Develop SEAP unit in the Municipality. • Appointing SEAP manager in the municipality. • The number of buildings and facilities covered by his work.	• Formal announcement by the municipality council for developing the SEAP. • Number of years the SEAP manager is contracted. • The percentage of municipal facilities supervised by the SEAP manager.
2	Setup a website and other social media	• Develop a Website or page on the original municipality web site for the SEAP of the municipality	• Launching the Web Site or a page on the existing web site. • Number of visitors in this website page
3	Energy Saving Instructions	• Publish the energy saving instructions in the municipal buildings.	• Energy consumptions measurements in KWh and savings in %
4	Awareness raising and Training Campaign	• Conduct training for the municipality staff	• Number of campaigns • Number of attendants
5	Start replacing the CFL lamps with LED lamps.	• Number of lamps replaced with LED lamps	• Number of lamps replaced with LED • Amount of energy savings
6	Replace the Air Condition with A+++ Inverter type when new air condition by end of life (10 years).	• Replacing the A/C	• Number of A/Cs replaced
7	Install lighting motion sensors in buildings.	• Area covered with motion sensors	• m²
8	Green Public procurement	• Update public procurement polices • Training for the municipality procurement staff • The number of Devices brought with green procurement procedures	• Public procurement polices • Number of municipality staff trained • Device number
Water supply			
9	Conduct awareness campaign to enhance the water conservation regulate the water consumption	• Number of awareness campaigns conducted	• Number of attendants

10	Distribute water saving tools for the faucet (Tap).	• Statistical count for the types of faucets in homes • Purchase the most famous Faucet (tap) type used in houses. • Distribute the water saving faucets to the houses	• Count the number of houses who have water saving faucet
11	Encourage citizens to collect rain water in the winter season	• Print leaflet and distribute on the city shows the importance of using rain water with instruction how to collect it.	• Number of houses who received the leaflet for rain water collection
12	Conduct routine maintenance and check the water leak in main feeder piping and fix the leaks	• Prepare water distribution drawing for the water network. • Define the main feeders and sub feeders • Maintain main feeders leak • Maintain sub feeders leak • Compare water consumptions	• Number of leaks fixed in the main feeders • Number of leaks fixed in the sub feeders. • Number of feedback and complain from citizen after fixing leaks.
13	Install water meters on the main water supply and main feeders and branches to monitor water consumptions.	• Fix water meters on main feeders and sub feeders. • Count the number of users on each sub feeders and compare average consumptions per users. • Maintain feeders • Compare water consumptions	• Water consumptions on main feeders • Water consumptions on sub feeders • Average water consumption per users • Water consumptions on main feeders after maintenance • Average water consumption per users after maintenance
14	Install water meters for each users.	• Fix water meters for each users	• Count the number of users
Waste water treatment			
15	Update the municipality policy to include in every new construction a standalone water treatment plant.	• Update the police through municipality council.	• Number of new construction which include new polices for standalone water treatment plant.
16	Include in new construction the reuse of treated water to feed the flush water supply in separate piping	• Update the police through municipality council	• Implement the police in new constructions
17	Infrastructure for wastewater management.	• According to the strategic plan for waste water the treatment plant to be defined location and capacity • Assign consultant to design the treatment plant and prepare the	• Design completed • Finance resourced • Execute the job

		budget line for the project • Resource the finance and execute the work.	
Solid waste Management			
18	Ensuring capacity development and enhancing public awareness	• Conduct workshop for municipality staff and NGO's for solid waste management	• Number of staff attended the workshop
19	Enhance the plan for sorting solid waste from source	• Design the leaflet and marketing material for solid waste sorting • Print the marketing materials	• Implement the plan
20	Developing solid waste strategy plan with management plan in order to overcome the high cost in collection and transportation	• Develop the plan • Dividing the city into different sectors • Conducting seminars to volunteer groups training them on methods of sorting solid wastes	• Reduction in cost for collection and fuel consumptions
21	Purchasing new fuel saving trucks with recommended spare parts	• Purchase the fuel saving trucks	• Number of fuel truck • Fuel consumption reduction in L/m
22	Rehabilitation of the existing landfill	• Rehabilitation launched	• Work completed
23	Upgrade the existing waste sorting plant	• Upgrade started	• Capacity increased by t/d
Municipal public lighting			
24	Public street lighting unit	• Launch the unit	• The qualification of the unit
25	Master street lighting drawing assign number for each pole	• Preparation of the drawing	• Number of poles been assigned with number

26	Identify each feeder pillar by number and install new KWh meters	• Preparation of the drawing	• Number of feeder been assigned with number • Number of feeder pillar with KWH meter
27	Maintenance check form	• Check form prepared and launched	• Number of check forms been executed after launching the process
28	Define the main roads and sub main roads and branches	• Roads defined	• Number of main roads and branches • Number of street lights in each type of road
29	Technical training for the maintenance staff	• Training conducted	• Number of attendants
30	Monitoring process	• Create the monitoring process	• Number of complaints received to the municipality for defective lights • The power consumptions in KWH
31	Replace HPS by LED Lights	• Number of light replaced	• Number of lights replaced
32	New Smart Feeder pillars	• Number of smart feeder pillars	• Number of smart feeder pillars
33	Remote monitoring and control	• Number of remote monitoring and control completed	• Number of remote monitoring and control completed
RENEWWABLE ENERGY Green power generation			
34	The community hall (BEIT BAAKLINE) under SUDEP	• Installation of the PV system • System installed capacity	• KWp • KWh/a
35	Water pumping station under SUDEP	• Installation of the PV system • System installed capacity	• KWp • KWh/a
36	The natural reserve	• Installation of the PV system • System installed capacity	• KWp • KWh/a
37	The municipality building	• Installation of the PV system • System installed capacity	• KWp • KWh/a
38	The central library	• Installation of the PV system • System installed capacity	• KWp • KWh/a
39	Baakline Secondary School	• Installation of the PV system • System installed capacity	• KWp • KWh/a

40	Baakline Intermediate school	• Installation of the PV system • System installed capacity	• KWp • KWh/a
Residential buildings			
41	Workshop with LNC	• Conduct workshop	• Number of staff attended the workshop
42	Workshop with local NGO'S	• Conduct workshop	• Number of staff attended the workshop
43	Open Solar Day	• Conduct open day	• Number of staff attended
44	Public awareness campaign in school and colleges	• Conduct awareness campaign	• Number of staff attended the campaign
45	Increase the initiatives for solar water heater	• Get the finance for initiatives	• Number of the initiatives offered
46	New Building Code	• Apply the new codes	• Number of new houses with new code
47	Solar water Heater in new building	• Apply new codes	• Number of new houses with new code
Tertiary buildings, *equipment/facilities*			
48	Public awareness campaign will be held for tertiary sectors addressing energy conservation, behavioural changes	• Conduct awareness campaign	• Number of staff attended the campaign
49	Certificate for green cedar certification	• Conduct awareness campaign • Number of participant	• Number of certificate issued
50	Implementing building codes in new buildings	• Apply the new codes	• Number of new tertiary building with new code
TRANSPORT			
51	Smart master plan for transportation	• Develop the master plan for transportation	• Develop the master plan for transportation
52	Promotion of eco driving	• Conduct training on eco driving	• Number of trained staff
53	Marathon Day	• Conduct marathon day	• Number of participant

54	Bike Day	• Conduct bike day	• Number of participant
55	Regulate the Public/Private bus transportation	• Regulate the bus operation, direction, covered roads. • Provide the map with direction and places. • Provide each bus with Telephone number for feedback and complaints. • Provide the schedule of Buses in all days of the week	• Develop the regulation. • Develop the map with direction and places. • Number of bus joint the plan. • Number of location with schedule of Buses
56	Provide bus stop stations	• Number of bus stations	• Number of bus stations
57	Provide green bus station	• Number of bus stations	• Number of bus stations
58	Parking area in Baakline community hall	• Construct parking area	• Parking capacity in number of cars
59	Parking area for school	• Construct parking area	• Parking capacity in number of cars
60	Parking area for citizen	• Construct parking area	• Parking capacity in number of cars

ANNEXES

ANNEX I – PROJECT FICHES

Baakline Priority Action of SEAP (1)

1- General presentation

Monitor and Regulate the water Supply

Summary of the Action:

The city suffers shortage in water supply due to the limited water resources, old infrastructure, and scarcity of rainfall, compared with high water demand due to the increase in human demography and urbanism, more over the Syrian crises added additional pressure with a high number of displaced Syrian refugees in the city.

The municipality is looking for new resources for water to balance the supply with the demand; however, without knowing the real demand and supply, the municipality will not be able to see the total picture. The action will concentrate on regulating and monitoring the water consumption/supply in addition to maintain the infrastructure.

It is essential to start solving the problem from the source which means from the water demand, the possibility to rationalise that demand and regulate water consumption.
Baakline consumes 345.5 MWh/year on water pumping, part of this consumption is produced through diesel generator which consume 18,7K L/y fuel due to the cut-off in EDL.

The municipality had already taken action forward in working on converting part of the water pumping station to operate on PV solar system through SUDEP program funded by EU. This will save the high cost in electrification and reduce the dependence on fusel fuels. The project will provide 36.4KWP production around 70MWh/year which will reduce the emission by 47 t CO_2.

In addition to that the following foresee actions will be considered as priority in order to insure the monitoring and regulating the water supply and demand:

- Conduct awareness campaign to enhance the water conservation and regulate the water consumption.
- Distribute water saving tools for the faucet (Tap).
- Encourage citizens to collect rain water in the winter season to reduce the high season demand in summer.
- Conduct routine maintenance and check the water leak in the main feeder piping
- Install water meters on the main water supply and main branches to monitor water consumptions.

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
WATER SUPPLY			**571**	**347**	**217.8**	**156.35**	**0.49 %**	**€146,000**
Short Term Action	9	awareness campaign			17	14.75	0.05%	€ 3,000
	10	Water saving tools for the faucet (Tap)			17	14.75	0.05%	€ 10,000
	11	Water collection through raining season			10.4	8.85	0.03%	€ 3,000
	12	Routine maintenance			104	88.5	0.27%	€ 10,000
	13	Install water meters in main feeders and main branches			34.7	29.5	0.09%	€ 120,000

Contact person in the local authority	Project owner	State of Action	Location
The municipality Mayor	Baakline Municipality	NEW	Baakline City

General Objectives of the project
The main objective of the action is to regulate the water consumptions; by knowing where the water has been highly consumed is one of the tools to regulate the water demands. Providing alternative solutions to save water and store rain water is a backup solution supported with searching for another water resource for the city. Solving the shortage in water supply and availability will contribute directly to facilitate the cost applied on the citizen, and it reduces water being trucked that adds a lot of pollution and emissions into the environment.

