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Palestine
Municipality of Hebron
Sustainable energy action plan (SEAP)

بلدية الخليل

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Sustainable energy action plan (SEAP)

Municipality of Hebron

- Palestine -

Integral document of the sustainable energy action plan

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1. Strategic vision

1.1. Municipal strategy

The development of a municipal strategy – in consultation with elected officials and other local stakeholders – that is endorsed by the municipal council is critical for the effective implementation of national policy at the local level. The strategy, which comprises quantifiable objectives, is the basis for developing actions and measures to reduce energy consumption and integrate renewable energies in the territory.

The development of the sustainable energy action plan (SEAP) constitutes the basis for implementing the municipal strategy. It requires:

- The **strong involvement of local elected officials** during all of the phases of the SEAP project in order to direct and ensure a coherent overall municipal policy. To implicate elected officials, actions must be carried out to inform, educate and train them on national energy efficiency and renewable energy policies.
- **The action plan must be developed based on the specific energy situation of the municipality outlined in the baseline emissions inventory (BEI)**: the sectors that consume the most energy and that emit the most greenhouse gases in municipal property as well as other sectors in the municipality
- **Setting up and training of a municipal sustainable energy unit**: energy is a transversal issue that touches several levels of municipal services. In order to manage it properly, a team, with well-defined roles and responsibilities, will be created to manage and monitor the action plan, as well as to provide feedback on and evaluation of the implementation process, so as to ensure its efficiency.

In addition, in order to guarantee the development and efficient implementation of projects, the municipal local authorities must:

- Follow energy efficiency and renewable energy regulations
- Define a clear and long-term local energy policy for the municipality
- Set aside an annual budget, based on the action plan laid out in the SEAP, for energy efficiency and renewable energies
- Inform, educate and train municipal employees on an on-going basis
- Create partnerships with local professionals for energy efficiency and renewable energies
- Search for additional funds to complement the municipal budget and financial backing to support the execution of the SEAP (energy efficiency and renewable energies)
- Develop public private partnerships (PPP)

The public promotion of the local energy efficiency, renewable energy and environmental protection strategy will provide visibility for all of the local actors and stakeholders that take part as providers or beneficiaries. The regulatory and incentive measures put in place will stimulate the local market, attract national investors and local entrepreneurs to contribute to the development of the market and will create local jobs.

1.2. Municipal vision

The municipal vision is based on the strategy and medium to long-term objectives of the municipality, as well as those at the national level. Keeping in mind its specific context, the municipality is developing a strategy consistent with the Palestinian energy strategy and the sustainable development needs of the territory.

This strategy is structured around two levers:

- Reduce energy consumption in all sectors through energy conservation and efficiency, in order to provide better services while reducing costs and impacts.
- Promote energy production from locally available renewable resources in order to cover, as much as possible, energy needs from these decarbonized sources.

As energy consumption is dependant on many stakeholders within a given territory, the strategy needs to include all of the concerned actors. All of the activities that take place within the territory will be included in the energy consumption reduction and renewable energy promotion measures. These measures also strive to protect the local environment (air, water, soil, waste) and contribute to the protection of the national and global environment (GHG).

On-going information and awareness raising actions must lead to the strengthening of energy consumption reduction commitments and the increase in production of local renewable energy by actors operating in the territory. These activities include the following sectors:

1. Housing stock (energy conservation and efficiency/renewables energy development)
2. Housing market (mobilisation of professionals)
3. Transport and mobility (planning and reduction of urban traffic)
4. Active mobility (development of a cycling policy and promotion of walking pathways)
5. Mobilization of the local industrial sector
6. Management and treatment of solid waste and wastewater
7. Development and integration of renewable energies
8. Development of a local renewable energy market.

1.3. Municipal objectives

In accordance with national policy, the Municipality adopted the following strategic objectives within the framework of its sustainable energy development policy:

1. Reinforce and promote energy efficiency in municipal property, public infrastructure and other local activities.
2. Promote the integration of energy efficiency and renewables into public and private housing construction projects in the municipality.
3. Integrate the development of energy efficiency and renewable energy into the municipal sustainable development plan (job creation, local energy efficiency and renewables market, market for local services, etc.).
4. Implicate all of the territorial actors in the promotion of energy efficiency and the development of renewables,
5. Develop a sustainable energy action plan (SEAP) in the city.
6. Develop partnerships with all of the providers that are favourable to the implementation of the SEAP.
7. Reduce energy consumption and GHG emissions by 20% in the Municipality by 2020.
8. Inform the public about the true cost of energy and make known the incentives and initiatives that encourage energy conservation and efficiency.
9. Create energy conservation and efficiency, renewable energy development and environmental protection communication plans that target the local population and the socio-professional categories present in the territory of the city.