Principal partners and stakeholders	Ultimate beneficiaries of the project
The Municipality of Baakline The Municipal Council. NGOs	The Municipality of Baakline, The Stakeholder of Baakline 25,000 inhabitants

Link to municipal development plan	Area(s) of Intervention	Estimated investment cost
The water supply is a core sector for the municipality's needs and represents an essential part for the city's sustainability.	The Municipality of Baakline	€1,396,000

2- Technical description

Main Technology to implement and equipment to use	Previous or linked studies
The water meters with telemetry system is to be connected with the municipality control room to monitor the real demand of water supply and to discover early leak of underground water. These technologies need to be implemented in a simple and reliable way.	No previous studies have been conducted, but there are many projects which have been successfully implemented in Lebanon. This can serve as an example to be followed by the municipality.

Project lifetime : exploitation or use duration	Implementation timeframe and Start date if set	Engineering studies	Other previous studies (if any)
Five Years	Jan 2017	Required	Not applicable

Implementation plan or construction plans necessary for the implementation and their availability
Many steps have been taken by the municipality: - A new water network has been established and another new part is still under process. -The main part of the work has been completed whereas the monitoring process is still not implemented. -Awareness campaigns at schools start and are still under process. The city needs to accomplish the monitoring part, as it gives the municipality an overall idea of the real demand on water and alerts if a leak appears in the unseen parts in the water network. The following summarise the implementation parts.

Availability of environmental impact assessment or mitigating measures to protect environment if any
Not applicable

3- Organisation and procedures

Formal approval	The municipality council is required to approve the plan and the implementation	**Staff allocated to prepare, implement and monitor the action (number, position and duration of engagement)**	SEAP UNIT is part of this action which will set the unit for proper implementation and monitoring
Legal responsible body (is) for:	Municipality Lawyer	**Municipal of city staff training needs**	Will be part of the actions

Technical assistance needs	Role of Partners
An expert will be appointed to collaborate and support the municipality in its plan; moreover, support from different local communities, NGOs and government will be highly required.	The **Municipality of Baakline** to launch the events and implement the actions. The **Municipal Council**: to issue a set of laws to regulate the water consumptions and approve set of projects serve the water saving and regulations. **NGOs** to support the municipality work in participation in the events and the general goals of the action **LCEC** : Project Evaluation & Technical Support **MOI** : Legal Support & Coordination between Municipalities

4- Cost estimates

All cost	Initial and start-up expenses	Approximate operational Costs (including maintenance	Approximate annual income for energy producing projects
€ 146,000	€ 120,000	NA	€ 26,217

Draft calculation of the NPV and return of Investment (IRR).

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 3,690	/year	€ 36,896	€ 29,194
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
26,217	217.8	0	378,574	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action

YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5- Available and foreseen sources of funding

Local authority's own resources	National Funds and Programmes	International Financial Institutions	EU Funds & Programmes and other external funds
To be defined by the municipality	NA	EU, UNDP, AFD, USAID, MPEW	To be defined
Public-Private Partnerships amount/share (available or to raise)	**Lined up private investments**	**Loans and potential borrower**	**Expected annual cost savings to the City budget**
NA	NA	20%	€ 26,217
Other			

6- Projected Energy Estimates in 2020

Energy savings MWh/a	Renewable energy production MWh/a	CO_2	Target Year
217.8		156.35	NOV. 2020
Percentage of net reduction on the territory	**Reduction as related to BAU scenario**	**Per capita calculated reduction**	
0.49 %	217.8 MWh/a	0.006254 t CO_2/a	

7- Summary of related Awareness Raising (AR)actions

AR related to the action	AR related to community
• Awareness and Training workshops on changing behavior for the Municipality staff. • Taking the measures related to the activities of preserving the environment to impact their change in behavior. • Implementing Energy Saving Instruction and tools for employees.	• Linking the actions to the associations and NGOs and their social networks. • Promoting the installation of similar equipment in other public and private buildings through a renewable energy equipment forum aimed at relevant stakeholders. • Promoting the project in the media through publicity, social media networks and implementing a municipal website

8- Assumptions and risks

Lack in developing policies and monitoring the consumption in addition to availability of fund will be the main assumptions and risks.

The municipality should insure that instruction will be followed either by providing initiatives or inducement.

9- Key success factors

The city suffer from water shortage every summer season when water demand increasing. The need of water and the scarcity of water will be the main title to citizen attention, supported with the instruction to regulate the water consumptions. This will bring the attention to the citizens and push them to follow the instructions to regulate the water consumptions and reduce the water demand.

10- Next steps
Install water counter in each house and monitor the demand with tariff in high demand season.
11- Annexes
Refer to the CAPP

Baakline Priority Action of SEAP (2)

1- General presentation

Support the implementation of the sorting at the source for the solid waste by Purchasing New Fuel Saving Truck for Solid Waste Collection

Summary of the Action:

The garbage crisis which has left Lebanon's streets filled with rotting trash had negative impact on the city. This crisis had allowed the Municipality of Baakline to take the role and look for solution to the overcome problem of garbage crises at least within the City perimeter and Shouf Swaijani towns.

One part of the solution was in looking for financial help to open the sorting factory which was built and not been used for years due to the limited financial resources. The other part of the solution was to reduce the city's produced garbage by engaging recycling technicians to assist pushing the citizen to sorting and managing their solid waste by themselves

Many houses of the City used the compost to fertilize the land, this practice allowed people to relieve ancient agricultural traditions and use the compost from solid waste to fertilize their lands. Also the municipality had requested the vegetable stores to deliver their rotten vegetables and fruits to the organic chicken farms. More over the paper and cartoons had been separated from garbage and collected individually.

The municipality fixed three days per week for garbage collection, two days for organic and one day for solids; This initiative was called smart sorting and collection plan and was successful, as it came with impressive results in a short period of time and modest implementing costs .

The sorting at the source for the solid waste is important as, in addition, it helps in reducing the daily trips of the solid waste trucks and consequently the fuel consumption and the maintenance cost for collection.

The focus was on changing the behaviour in solid waste management and moving on to the smart way in sorting the solid waste at the source.

In the meantime, to complete the operation and continue the support, the City still in need to provide certain tools like acquiring collection trucks, rehabilitating the landfill, and upgrading the existing sorting plant to increase its capacity and efficiency.

The following short and long term actions summarize the essential needs to complete this operation :

- Ensuring capacity development and enhancing public awareness in the City.
- Enhancing the plan for sorting solid waste from source
- Developing waste strategy plan with waste management plan in order to overcome the high cost in collection and transportation
- Purchasing new fuel saving truck for solid waste collection, providing modern collection garbage trucks, which could save fuel and reduce the cost of operation, as the new technologies will help in reducing fuel consumptions for the trucks.

The actions are part of building the infrastructure base for the solid waste collection and management, where the base for calculation was not part of the municipality's responsibility, but part of a national responsibility and management.

Also, the old setup was based on the collection of the solid waste, sending them to Beirut and then back to Na'emah land fill; This process cost a lot and consumed large quantity of fuel for transportation. The distance covered reached more than 120 Km trip daily with high operation cost; whereas, in the new sorting plan, the distance is short, consuming only 15 Km/day.

Assuming a fuel consumption of1.5 L/km, the saving daily distance being 105Km/day, the saving becomes 157.5l/day x 365 days=57487.5L/year. This counts for reduction in emission 155 t CO2 /year which is equal to saving 580 MWh/year in addition to the operation cost which counts for more than 100$/ton.

Contact person in the local authority	Project owner	State of Action	Location
The municipality Mayor	Baakline Municipality	NEW	Baakline City

General Objectives of the project

Sorting at the source for the solid waste is important since it helps in reducing the daily trips for the solid waste trucks, the fuel consumption and the maintenance cost for the collection.

Principal partners and stakeholders	Ultimate beneficiaries of the project	
The Municipality of Baakline ,The Municipal Council, NGOs	The Municipality of Baakline, The Stakeholders of Baakline 25,000 inhabitants	
Link to municipal development plan	**Area(s) of Intervention**	**Estimated investment cost**
The solid waste management is a core sector for the municipality's needs and represents an essential part for the city's sustainability.	The Municipality of Baakline	€ 3,490,000

2- Technical description

Main Technology to implement and equipment to use	Previous or linked studies
By applying Hybrid Drive System with Advanced Technology for Fuel Reduction, it replaces the conventional transmission with a hydraulic transmission to drive the truck off mechanical and hydraulic power, hence reducing the fuel consumption up to 50%. The brake energy recovery also allows the truck to extend brake replacements. If this technology is implemented in Baakline, it will help in mitigation of the emission and reducing the operation cost for solid waste management	The transportation cost for solid waste is an essential part due to the high fuel consumptions in collection and transportation.

Project lifetime : exploitation or use duration	Implementation timeframe and Start date if set	Engineering studies	Other previous studies (if any)
Five Years	Jan 2017	Required	Not applicable

Implementation plan or construction plans necessary for the implementation and their availability

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario MWh/a	Mitigation in Energy MWh/a	Mitigation in t CO_2%	Costing in €
SOLID WASTE MANAGEMENT			**580**	**155**	**0.476%**	**3,490,000**
Short Term Action	19	Ensuring capacity development and enhancing public awareness	580	155	0.4761%	
	20	Enhance the plan for sorting solid waste at the source				
	21	Developing waste strategy plan				
	22	Purchasing new fuel saving truck for solid waste collection,				740,000

		Priority Action @ 2	
Long Term Action	23	Rehabilitation of the existing landfill	2,000,000
	24	Upgrade the existing waste sorting plant	750,000

YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

Availability of environmental impact assessment or mitigating measures to protect environment if any

Not applicable

3- Organisation and procedures

Formal approval	The municipality council is required to approve the plan and the implementation	**Staff allocated to prepare, implement and monitor the action (number, position and duration of engagement)**	SEAP UNIT is part of this action which will set the unit for proper implementation and monitoring
Legal responsible body (is) for:	Municipality Lawyer	**Municipal of city staff training needs**	Will be part of the actions

Technical assistance needs	**Role of Partners**
An expert will be appointed to collaborate and support the municipality in its plan; moreover, support from different local communities, NGOs and government will be highly required.	NGOs to support the municipality work in participation in the events and the general goals of the action MOI : Legal Support & Coordination between Municipalities

4- Cost estimates

All cost	Initial and start-up expenses	Approximate operational Costs (including maintenance	Approximate annual income for energy producing projects
€ 3,490,000	€740,000	NA	€ 69,815

Draft calculation of the NPV and return of Investment (IRR).