10. Reduce energy needs during peak periods by managing electricity demand and by changing energy and gas consumption behaviors and habits.
11. Coordinate with the government on the national strategy and energy efficiency and renewable energy action plan, as well as on the review of the municipal sustainable energy action plan.

Among these objectives, the primary objectives of the municipality are to:

- Reduce energy consumption across the board by around 20 to 25%
- Reduce GHG emission by 20 % in 2020, compared to the business as usual scenario and using the 2014 baseline.
- Continue efforts to reduce energy consumption and improve efficiency resulting in a continuous trend of improvement of energy intensity (Energy consumption compared to Gross development product)
- Continue reducing GHG emission with the objective of containing GHG per capita below 1,8 tons or less on the long term as a significant contribution to global efforts to combat climate change, in application of the Paris Agreement adopted at COP21.
- Improve services to inhabitants and all stakeholders in order to promote a better quality of life in the city.

To place the issues of the territory into perspective, it is important to note the results of the Baseline emissions inventory (BEI) of the municipality:

- **Consumption:** Transport and residential buildings account for 40% and 33%, respectively, of energy consumption in Hebron.
- **Emissions:** Residential buildings, transport and industry are the largest emitters of greenhouse gases and account for nearly 70% of Hebron's emissions.
- **Emissions from municipal property:** Public lighting is the main source of emissions from municipal assets, although it accounts for less than 1% of the city's overall emissions.

1.4. Implementation of the strategy

In order to implement the strategy, it is necessary to develop a municipal sustainable energy action plan. The SEAP is based on the assessment of all the sources and types of energy consumed and the GHG baseline emissions inventory (BEI).

The action plan must include actions to reduce energy consumption as well as support measures to ensure that the plan is executed according to the set calendar.

The action plan is structured in two parts:

- **Actions for municipal buildings and services:** presentation of the activities that fall under the direct responsibility of the municipality (the buildings it manages and the services that fall under its authority).
- **Actions on the territory of the municipality**:
    - Presentation of the activities that can be put in place independently of municipal actions, but that need to be supported and facilitated by the municipality in order to ensure the coherence of the different projects.
    - Presentation of the main potential actions to create and develop a renewable energy market, as well as the constraints and barriers that must be overcome.

2. Actions on municipal buildings and services

2.1. Municipal buildings

The municipality owns many buildings in different locations representing a total of 133.000 square meters that could be detailed as follows:

- 60.000 square meters of offices (including, the city hall, administrative sites, water and sanitation offices, electricity management building, library, cultural center, etc.)

- 13.000 square meters of commercial facilities, warehouse and technical equipment and
- 60.000 square meters of schools.

All these buildings represent a potential of 32.000 square meters of roofs that could be equipped with solar PV.

Municipality buildings consume 2,122 MWh of electricity per year (2014 reference) and 2,265 MWh when counting all types of energy. This consumption is composed of electricity - lighting, cooling and heating, office equipment (computer, copiers, etc.), elevator, etc. - but also in minor parts, of gas and diesel. The electricity bill from municipality buildings alone represents 271 K€.

Short-term actions

The Municipality is willing to develop initiatives to reduced energy consumption but so far no consistent plan was implemented. More efforts should be done in **raising staff awareness** on simple change of behaviour to save energy without significant investment:

- Open curtains and window shutters during daytime to avoid artificial lighting.
- Keep inside temperature between 21°C maximum in winter, and 24°C minimum in summer to ensure good comfort all year long and make strong cut in energy consumption.
- Avoid elevator and choosing stares when going up or down one or two floors.
- Turn off electric equipment at end of working time or when not actually used.

It would be interesting to promote a challenge between services / units to invite all workers from the Municipality to make efforts to save energy. The best performing service would be celebrated as “energy saver/ climate saver”, and would get a special gratification.

These activities will be promoted by the Environmental awareness unit, which will be set up within the Municipality communication department (see priority action #5).

Long-term actions

Beyond promoting awareness and behavioural change, it is necessary to develop a clear and comprehensive plan to replace old devices and equipment and **install energy efficient** systems that will help reducing electricity consumption. Ideally, this programme should be implemented, in a first phase, in a small number of buildings (starting with the more symbolic one: the city hall) but covering all type of devices and equipment, in order to concentrate many initiatives on the selected buildings and demonstrate the benefit of these structural changes:

- Switch from AC / Heating reverse systems to central management of heating and cooling.
- Switch to LED lighting and install motion sensors in offices. This device turns the lights off during un-occupied periods. This can reduce lighting consumption by 20% to 80% depending on the occupancy type of these areas. A case study, conducted in Tulkarem, demonstrates that a 30% cut could be easily achieved installing such sensors in key areas, with a pretty limited investment (1,200€ / 100 square meters) and very short payback period (22 months)[1].

These technical projects need to be tightly monitored to register impact on energy consumption reduction to prepare progressive enlargement to a larger number of targeted building.