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 18,957	/year	€ 189,568	€ 150,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
69,815	580.0	0	979,769	€ 0.12/Kwh

5- Available and foreseen sources of funding

Local authority's own resources	National Funds and Programmes	International Financial Institutions	EU Funds & Programmes and other external funds
To be defined by the municipality	NA	To be defined	To be defined
Public-Private Partnerships amount/share (available or to raise)	**Lined up private investments**	**Loans and potential borrower**	**Expected annual cost savings to the City budget**
NA	NA	20%	€ 69,815
Other			

6- Projected Energy Estimates in 2020

Energy savings MWh/a	Renewable energy production MWh/a	CO t CO $_2$ /a ^{2} r	Target Year
580.0		155	NOV. 2020
Percentage of net reduction on the territory	**Reduction as related to BAU scenario**	**Per capita calculated reduction**	
0.476%	580 MWh/a	0.0062 t CO $_2$ /a	

7- Summary of related Awareness Raising (AR)actions

AR related to the action	AR related to community
Developing, policy, organization, Skill, partnership and Information base	• Sorting solid waste from source. • Raise awareness, educate and inform users on recycling the compost. • Promote using recycled bags.

8- Assumptions and risks

Lack in developing policies and monitoring the consumption will be the main assumptions and risks.
The municipality should ensure that polices, structures, procedures and practices of solid waste management are in place.

9- Key success factors
The increase awareness due to the shock which happened due to the garbage crises in the country build huge awareness and acceptance for sorting from sources.
10- Next steps
Continue monitoring the operation and keep the awareness for the citizen
11- Annexes
Refer to the CAPP

Baakline Priority Action of SEAP (3)

1- General presentation

SMART CITY WITH INTELLIGENT PUBLIC STREET LIGHTING

Summary of the Action:

In Baakline, like any other city in Lebanon, the High Pressure Sodium (HPS) lamps have been the conventional means of illuminating roadways and various public spaces for decades. The total number of street lights reached one thousand five hundred street light luminaries with most of the lamps rated for 400/250 watt

Now, new LED Street lights technology has been developed. This new technology enhances illumination along city streets while providing savings through increased energy efficiency, decreased maintenance needs and longer-rated lifetimes. Potential cost savings in energy consumption could be as high as 40% or more. LED street lights are capable of producing a better quality white light with less energy consumption than HPS. The quality gained from LED lighting improves the perception of more powerful light, while reducing the power of the light that is actually emitted. The actions that are under process at this stage:

- Establishing street lighting unit to support the implementation of the SEAP for street lighting sector.
- Preparing the master street lighting drawing where each pole should have identification number with full data like power and type, and assign a number for each pole inconformity with the site as to the master drawings.
- Identifying each feeder pillar by number, install new KWh meters and calculate the total load connected on each feeder. With Data collection for the load consumptions: Each month the data should be taken for each feeder and verified with actual connected load.
- Prepare the maintenance check form which includes the maintenance process, identification number for the street lighting, and type of issues and actions made for fixing it with detailed spare parts used in maintenance with time consumed and costing.
- By using the master plan drawing, the public lighting unit will define the main roads and sub main roads and branches and assign each area with the recommended power for street lights.
- Conduct a technical training for the maintenance staff to ensure compliancy with the technical and efficiency of work.
- Monitoring process: Add more pages to the municipality website to include the citizen's feedback or complaint about any defective in street lights as a tool for monitoring the maintenance staff.

The actions which are considered as priorities are:

1. Install new Smart Feeder pillars with full protection and measurement tools required equipment which contain:
    - Outdoor enclosure with security lock
    - Astronomical timer
    - Power analyser/metering
    - Control components
    - Protection devices short circuits, over current, Earth faults, Surge protection
    - Wireless communication with main station
2. Install new LED lighting according to the master plan with dimmable drivers. The LED light should be selected according to the international standard to comply with the safety regulation for the street lighting and meet the location and site needs. Also the street lighting should have enough space for controller. This will be added in the future inside the street light near the street light driver.
3. Install remote monitoring and control for the system which consist of:
    - Electronic ballast controller designed for carrying out the remote management of a luminary in street lighting installations inside the street lighting with impeded power line controller.
    - Control component inside the feeder pillar to communicate with the street lighting and the main station in the municipality.
    - Main station in the municipality with remote software and monitoring and control tools
    - Proper training on the system

The city has moved forward in its initiative, yet part of its actions has to be completed. The priority action includes:

- INSTALL NEW LED LIGHTING
- INSTALL NEW SMART FEEDER PILLARS

The priority action will concentrate on applying the plan by areas, where the area will be identified through the main feeder pillars. In Baakline, there are 24 feeder pillars which divide the city into 24 areas.

SECTORS & fields of action	Action No	KEY actions/measures	BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
			MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
PUBLIC STREET LIGHTING			**2,375**	**1,543**	**1833**	**1,197**	**3.68%**	**€1,000,000**
Long Term Action	31	Install new led lighting			1523	995	3.06%	€ 750,000
	32	Install new smart feeder pillars			58	38	0.12%	€ 125,000
	33	Install remote monitoring and control			252	164	0.50%	€ 125,000

Contact person in the local authority	Project owner	State of Action	Location
The municipality Mayor	Baakline Municipality	NEW	Baakline City

General Objectives of the project

Baakline sets its vision towards becoming a smart city leading the change in Chouf Souayjani Region. Street lighting would be an essential part to establish the smart city platform and enhance the smart monitoring and management. The mitigation for GHG emission in public street lighting becomes essential with the increase in power demand. Thus applying a smart management for this sector would help in reducing power consumption and maintenance cost.

Principal partners and stakeholders	Ultimate beneficiaries of the project	
The Municipality of Baakline ,The Municipal Council, NGO's	The Municipality of Baakline, The Stakeholders of Baakline 25,000 inhabitants	
Link to municipal development plan	**Area(s) of Intervention**	**Estimated investment cost**
The SEAP is under approval from the municipality council	The Municipality of Baakline	€ 1,000,000

2- Technical description

Main Technology to implement and equipment to use	Previous or linked studies
The LED of (110/70W) is a new technology which will be used in addition to the remote monitoring process by utilising GSM system or other WIFI service available in the city	The current situation for consumption is:350 watt average lamp used x 1500 number of street lights x 4400 operation hours per year=2,310 MWh/a The New type of Lamp Led are mix of 110 Watt on the main road and 70 watt on the branches. The energy consumption's : assume the number of 70 watt and 110 watt are equal (average 90 watt) The energy consumptions : 90 watt *2200 hour of operation of full power + 2200 hours of operation of 50% dimming) x 1500 street lamps = 445.5 MWh/a The envisaged energy saving will be: 1864.5 MWh. The power saving for using Astronomical timer is around 205.5 MWh/a

Project lifetime : exploitation or use duration	Implementation timeframe and Start date if set	Engineering studies	Other previous studies (if any)
Five Years	Jan 2017	Required	Not applicable

Implementation plan or construction plans necessary for the implementation and their availability

Year	2017	2018	2019	2020	2021
Phase	1	2	3	4	5
Feeder Pillars number	1-5	6-10	11-15	16-20	21-24
Costing	€ 200,000	€ 200,000	€ 200,000	€ 200,000	€ 200,000

Availability of environmental impact assessment or mitigating measures to protect environment if any

Not applicable

3- Organisation and procedures

Formal approval	The municipality council is required to approve the plan and the implementation	**Staff allocated to prepare, implement and monitor the action (number, position and duration of engagement)**	SEAP UNIT is part of this action which will set the unit for proper implementation and monitoring
Legal responsible body (is) for:	Municipality Lawyer	**Municipal of city staff training needs**	Will be part of the actions

Technical assistance needs	**Role of Partners**
An expert will be appointed to collaborate and support the municipality in its plan; moreover, support from different local communities, NGOs and government will be highly required.	LCEC : Project Evaluation & Technical Support MOI : Legal Support & Coordination between Municipalities

4- Cost estimates

All cost	**Initial and start-up expenses**	**Approximate operational Costs (including maintenance)**	**Approximate annual income for energy producing projects**
€ 1,000,000	€200,000	NA	NA

Draft calculation of the NPV and return of Investment (IRR).

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
20%	0%	80%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 101,103	/year	€ 1,011,031	€ 800,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff

220,639	1,833.0	0	2,557,195	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5- Available and foreseen sources of funding

Local authority's own resources	National Funds and Programmes	International Financial Institutions	EU Funds & Programmes and other external funds
To be defined by the municipality	NA	To be defined	To be defined
Public-Private Partnerships amount/share (available or to raise)	**Lined up private investments**	**Loans and potential borrower**	**Expected annual cost savings to the City budget**
NA	NA	20%	€ 249,167

Other

6- Projected Energy Estimates in 2020

Energy savings MWh/a	Renewable energy production MWh/a	CO$_2$	Target Year
2070		1,197	NOV. 2020
Percentage of net reduction on the territory	**Reduction as related to BAU scenario**	**Per capita calculated reduction**	
3,68%	2070 MWh/a	0.04788 t CO$_2$ /a	

7- Summary of related Awareness Raising (AR)actions

AR related to the action	AR related to community
Developing, policy, organization, Skill, partnership and Information base	Posters nailed on street lamps to alert citizens on municipality action. Promoting the usage of efficient lighting through promoting of led lamps. Training students to use energy efficiently.

8- Assumptions and risks

The Risks which affect the life time of the system and doesn't pay back it is invest,

- Low quality and low efficient product
- Missing the protection for over current and short circuits and surge.
- No maintenance
- Poor installation
- Poor network

The assumption which considered in this action:

- High quality of product with long life operation and low maintenance needs.

- Qualified maintenance staff.
- Availability of spare parts.

9- Key success factors

- The lessons learned from previous action in the city, the city had previous experience in installation of LED lights.
- The SUDEP project had additional experience for which will added additional lessons in this line.
- The Street lighting unit will added values and allow for monitoring and marinating the actions and evaluate the process.
- The technical training for the maintenance staff to ensure compliancy with the technical and efficiency of work.

10- Next steps

Review the new technologies in street lighting to implement the latest one

11- Annexes

Refer to the CAPP

Baakline Priority Action of SEAP (4)

1- General presentation

Green Building

Summary of the Action:

The building action can be summarized as follows:

SECTORS & fields of action		KEY actions/measures	BAU Scenario	Mitigation in Energy		Mitigation in %	Costing
Action No			MWh/a	MWh/a	t CO_2 /a		
				1524	1035		
BUILDING RESIDENTAIL SECTOR	46	**INCREASE THE INITIATIVES FOR SOLAR WATER HEATER FOR LOW INCOME HOMES Priority Action @ 4**		1016	690	2.12%	€ 200,000
BUILDING TERTIARY SECTOR	49	**CERTIFICATION FOR GREEN CEDAR CERTIFICATION Priority Action @ 4**		508	345	1.06%	€ 70,000

The priority action which can be implemented is to enhance and motivate the installation of solar water heater in residential sector and promote green behaviour in tertiary sector.

INCREASE THE INITIATIVES FOR SOLAR WATER HEATER FOR LOW INCOME HOMES

The municipality could play a good role in increasing the replacement of electrical water heaters with solar heaters. This is accomplished through updating its internal law to offer $200, deduction from the local taxes for each replacement of the electrical water heaters by the solar water heaters.
The municipality of Baakline has issued a local decision No.70 to exempt the local citizen for five years from water fees if they install Photovoltaic solar system ($ 700) and for one year if they install solar water heater which counts for $ 140. The incentives will be increased from only $200 which the BDL offers to $340 which the municipality could propose. The replacement programme will enhance the smooth implementation of solar water heaters in the city. The programme can be enhanced with the support of the local banks which can offer short loans offer. The municipality council can search for finance through local or international donors and payment can be deducted from the local taxes of the citizen. This brings the cost down to $500 for Water Solar Heater and the remaining amount can be supported through the bank with an almost zero interest for two years. The monthly payment would be $20 to $30 per month and this amount is affordable for low income homes.
The estimated cost for this action will be in range of € 200,000. The programme could cover around 1000 houses with most low income one.

GREEN CEDAR CERTIFICATION

The action will aim to implement an innovative mechanism to create a kind of competition between society components and the tertiary sectors to encourage their commitment, role, participation and sense of responsibility towards the environment and community.
The municipality could publish a Green Cedar Certification (GCC) to be presented in tertiary sectors like offices, shops, showrooms, companies, establishments etc.., to those who are willing to participate in this programme. The certification will show in metaphorical way the quantities of trees which have been saved in annual base.
The municipality, in coordination with the local NGO's and experts in energy and community behaviours, would set the standards to implement the action and provide the tools for training through holding workshops and distributing flyers and brochures
This action will have its impact on the civil society in reducing the footprint and addressing energy conservation with behavioural changes.

Contact person in the local authority	Project owner	State of Action	Location
The municipality Mayor	Baakline Municipality	NEW	Baakline City

General Objectives of the project

The buildings in the residential and tertiary sectors are responsible for 62.8 % of the total city energy consumption and represent the largest energy consumers and CO_2 emitters in urban areas; therefore, setting efficient policies to reduce energy consumption and CO_2 emissions in this sector is essential.

Principal partners and stakeholders	Ultimate beneficiaries of the project	
The Municipality of Baakline ,The Municipal Council, NGO's	The Municipality of Baakline, The Stakeholders of Baakline 25,000 inhabitants	
Link to municipal development plan	**Area(s) of Intervention**	**Estimated investment cost**
The SEAP is under approval from municipality council	Municipality of Baakline	€ 270,000

2- Technical description

Main Technology to implement and equipment to use	Previous or linked studies
NA	In the residential sector: The estimated electrical water heater is around 1,016KWh/a in each house so replacement it with Solar water heater could contribute reduction on consumption for around 1016 MWh for 200 houses. In the tertiary Sector: The calculated consumptions according to BAU will be 8,067MWh/a , through Green Cedar Certification programme a number of participant will be involve in this programme which estimated by 30% of city capacity, with target of 21% of estimated of their consumptions which count for 508MWh reduction.

Project lifetime : exploitation or use duration	Implementation timeframe and Start date if set	Engineering studies	Other previous studies (if any)
Five Years	Jan 2017	Required	Not applicable

Implementation plan or construction plans necessary for the implementation and their availability

The SEAP unit will be the core element in the implementation: it will coordinate the implementation of the initiatives for solar water heater in residential sector and process of issuing the Green Cedar Certification in tertiary sector

Year	2017	2018	2019	2020
Number of unit solar unit in Residential sector	250	250	250	250
Number of certification in Tertiary sector	20	20	20	20

Availability of environmental impact assessment or mitigating measures to protect environment if any

Not applicable

3- Organisation and procedures

Formal approval	The municipality council is required to approve the plan and the implementation	**Staff allocated to prepare, implement and monitor the action (number, position and duration of engagement)**	SEAP UNIT is part of this action which will set the unit for proper implementation and monitoring
Legal responsible body (is) for:	Municipality Lawyer	**Municipal of city staff training needs**	Will be part of the this actions

Technical assistance needs	**Role of Partners**
An expert will be appointed to collaborate and support the municipality in its plan; moreover, support from different local communities, NGOs and government will be highly required.	LCEC: Provide initiative of $200 to support the installation of water Solar Heater. NGO's: Support the implementation of Green Cedar Certification

4- Cost estimates

All cost	**Initial and start-up expenses**	**Approximate operational Costs (including maintenance**	**Approximate annual income for energy producing projects**
€ 270,000	€67,500	NA	NA

Draft calculation of the NPV and return of Investment (IRR).

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 6,834	/year	€ 68,338	€ 54,074
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
183,444	1,524.0	0	2,707,957	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action

YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5- Available and foreseen sources of funding

Local authority's own resources	National Funds and Programmes	International Financial Institutions	EU Funds & Programmes and other external funds
To be defined by the municipality	NA	To be defined	To be defined
Public-Private Partnerships amount/share (available or to raise)	**Lined up private investments**	**Loans and potential borrower**	**Expected annual cost savings to the City budget**
NA	NA	20%	€ 183,444

Other

The municipality doesn't have revenues from this action however the municipality support the low income families, this action will be part of support to those families.

6- Projected Energy Estimates in 2020

Energy savings MWh/a	Renewable energy production MWh/a	CO_2	Target Year
1,524		1,035	NOV. 2020
Percentage of net reduction on the territory	**Reduction as related to BAU scenario**	**Per capita calculated reduction**	
3.18%	1,524 MWh/a	0.0414 t CO_2 /a	

7- Summary of related Awareness Raising (AR)actions

AR related to the action	AR related to community
Developing, policy, organization, Skill, partnership and Information base	Awareness campaigns: production of promotional material (leaflets, brochures, posters, catalogues) and perhaps billboard advertisements. • Exhibitions of solar equipment • Info days for the citizens, dissemination of messages through radio, newspapers and television, especially using local media.

8- Assumptions and risks

The Risks which affect the life time of the system and do not pay back its investment are:

- Low quality and low efficient product
- Improper maintenance
- Improper Installation

The assumption which considered in this action:

- High quality of product with long life operation and low maintenance needs.
- Qualified maintenance staff.
- Availability of spare parts and support.

9- Key success factors

The city had many provider for Solar water heaters and many shops which promote efficient lighting , the trends for converting the lights from CFL to LED are in increase, the only fact need to be addressed is the quality of product which been used.

10- Next steps

Implement energy code for the city

11- Annexes

Refer to the CAPP

Baakline Priority Action of SEAP (5)

1- General presentation

Increase the capacity of parking area

Summary of the Action:

The transportation sector is responsible for 31 % of the city total emission as it produces 8,038 t CO2/ year (2013). The municipality fleets produce 0.75 % (60 t CO2) of transportation emission and the remaining 99.25 % is caused by the private transportation.
The transportation actions can be summarized as follows:

SECTORS & fields of action		BAU Scenario		Mitigation in Energy		Mitigation in %	Costing
Action No		MWh/a	t CO_2 /a	MWh/a	t CO_2 /a		
TRANSPORTATION		**40,918**	**10,208**	**2,466**	**615**	**1.89%**	**€ 2,000,000**
58	Parking area in Baakline community hall			822	205	0.63%	€ 400,000
59	Parking area for school(SNC)			822	205	0.63%	€ 600,000
60	Parking area for citizen			822	205	0.63%	€ 1,000,000

The priority action tends to increase the capacity of parking areas in order to increase the road capacity and reduce the congestion in the roads

1. PARKING AREA IN BAAKLINE COMMUNITY HALL (BEIT BAAKLINE)

The community hall is located in the main city road, and in any event it witnesses overcrowding in the main street. The municipality tried to convert the main road to one direction at crowding time, but this does not solve the main issues. So parking area for the community hall becomes an urgent need.

2. PARKING AREA FOR SNC SCHOOL

The Shouf National College (SNC) is located on the main entrance of the city road and is, thus creating daily congestion in the morning and afternoon. The main issue lies in the unavailability of the parking area for buses and cars. Thus a parking area becomes an urgent need.

3. PARKING AREA FOR CITIZEN

The other issue which the city suffers from is the shortage in car parking for the citizens who are willing to use the bus in their transportation to Beirut city. Many tend to park their cars in the main roads which create additional problems in the city. Creating new and secure parking areas becomes an important action. Preventing parking the cars aside the main roads will also support the smooth movement of cars.

Contact person in the local authority	Project owner	State of Action	Location
The municipality Mayor	Baakline Municipality	NEW	Baakline City

General Objectives of the project

One of the main obstacles in transportation in Baakline is the road's capacity. The number of cars is increasing and the road capacity is limited.
The main objective of the action is to increase the road capacity by increasing the parking areas.
This will support the mitigation of emissions due to road congestion and will increase road safety.

Principal partners and stakeholders	Ultimate beneficiaries of the project
The Municipality of Baakline ,The Municipal Council, NGO's	The Municipality of Baakline, The Stakeholders of Baakline 25,000 inhabitants

Link to municipal development plan	Area(s) of Intervention	Estimated investment cost
The SEAP is under approval from municipality council	Municipality of Baakline	€ 2,000,000

2- Technical description

Main Technology to implement and equipment to use		Previous or linked studies	
To be verified through the design phase		The design stage will work out the study for the proper implementation	
Project lifetime : exploitation or use duration	**Implementation timeframe and Start date if set**	**Engineering studies**	**Other previous studies (if any)**
Five Years	Jan 2017	Required	Not applicable

Implementation plan or construction plans necessary for the implementation and their availability

Year	2017	2018	2019	2020
Action 1	Design/Tendering	Execution	Execution	Execution
Action 2	Design/Tendering	Execution	Execution	Execution
Action 3	Design/Tendering	Execution	Execution	Execution

Availability of environmental impact assessment or mitigating measures to protect environment if any

To be verified at design stage

3- Organisation and procedures

Formal approval	The municipality council is required to approve the plan and the implementation	**Staff allocated to prepare, implement and monitor the action (number, position and duration of engagement)**	SEAP UNIT is part of this action which will set the unit for proper implementation and monitoring
Legal responsible body (is) for:	Municipality Lawyer	**Municipal of city staff training needs**	Will be part of the this actions

Technical assistance needs	Role of Partners
An expert will be appointed to collaborate and support the municipality its plan. Moreover, support from different local communities, NGOs and government will be highly required.	NGO's: The NGO's are the main partner of the actions where Beit Baakline and SNC would share part of the actions as possible.

4- Cost estimates

All cost	Initial and start-up expenses	Approximate operational Costs (including maintenance	Approximate annual income for energy producing projects
€ 2,000,000	€ 300,000	NA	NA

Draft calculation of the NPV and return of Investment (IRR).

Local or Outsource Finance	Private (or own) funds	Bank Loan	Interest rate	Amortization period in years
80%	0%	20%	4.50%	10
Fixed Financial amortization costs			Total loan repayment due:	Loan (principal) capital:
Loan repayment (annualized)	€ 50,552	/year	€ 505,515	€ 400,000
Annual revenues in €	Reduction in consumptions in MWh/a	Payback time in year	NPV(20 years) in €	PPA Tariff
296,833	2,466.0	0	4,259,066	€ 0.12/Kwh

Time schedule for implementation of the Short and long term action					
YEAR	2016	2017	2018	2019	2020
Short Term Actions	X	X	X	X	X
Long Term Actions			X	X	X

5- Available and foreseen sources of funding

Local authority's own resources	National Funds and Programmes	International Financial Institutions	EU Funds & Programmes and other external funds
To be defined by the municipality	NA	To be defined	To be defined
Public-Private Partnerships amount/share (available or to raise)	**Lined up private investments**	**Loans and potential borrower**	**Expected annual cost savings to the City budget**
NA	NA	20%	€ 296,833

Other

The congestion in the city affect much the traffic and impact invest in the city, and increase the pressure on the municipality to keep policemen in each congestion sector, which added more cost on the staff. The municipality could reap revenue from those parking as part of supporting the actions.

6- Projected Energy Estimates in 2020

Energy savings MWh/a	Renewable energy production MWh/a	CO$_2$	Target Year
2,466		615	NOV. 2020
Percentage of net reduction on the territory	**Reduction as related to BAU scenario**	**Per capita calculated reduction**	
1.89%	2,466 MWh/a	0.0246 t CO$_2$ /a	

7- Summary of related Awareness Raising (AR)actions

AR related to the action	AR related to community
Developing, policy, organization, Skill, partnership and Information base	• Awareness campaigns to young people (to whom mobility is important) on car sharing • Build AR campaigns to transport decision makers and other community groups, in particular the disabled and the elderly (shared taxi called “service”). • Use all media forms and produce imaginative posters, local TV and radio press articles about the issue. • Promote a car pooling scheme run on the Internet and co-financed by the municipality, at the disposal of all employees and city dwellers. • Define practical advantages for car sharers (public or private sector) when setting up employees’ mobility plans (such as free and dedicated parking places, financial contribution from the company for petrol, free bicycles, access to the repair shop, etc.).

8- Assumptions and risks

The Risks which affect the life time of the system and doesn’t pay back its investment are:

- Improper maintenance
- Parking capacity
- Improper design for entry and exit which may increase congestion

The assumption which considered in this action:

- Enough capacity to the city and support the future demand
- Qualified maintenance staff.
- Available of security

9- Key success factors

The streets of the town represent a link between several towns’ points and linking the capital with several mountain towns. Car parking will allow the municipality of Baakline to be the core links to other cities and would Supports economic movement and eco-transport.

10- Next steps

Implement energy code for the city

11- Annexes

Refer to the CAPP

ANNEX II – CITIZENS AWARENESS PROMOTION PLAN (CAPP)

Baakline

Towards a Smart Sustainable City, leading change into Chouf Souayjani region

Preparing and including the "Awareness Raising Actions" component in the SEAP

In addition to the requirement linked to the public consultation of the SEAP, a Citizen Awareness Promotion Plan (CAPP) has to be elaborated by the municipality as part of the Sustainable Energy Action Plan document (SEAP).

Identification of CAPP actions through participatory training workshops

The CES-MED project has conducted a tailored communication and CAPP training workshop for the local authority and it communication team in coordination with (and attended by) the Focal Point and the SEAP Consultants. Prior to conducting the workshop, which was led by CES-MED key communication expert (KE), a three parts "Communication Kit" was handed on to the local authority and SEAP Consultant, who were asked to get acquainted with its content prior to conducting the training.

The "Communication Info Kit" (annex1) includes:

- *Part 1: the "CAPP Guidelines" document: a tailored comprehensive manual prepared by CES-MED for the use of cities/municipalities on how to identify, plan and conduct awareness raising actions (Arabic, English and French versions)*

  (http://www.ces-med.eu/images/CAPP/Annex_7_CAPP_v.4.0_02122014_EN.pdf).
- *Part 2 includes;*
  - *PPT Presentation of the CAPP Guidelines*
  - *Presentation of "how to prepare and implement a communication and an awareness campaign" showing techniques, materials and models*
  - *Pools of benchmark examples and references to best practices from across the world towards citizen engagement and behaviour change, with adaptation to the CES-MED cities context*
- *Part 3: consists of 4 Tables to assess CAPP conditions and identify actions.*
  - *Table 1 is used to conduct a rapid investigation to identify awareness situation, levels and needs linked to behavioural change in the city; and to initiate discussions with the workshop participants towards the identification of target audiences and the SEAP CAPP actions.*
  - *Table2: presents the content of a plan to implement a CAPP action related to a Pilot Project.*
  - *Table 3 presents the proposed actions related to the general sustainable energy challenges and to the city.*
  - *Table 4: presents the proposed CAPP actions linked to each SEAP priority projects.*

During the workshop, the "Communication Kit" material was explained. The following discussions, assessment and analysis addressed awareness raising conditions and challenges, communication concepts and CAPP methodologies, tools, techniques before examining and multiple benchmark applications.

A practical exercise was then conducted to specify the SEAP's CAPP actions, whereby the local authority general awareness raising needs and SEAP's priority actions (proposed in the Project Fiches) were looked over and proposed. In doing so, the template tables were "draftly" filled by the participants and the KE.

Following the workshop, the participants have thoroughly reviewed the tables and finalized them with CES-MED KE and the SEAP Consultants, prior to including them in the SEAP (below).

The Communication Info Kit and specially the CAPP Guidelines are to be used as reference work manuals for the subsequent detailed planning and implementation of the CAPP actions proposed in the SEAP document and other similar awareness raising actions.

Preparation of COMMUNITY AWARENESS PROMOTIONAL PLAN (CAPP)

Template 1- Situation analysis of Baakline

Aim

The questions in the attached templates cover various areas of actions and levels of awareness linked to the behavioural change. It has been used to conduct a quick investigation on the awareness situation and the citizens' level of perception in the city concerning renewable energy and energy saving.

Filling out the templates has identified and assessed the conditions in the municipalities prior to preparing the CAPP and answers a number of questions, including:

1) Who is the target audience of the CAPP?
2) What are the priority issues to be addressed by the CAPP (that also could be identified by the PAED as priority actions)?
3) What is the level of awareness for the energy key problems? What are the main issues of concern to raise awareness about?
4) What are the previous awareness-raising actionsthat CAPP needed to be built on?
5) What is the situation, related to the public consultation, mainly based on?

Filling out the template helped in pointing out how raising awareness can be utilized as a tool to improve energy policy and facilitate the implementation of its actions. It has also allowed initiating discussions in the Communication Workshop and helped identifying appropriate campaigns and actions.

Specific objectives:

(i) Provide the necessary information about the current conditions and the situation regarding awareness of energy saving and renewable energy.

(ii) Help to identify the most appropriate a) **awareness raising campaigns** that would accompany the SEAP vision/strategy and b) the **awareness raising actions** that would accompany the priority actions determined in the SEAP.

Steps to follow:

(i) The SEAP team of the municipality has filled the templates based on their understanding and perception of the city's inhabitants. They were free to seek the opinion of a limited number of persons to help fill the answers.

(ii) The filled templates were discussed in the "CES-MED Communication Workshops", which were led by CES-MED Communication Expert and attended by the SEAP consultant and the SEAP municipal team. In parallel, the vision/strategy of the city and the proposed pilot actions in the SEAP were reviewed as part of the workshop exercise.

The outcome guided the selection of the most appropriate awareness raising campaigns and actions of the SEAPs including the ones related to priority projects.

Identification of the target audience and the importance they give to Sustainable Energy (audience targeted by the awareness raising campaigns and actions)			
Age group	Very important	Important	Not important
Women/Men			
Youth	X		
Middle Age	X		
Seniors		X	
Other (Children)	X		

Identification of priority issues to be addressed by a sustainable energy action and their level of importance			
Issue	Level of importance		
	Very important	Important	Not important
High price of energy	X		
Availability/lack of energy	X		
Availability of transport		X	
Waste management		X	
Clean environment	X		
Air pollution	X		
Other	X Water supply and use		

Identification of level of awareness (energy problems) and education of energy related issues			
	Very aware (through media or research)	Aware but not convinced	Not Aware
Impact on environment		X	
Cost of energy	X		
Waste of energy		X	
Climate change		X	
Ways to save energy consumption		X	
Water supply	X		
Existence of renewable energy		X	

Previous awareness actions conducted by the city/municipality or by other actors	
Has the city or local authority done previous actions	Yes
If yes, who conducted the actions (the city/municipality, NGO, national authority…)	EU Embassy in Lebanon MBAA-Baakline Municipality, the Chouf Souayjani Federation of Municipalities-FMCS, and The Lebanese University-UL through the SUDEP project (funded by the European Union).
If yes, describe the action	Ads and promotions published by the Ministry of Energy (MOE) through TV, billboards etc., encouraging citizens to buy solar system with challenging prices. A National event held on June 5, 2015 in the presence of the EU Ambassador Awareness campaigns to local population, led through SUDEP project, awarding the most efficient modes of energy consumption. Energy saving awareness actions involving MBAA representatives & citizens Awareness actions were raised by MBAA towards engineers and citizens to introduce them to the concept of green buildings and its benefits and train the professionals in this sector (a programme in collaboration with UL)*.
If yes, what was the budget and how did you fund it	Funded through the SUDEP project
If yes, outcome, impact and feedback	Outcome: SUDEP brochures and posters were designed to raise awareness in local population about the concept of energy saving and Renewable Energies. Impact: people became informed and aware of energy saving & the importance of Renewable Energies. Feedback: Positive. It was clear that local population showed interest in energy saving and renewable energy technologies through their participation and interaction and were willing to know more about it.

*The Municipality of Baakline is working on new regulations to exempt houses using green energy of municipal fees; attached a copy of the decrees in Annex 1.

Public consultation	
Does the city practice public consultation?	Yes
Has the city done public consultations for SEAP?	Yes, it did cover all Residential neighbourhood Committees members, but not all citizens.
Is it part of the legislative process?	YES
Foreseen consultation(s)	There will be more when needed.
Does the city liaise with national institutions, stakeholders?	Yes

Situation analysis

The study that targets age group and profile shows that the middle- aged and young audience are aware of and well-informed about the energy challenges. The children seem to be open to any new information. It is recommended to carry out the effective communication with them and get them involved in discussions to share their ideas, benefit from their opinion and disseminate them into the public.

For the oldest age group,more persuasion is needed on the issue as their environmental deeds are deeply rooted in their cultural norms and beliefs.

The template shows the important leverages on which our communication can be based upon. They includethe price and (non) availability of energy, the cleanliness of the environment and the water supply and use. The ambiguity lies in the fact that the citizens of Baakline, in general, are aware of some energy issues and challenges but do not feel convinced about their significant level except for the those related to household expenses and daily necessity (i.e. cost of energy and water supply) for Lebanon has been facing shortage of electricity for many years and shortage of water lately.

Nevertheless, the municipality of Baakline has conducted awareness raising actions and campaigns that are related to sustainable energy to the civil society as well as to its professionals in the energy sector. It was able to assess their positive impact on alerting the population about renewable energies and the importance of energy saving through the level of participation as well as the expression of their interest.

The means of communication, and the tools used were TV spots, billboards, a national event, competitions on efficient modes of energy consumption and less waste of energy with awards granted at the results.

These actions have been funded through the SUDEP Support Mechanism grant, an EU funded project.

Finally, public consultations, as part of the legislation of the city, have been well conducted by the municipality, with all residential neighbourhood committees' members, but have not reached all its citizens yet. Part of the legislative practice of the local authority, there will be involvement and engagement of the population through tailored messages and adequate tools.

Template 2.1

Proposed Communication or Awareness Raising Action related to Specific/Pilot Project: The waste issue

1. **Title of the Pilot Project**

   Waste Management Contingency plan خطة طوارئ لمعالجة النفايات

2. **Title of the Communication Action related to the pilot project**

   Two communication actions were prepared; one on MBAA level (Baakline Municipality plan for waste collection and transportation) and the other on FMCS level (A waste management contingency plan) .

3. **Location**

   Awareness campaigns held in FMCS building and other locations in Baakline as well as schools.

4. **Summary of the Communication Action**

   General Objective: Solving waste issue with an environmentally friendly approach.

   Key message:

   Federation, Municipality and Neighbourhood Committee…hand in hand to solve this issue.

   اتحاد، بلدية ولجنة حي ... ايد بايد منحل القضية

   Theme: Sorting at the the source, reducing waste volume

   الفرز من المصدر ، تخفيف حجم النفايات

   Target group: Citizens in Chouf Souayjani, households, economical institutions and schools.

   Tools and channels:

   - Brochures, posters, banners,
   - Launching competitions between schools and neighbourhood's committee

5. **Organization**

   Roles and responsibilities:

   The communication team of Baakline municipality will be responsible for conducting this AR action. Its members are: Amani Beaini, Najwa Hamadeh, Lara Shamseddine and Amira Hamadeh.

   Project lifetime:

   The project started on July 17, 2015. It will be carried on until the municipality reaches a positive feedback from citizens.

   Link to other opportunities and/or events:

   This campaign opened the door for residential neighbourhood committees RNC'S members to participate in decision making, which is a major target in our project "LETS' BUILD OUR INCLUSIVE CITIES OF CHOUF SOUAYJANI REGION AND DEVELOP THE PARTICIPATIVE DEMOCRACY" (ENPI/2013/329-025 financed by EU and implemented by Baakline Municipality and Chouf Souayjani Federation).

   Principal partners and stakeholders and their roles:

RNC's committees in all FMCS municipalities, citizens, and municipalities' employees are working together in order to achieve the goals of this campaign.

Staff training needs:

Several trainings from experts were held during the first stage of the project.

Technical assistance and expert needs:

Baakline municipality hired professional experts to train and lead the teams of all the municipalities included in the Federation, in addition to supervising the work.

6. Cost estimate

Estimated implementation cost:

The estimated implementation cost is around 25,000,000 LBP (Around=14,896€) per month

Funding source:

Municipalities will be funding the action for the time being.

Initial and start-up expenses and approximate operational Costs: NA

7. Next steps: Continuing in reducing waste volume, sorting at the source and operating Slayeb plant.

8. Follow-up, evaluation and impact assessment

These steps are always monitored and supervised by FMCS, and followed by additional actions that are needed.

Template 2.2

Proposed Communication or Awareness Raising Action related to Specific/Pilot Project: Energy Awareness

1. **Title of the Pilot Project:**

   Energy Awareness: A New Energy Vision, Baakline towards Smart City leading change into Chouf Souayjani region.

2. **Title of the Communication Action related to the pilot project**

   "Renewable energies can be reached by all"

   **"Sustainable development is a right for everyone,
   Participating and saving the planet is our duty "**

3. **Location:**

   Awareness campaigns will take place in MBAA & FMCS building and other locations in Baakline such as schools, universities and associations.

4. **Summary of the Communication Action**

   General objective(s):

   The main objective is to "transform Baakline into Smart City", reaching the EU 2020 target of CO_2, renewables and energy efficiency; to be economical, social and ecological friendly; and to lead change inciting FMCS Local Authorities towards signing the Covenant of Mayors.

   Key Messages:

   ✓ Local authorities are directly responsible to switch to energy efficiency techniques concerning their public buildings.

   Local authorities, with the help of the private sector,should increase the use of renewable energies and raise awareness to the public on the benefits of using energy efficiency technology (for the environment and for their pocket).

   ✓ Local authorities should get engaged in reducing their energy consumption and increasing their use of renewable energy within a specific period of time (from now till year 2020) within a percentage range (10 to 20 %).

   Theme:

   ✓ Developing and implementing sustainable policies and legislations, in moving towards and adhering to the Covenant of Mayors (CoM) and "Green Building".
   ✓ Showing energy efficiency and renewable energy in renovated and new buildings which can be replicated in the region and Lebanon.
   ✓ Capacity development for the eight other FMCS Local Authorities.
   ✓ Using media to change people's energy use behaviour.

   Target group:

   It is important to highlight the fruitful European grant contract (Europe Aid/134-505/L/ACT/LB- Support to Democratic Reform in Lebanon) in its supportto disseminate the expected results between all FMCS citizens and stakeholders, and appreciate the participation of neighbourhood committees (RC) that will be established in all cities of Chouf Souayjani. The targets groups of this proposed project will be as follows:

i) **The neighbourhood committees (RC) members** of FMCS cities (250 residents), who can, likely, help their LAs in disseminating the project benefits to incite the local people to experiment Renewable energies and to be more involved into the LA projects.
ii) **House holders:** This project is directed to all citizens of MBAA& FMCS who can minimize their power provision cost and enjoy a clean environment.
iii) **Architects &Engineers** (around 220 persons into the 9 FMCS cities) deeply concerned about the concept of the "Green Building".
iv) **Contractors and environmentally-conscious developers** (around 80 persons) they are the ones who put the engineers plan into action and follow up step by step the constructions that are taking place; therefore, they must be informed properly about the ways renewable energies work and how to establish "eco-construction".
v) **FMCS Local Authorities** who showed interest in renewable energies; this project comes as a support for providing a new way of Energy Supply by moving towards and adhering the CoM.
vi) **12 Environmental Committees and associations** interested in all issues protecting the environment from pollution. They are ready to adopt and support this project.
vii) **9 Public Health Committees** interested in every issue that prevents various sources that influence health from causing any damage, like polluted environment.
viii) **Private sectors, especially Small and Medium Enterprises** who can reach necessary opportunities to create more jobs and small businesses, especially for young people and researchers.
ix) **Final beneficiaries:**
- All the citizens of Chouf Souayjani Region (from any age and gender), FMCS LA-s, FMCS private and public sectors.
- The local authorities of the FMCS.
- All Lebanese citizens, LAs, private and public sectors.

Tools and channels:

In order to ensure the improvement of the awareness and involvement of the local population with regard to sustainable local policies, including sustainable energy, a dissemination and visibility plan will be undertaken to assure the followings issues:
✓ Prepare and submit recommendations and actions to ensure sustainability and replication of the project results.
✓ Disseminate project results among the beneficiaries and related stakeholders.
✓ Disseminate the scientific study that will be produced by LU, in order to spread the information to the 9 cities of Chouf Souayjani Region. This study will also help as a reference in the energy efficiency and renewable energy field in the Chouf Caza and Lebanese cities and towns.
✓ Disseminate information, attract Local Authorities to join the CoM, appeal to private and public actors, and organise networking activities.
✓ Produce tailored promotion materials in Arabic on sustainable urban development based on renewable energy policies.
✓ Develop the communication strategy that includes Media communication campaign.
✓ Plan and implement the specific communication activities based on the communication strategy.
✓ Develop global media and events platform where stakeholders can share knowledge, technologies and expertise, and identify innovative solutions to the challenges faced by climate change and a growing population.
✓ **Set up and maintain a high-quality and user friendly project website that can be connected to other European website, (such as: www.citiesengage.eu).** The objective being to ensure good communication, visibility and spread results of the programme and its demonstration projects; disseminating good practices that could serve as model actions in the implementation of SEAPs in other municipalities (possibly including exchanges between neighbourhood regions).

The communication tools will be as follows:

- **Website and Social Media**
- **Logo**
- **Dissemination material (mailings, leaflets, newsletters…)**
  - Flyers, Brochures, T-shirts & Caps
  - Vinyl installation
  - Local Magazines

Videos, TV & Radio Conferences

Awareness campaigns, Training sessions, workshops & Conferences

Events/PR

National & local Events & Artistic performance

5. Organization

Roles and responsibilities:

All of the planned activities are to be documented via progress reports, records either visual or audio, photos, press agencies in addition to any other media tool that will be available during that event.

Project lifetime:

The planned communication activities will take place during the eight coming months, since this period will cover the schools and university year.

Link to other opportunities and/or events:

We can take into account a number of "International Days" to mark important aspects of human life and history (like the Environment day, etc.) which intersect the construction phase; meaning that some of the foreseen activities could be held in conjunction with these international occasions basing on the time availability.

Principal partners and stakeholders and their roles (1):

MBAA, FMCS and their citizens take the lead in mitigating the effects of climate change through the development and implementation of sustainable energy policies. Under an exceptional model of multilevel-governance (municipality and Federation of municipalities) and subsidiary in action between MBAA and FMCS, the project can develop or strengthen existing partnerships between local and regional authorities. The project provides an environmentally responsible solution for local communities, and will allow protecting and enhancing the quality of the environment and making decisions which reflect the environmental impact of the use of energy.

On the other hand, National organizations, local associations & existing SMEs in Chouf Area will be major partners of the project

Staff training needs:

Our staff could ask for a training session with experts, a workshop or conference to improve the knowledge level in sharing better ideas and smart solutions.

Technical assistance and expert needs:

Experts on Renewable energy and energy saving.

6. Cost estimate

Estimated implementation cost in Euros

Activity	Budget
Creation of Project website & Logo	3410
Production of Communication Materials	25960
Organization of media campaigns on social networks	2200
Organization of Seminars / Training sessions/ workshops sessions	26540
Carrying out awareness campaigns	18810
Field visits	4675
Carry out local events	8800
Carrying out national promotional event	3300
Production of video DVD	7150
Advertisements on newspapers & Press conferences	770
Artistic performance	18150

Funding source (available and foreseen)

This project is partially funded by the European Union project SUDEP (50%):

The European Union contribution to this project will be made apparent in all produced communication materials either when printed or released.

7. Follow-up, evaluation and impact assessment

This project will be followed up by our team. A monitoring and evaluation system will be established by Baakline municipality to ensure a suitable implementation of this project.

The project provides the local communities an environmentally responsible solution for the impact of the energy use that will protect and enhance the quality of the environment..

The greatest challenge of community's partnerships is to use their own assets and to internalize the need to improve their life styles; this can be achieved through the individual and community empowerment. This process will be achieved through lobbying activities towards the main concerned actors and a strong visibility campaign. The results of this campaign will lead to an increased awareness and participation of both the institutional and the civil society organizations.

Communities must become equal partners in the development process through the involvement of all their members in the analysis of the existing assets as a starting point for launching an investment initiative, rather than becoming recipients in need of expertise.

Template 3.1

Identification of CAPP CAMPAIGN TOPIC related to sustainable energy challenges

Once the Sustainable Energy challenges and priorities, the general awareness raising priorities, and the specific awareness raising needs related to SEAP actions are identified, the CAPP's main areas of intervention and activities can be defined. The table below portrays the challenges, priorities and related AR activities.

Challenges:	Priorities:	Awareness Raising Priorities, Topic & Activities of CAPP Campaign
High percentage of Co2 emissions (generators, heating appliances, transportation appliances….)	Reduce CO2 emissions. Practice responsible behaviour toward our planet. Encourage people to use common transportation vehicles. Encourage people to switch to solar systems.	**Topic** : **CO_2 emissions are dangerous for the planet and for the environment.** **Activities**: Raise awareness about decreasing CO_2 emissions by introducing citizens to the renewable energy technologies through leaflets, carpooling, a day without cars. Set a department within the municipality to provide energy advice to the citizens. Promote the usage of solar water heater through fairs, direct communication, (Baakline Municipality published two decrees related to solar water heating and for installing a full solar system).
Water consumption (lack of water due to overload on usage)	Promote and practice responsible controlled water consumption (to save water and reduce the water bills). Promote treated waste water to be reused.	**Topic**: **Save water as a collective heritage: adopt better social behaviour towards water consumption** **Activities**: Provide fact sheets to explain the risks of water scarcity and the negative effects of high water consumption and how overcoming water scarcity is possible as a collective action. Raise awareness, educate and inform users on water resources, and their limitations. Provide practical tips on how to reduce water consumption with stickers, educational films, documentaries, distribution of water stream reducers. Introduce users to new methods and procedures adopted by the municipality to control water consumption: water meters to be installed on water sources delivering the needed quantity for every neighbourhood according to the number of citizens. At a later stage the municipality is planning to fix a water meter for every home for a better individual

		water expense calculation.
Overconsumption of energy	Consume energy more responsibly Reduce the city's energy bills Reduce the impact of greenhouse gas emissions	**Topic:** **Energy-saving measures are easy, daily small steps.** **Activities:** Provide citizens with some practical tips on how to save energy in their homes. AR campaign of being eco-citizen: Explain the side effect of greenhouse gas emission and the usage of renewable energies technologies (electricity from natural resources). Distribution of LED lamps.

Template 3.2

CAPP activities as related to SEAP Priority Actions of Baakline

This template will guide the municipality in the implementation of a strategy and the identification of adequate awareness raising activities according to the target group and its needs related to the priority actions identified in the SEAP.

SEAP Priority Actions	Related CAPP Activities:
1- Smart Street lighting system with low consumption lamps	**Target Audience:** - Civil society, - Private and public operators **Key Message:** - The installation will benefit the city at both the environmental and the economic levels, thus applying renewable energy to urban areas is important. **Objectives:** - Promoting the installation of similar equipment in other urban common areas - both public and private **Communication Tools:** Awareness raising documentary on TV. Posters nailed on street lamps to alert citizens on municipality action Promoting the usage of efficient lighting through distribution of led lamps. Training students to use energy effeciently.
2- Solar Water Heater for each house in Baakline	**Target Audience:** - Civil society - Private and public operators **Key Message:** - You can get hot water for 300 days a year in your house with zero emission and zero cost. - Solar energy is everlasting! **Objectives:** - Decrease Co_2 emissions and be responsible towards the planet. - Increase sustainability. - Reduce the electrical billing cost for household. **Communication Tools:** Awareness campaigns: production of promotional material (leaflets, brochures, posters, catalogues) and perhaps billboard advertisements. Exhibitions of solar equipment Info days for the citizens, dissemination of messages through radio, newspapers and television, especially using local media.

3- Smart management for drinking water (from resources to end users)	**Target Audience:** - Civil society - Private and public operators **Key Message:** - Water is a source of life: don't waste it - Manage it smartly; ensure your consumption over the year. **Objectives:** - Increase the awareness for water saving - Reduce the billing cost for water on high demand season. - Reduce non-revenue water (reduce wasted water or water leak) - Increase efficiency and sustainability - Get young people's full commitment in the control of the hydrous heritage. **Communication Tools:** Raise young people's awareness: exhibition of drawings related to water, various competitions in literature, music, drawing, and painting also related to water, with prizes awarded. Launch a campaign for the general public with a view to enticing people to save water, through messages conveyed by television, the radio and the written press. Host grey water for citizens and encourage them to use it.
4- Smart solid waste management collection, transportation and treatments.	**Target Audience:** - Civil society - Private and public operators **Key Message:** - Waste should not be wasted: Reduce the amount of solid waste and save your environment. **Objectives :** - Increase the awareness for reducing the thrown amount of waste - Reduce the billing cost for waste collection and transportation - Practice responsible and integrated waste management within the city - Increase sustainability **Communication Tools** Awareness campaigns and seminars to explain the negative effects on solid waste accumulation Launch AR regarding the SEAP and the municipality's vision Provide incentives and taxes related to the solid waste in commercial and residential sectors Provide practical tips to reduce solid waste at its source, to re-use and recycle. Launch awareness operation: cleaning day and sorting in neighbourhood. Issue a «Clean» certificate for deserving ones. Installation by the municipality of recycling bins in all municipal buildings and

	facilities promoting recycling of plastic bottles, batteries, paper. Educational kits - with a view to teaching young people how to recycle and reuse waste.
5- Solar Power for each house in Baakline	**Target Audience:** - Civil society - private and public operators - Professionals in energy sector **Key Message:** - You have the power to have free power **Objectives :** - Reduce the diesel generator billing cost for household - Round-the-clock electricity - Increase sustainability - Decrease the Co_2 emissions and practice responsible toward our planet. **Communication Tools** Exhibitions or demonstration fairs Awareness campaigns: brochures, catalogues, posters. Distribute fact sheets that include data on the importance of solar energy, its advantages and the savings expected in %. Create an info center to inform citizens about new technologies.
6- Create parking lots (underground) for cars in congested allocation like Baakline Main Hall, main entrance for Baakline Shouf National College, main souk & Increase the road capacity.	**Target Audience:** - Civil society, specifically young people - private and public operators **Key Message:** - For a cleaner, safer and quieter city - If you care (about the environment), share (your car) **Objectives:** - Reduce the fuel consumptions and congestion - Increase sustainability - Increase roads capacity - Encourage car sharing **Communication Tools** Awareness campaigns to young people (to whom mobility is important) on car sharing Build AR campaigns to transport decision makers and other community groups, in particular the disabled and the elderly (shared taxi called “service”). Use all media forms and produce imaginative posters, local TV and radio press articles about the issue. Promote a car pooling scheme run on the Internet and co-financed by the municipality, at the disposal of all employees and city dwellers. Define practical advantages for car sharers (public or private sector) when

	setting up employees' mobility plans (such as free and dedicated parking places, financial contribution from the company for petrol, free bicycles, access to the repair shop, etc.).
7- Waste water treatment and management for remaining part of the city	**Target Audience:** - Civil society - private and public operators **Key Message:** - Nature provided you with a treasure: save the underground resources **Objectives:** - Save underground water from waste water pollution and leakage of the waste water without treatment **Communication Tools** Raising Awareness of finite resources with a series of short videos to highlight the impacts of wastewater on the ecosystem and on the community, and the benefits of a better management for various audiences. Contribute to press releases, media advisories, press conferences
8- Expansions of existing main roads	**Target Audience:** - Civil society - private and public operators **Key Message:** - The municipality is providing a safe, high-level road network **Objectives :** - Decrease CO_2 emissions from automobiles - Increase the road capacity - Reduce gas emissions and carbon footprint **Communication Tools** Awareness of the problems caused by car traffic: congestion, pollution… AR campaigns on road safety for all users in the road traffic system Promote network and traffic management Launch effective communication for all responsible parties to ensure the efficiency of the programme. Design clear signage for speed limits, directions, etc.

Recommendations:

These tables have been thought and prepared by the communes and municipalities. In this approach, they aim to promote in a particularly innovative and ambitious way local communities' response to current challenges identified in the SEAPs, notably in the management of energy and the promotion of renewable energies. They allow us as well to identify the most appropriate communication actions to reach the local community.

In the case of Baakline specifically, the senior target group has very little interest in the topic and is very suspicious about the literacy around it. We need to find out what would be the best way to anticipate the barriers that affect their choices and preferences for their environmental behaviours. The actions will be seen as a credible message if promoted through the proper insight: cost of their bills, a concrete concept as where the climate change might sound like a virtual one. The one question they might need an answer to is: "what's in it for me?"

On the other hand, young people and students are high dynamic and face changing situations; they are clearly educated to the energy issues and climate change. They are able to influence the policy-making process while reshaping the general public interests and specific constituencies, such as consumers, workers, and households; it is essential to endorse their processes of perception, judgment and reasoning regarding renewable energies information.

As for children, they can be the best censors when convinced of the validity of behaviour. If it is the case, they will not only apply it, but they will also see to it that the elders and their relatives apply it too. It is necessary to shape their perception with educational approaches so that they will become the cornerstone of water-saving and respect for the environment.

Baakline municipality is a very active force, setting various challenges and aiming at meeting them. However, it needs to assess the perception of options it offers to her citizens as viable and sustainable alternatives that will benefit them; use the adequate medium to deliver its message and lead the people in their choices towards a change in behaviour, enabling individuals to make informed decisions. Awareness-raising should be carried out in an interconnected manner between the municipality and its citizens to create cohesion and therefore persuasion concerning the ongoing projects and the future ones.

Therefore, it is important to use a leverage which we can use and base our communication upon such as:

- Establish a strong and dynamic communication methodology to facilitate the planning and implementation of SEAPs as well as stick to the vision slogan in every communication to highlight the goal aimed at (leading change);
- Express a clear political commitment to involve individual target groups in future planning procedures to adapt/improve measures according to specific demands;
- Set up a permanent forum with representatives of the various target groups (including the ones from the union of municipalities);
- Communicate and promote at the municipalities level about actions and measures toward energy saving and energy efficiency that improves the quality of life in the city.
- Empower the communication cell within the municipality, plan to set up its structure, strengthen its capabilities and its human resources. It can carry its actions at the level of the municipality, in order to build a sustainable awareness plan adapted to the project of the city and connect with its citizens in order to implement the concept of eco-responsibility.

References to annexes

Annex 1: decree for new regulations to exempt houses using green energy of municipal fees
Annex 2: Decree for Contingency plan for waste treatment in the towns of Chouf Souayjani
Annex 3: Municipal banner on collecting sorted waste
Annex 4: Posters for sorting solid waste
Annex 5: Stickers for sorting

Annex 1

الجمهوريـــة اللبنانيـــة
قضـــــاء الشــــوف
بـــلـــديـــة بعقـــليــــن

التاريخ : ٧ / ١٠ /٢٠١٥
الصادر : ٧٠

قرار مجلس بلدي رقم (٧٠)

إن مجلس بلدية بعقلين المنعقد أصولاً يوم الإربعاء بتاريخ ٧ /١٠ / ٢٠١٥ برئاســة رئيسة البلديـــة الدكتورة نهى الغصيني ابو عجرم وحضور الأعضاء السادة : نائب الرئيس جميل رافع - منى ابو حمدان - جميل حماده - ناصر بو رغيم - غسان بدور - أنور ابو عجرم - صبحي الحلبي - محمد فضل - نبيل المصفي - مأمون تقي الدين ،

وتغيب بعذر الأعضاء السادة : هيثم الصعيدي - هادي حماده - هادي ابو شقرا ،

وحيث أن البلدية منتسبة الى ميثاق رؤساء البلديات حول الطاقــة المستدامـــة مـــن خــــلال البرنـــامج الأوروبي الذي أطلقـــه مكتب المساعدة التابـــع لمشروع توفيـــر طاقـــة نظيفـــة لمدن البحر المتوســـط CES-MED تحت إشراف وزارة الداخلية والبلديات.

وحيث أن بلدية بعقلين قد ربحت منحة من مشروع SUDEP الممول من الإتحاد الأوروبي وهي تنفـــذه حالياً بموجب القرار البلدي رقم ١٩ تاريخ ٢٠١٤/٤/١١ – بعقلين نحو مدينـــة ذكيـــة – تقـــر مفهـــوم الطاقـــة المستدامـــة في منطقة الشوف السويجاني .

وحيث أن هذا الأمـــر ينعكس إيجاباً على إقدام المواطنين على إستخدام الطاقـــة البديلـــة،

وبما أنه يجب تحفيـــز سكان البلدة على إستخدام الطاقـــة البديلـــة وتخفيف الإنبعاثات الحرارية .

بناء على قانون البلديات وتعديلاته

– يقـــــرر ما يلي–

مادة أولى: إعفاء أصحاب الوحدات السكنيـــة الذين سوف يبادرون على تجهيز كامل منزله بإنارة الطاقة البديلة من رسوم المياه لمدة خمس سنوات.

مادة ثانية: ينشر ويبلغ هذا القرار حيث تدعو الحاجة.

الأعضـــــــــــــــــاء **نائب الرئيس** **الرئيس**

Annex 2

خطة طوارئ لمعالجة النفايات في بلدات الشوف السويجاني

- **يعلن اتحاد بلديات الشوف السويجاني والبلديات المنضوية به عدم القبول بتكليف مجموعة افيردا (بما فيها سوكلين) بما ورد في كتاب وزارة البيئة رقم 3521 / ب تاريخ 2015/7/25، وذلك منذ 17 / 7/ 2015، تاريخ التوقف الأول لهذه المجموعة عن العمل.**

- يتكلف اتحاد بلديات الشوف السويجاني، يعاونه ماليا البلديات المستفيدة، بتأمين فرز النفايات في مكب الصليّب لحين تشغيل معمل فرز النفايات في المنطقة ذاتها.

- تتعاون البلديات مع الاتحاد في تحمل كلفة معالجة النفايات في معمل فرز النفايات وتسبيخ المواد العضوية

- تتكلف كل بلدية تأمين نقل النفايات من بلدتها الى معمل الصليب وعلى نفقتها الخاصة

- تتكفل كل بلدية بتعميم مبدأي الفرز من المصدر والتخفيف من حجم النفايات قدر الامكان، كذلك توزيع المنشورات التي تم تحضيرها من قبل إتحاد بلديات الشوف السويجاني وبلدية بعقلين. يساعدها في هذه المهمة لجان الأحياء والجمعيات الاهلية المتواجدة في البلدة

مجلس اتحاد بلديات الشوف السويجاني

بعقلين فيه 2015/9/2

Annex 3


تعلن بلدية بطشاي عن البدء بجمع النفايات مباشرة من المنازل ابتداءً من يوم الجمعة ٢٠١٥/١٠/٩ حسب البرنامج التالي
١ - النفايات العضوية يومي الاثنين و الجمعة من كل أسبوع
٢ - النفايات الصلبة يوم الخميس من كل أسبوع
نأمل من الجميع التعاون و الالتزام بفرز النفايات من المصدر و تخفيف حجمها و عدم رميها على الطرقات حفاظا على الصحة العامة و نظافة بلدتنا
بلدية بطشاي
نشكر تعاونكم

Annex 4


النفايات الصلبة
غير العضوية
زجاج + تنك +
بلاستيك + ألمنيوم
+ كرتون + ورق ...
يتم وضعها في الأكياس
المتوفرة (غير سوداء اللون)
خطة الطوارئ لمعالجة النفايات


النفايات العضوية
فضلات طعام + محارم
+ ورق جرائد + حفاضات أطفال
+ مناشف ورقية ...
يتم وضعها في أكياس
سوداء اللون
NEWS
خطة الطوارئ لمعالجة النفايات


... إيد ب إيد منحل القضية
خطة طوارئ لمعالجة النفايات
لا للمحارق
لا للمطامر
نعم للتسبيخ
نعم لثقافة الفرز وإعادة التدوير
النفايات الصلبة
غير العضوية
زجاج
+
تنك
+
بلاستيك
+
المنيوم
+
كرتون وورق
النفايات العضوية
محارم
+
فضلات طعام
+
ورق جرائد
+
حفاضات أطفال
+
مناشف ورقية
+
يتم وضعها في أكياس
سوداء اللون
الرزنامة الأسبوعية
الإثنين
الثلاثاء
الأربعاء
الخميس
الجمعة
السبت
الأحد
اتحاد بلديات
Chouf Charaka
شوف شراكة

Annex 5


Chouf Charaka
شوف شراكة
خطة طوارئ لمعالجة النفايات
Scrap
(Organic Food)
فضلات طعام
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Cover and layout design: Harutyun Urpatyan

The European Union is made up of 28 Member States who have decided to gradually link together their know-how, resources and destinies.

Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms.

The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

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