Obviously the design and construction of new buildings should follow more stringent rules and new requirements allowing far better energy performance.

2.2. Street lighting

Street lighting in Hebron consumes 5,860 MWh of electricity per year (2014 reference), which represents an overall annual cost of 775K€.

The structure of the system can be described as follows:

Lamp power in Watt	Number of units
400	235

[1] Promotion of energy efficiency & renewable energy in strategic sectors in Palestine, Tulkarm Municipality Report. 19, June 2012.

250	2535
150	1347
100	1318
70	587
Total	6022

Short-term actions

Replacement of HPS lamps / PRIORITY ACTION #1

From initial investigations run in Hebron and other cities, replacement of old lamps by modern technologies (LED), appears to be very cost effective.

One option could be to set up an initial fund (200 to 500K€) to feed in a revolving fund dedicated to old lamps replacement. Hebron electrical department, managing street lighting, would set up a tight budget monitoring mechanism to precisely measure reduction in electricity consumption. The money saved would be invested again in lamp replacement. This set up can allow replacement of all lamps over time (5 to 7 years depending on technical choices) and ensures full replenishment of the initial investment fund.

The detailed process for this revolving fund is described in the priority action presentation fiche.

Long-term actions

Based on the Master plan currently in preparation in cooperation with CHF/Global communities, it will be soon possible to design a **street lighting strategic plan** identifying areas of differentiated usage, where lighting would be then adapted to the actual needs per specific area.

- Main roads, avenue and city entrances where high intensity lighting should be necessary at least between sunset and midnight and before sunrise. Note that lighting intensity could be easily reduced, even in these areas between midnight and few hours before sunrise.
- Secondary streets where reduced lighting intensity should ensure safety while allowing low energy consumption.
- Specific areas (parks, narrow streets, pedestrian areas, etc.) where motion sensors should be installed to light up when people are around and avoid lighting when nobody is there.

2.3. Water delivery

Water is a very scarce and strategic commodity in Palestine. Daily life of citizens, as well as the entire economy, depends on water availability. This is even more complex in Hebron, as the city has no direct access to water (no wells, no natural springs) and has to buy all its water from Israel. Thus the city faces many difficulties due to the limited quantities allocated by the Palestinian Water Authority in accordance with the “agreement” signed with Israel (Hebron protocol).

The Municipality aims at distributing 20.000 cubic meters per day (more or less 100l/capita or 7.3 million cubic meters/year). However, this capacity should be 40.000 m3 to take into account losses on the network and growing industrial needs.

The Municipality consumes 1,012 MWh/year for water distribution, representing a cost of 134K€.

Short-term actions

Efforts will continue to promote energy efficiency through working on pumping engines (adopting variable speed pumps). Improved management of pumps can reduce consumption by 15 to 20%.

Long-term actions

Restructuration water distribution / PRIORITY ACTION #2

The only significant change that would both improve the quality of delivery and reduce energy consumption will come from a different structure of the water delivery system. This new model must be based on big reservoirs placed on the heights of the city, using gravity to distribute water to all buildings. Energy consumption of both Municipality and residents would be then reduced. Hebron geography allows such a set up.

Ideally, the pumping station attached to the two or three reservoirs that would be installed must be

surrounded with solar PV, to cover, at least part of, the electricity needs of the pumping stations.

The first step of this action is to run a detailed **feasibility study** that will help define the appropriate size and location of the reservoirs.

It is important to mention that such a new water delivery system, will not only improve daily life of people and companies in Hebron, it will also generate significant cuts in energy consumption, reducing pumping needs, but also reducing transport of water by truck made necessary by water shortage on the network.

2.4. Water treatment

So far sewage from the Hebron Governorate runs untreated through populated areas causing a substantial damage to the aquifer and the health of residents. These environmental and sanitary impacts have been a serious challenge for many years as the sewage affects the communities living alongside the stream in Wadi As-Samen and pollutes the eastern aquifer used as a supply of potable water for the southern West Bank.

On April 22nd, a group of funding agencies - World Bank, US Aid, AFD - approved a US$ 67 million grant for the building the Hebron Regional Wastewater Management Plant. This plant will reduce environmental pollution from wastewater produced in the Hebron Municipality.

The wastewater treatment plant will treat the entire sewage stream coming from Hebron city. The project should be launched in 2015 and the plant would start operating end before 2020.
Hebron Municipality should explore the opportunity to add a bio-digester to the plant that could also process bio-waste collected in the city to produce methane (and then electricity).

Water recuperation and local development / PRIORITY ACTION #3
This "local economy" will avoid importing fodder, meat, milk, and cheese from Northern West bank and from Israel, reducing energy consumption of transport and cutting GHG linked to these avoided transports.

It is important to mention that this project is not only a smart way to give added value to exhaust from the wastewater treatment plant, it is also an interesting plan to adapt to climate change.

Note: The impact of this component in terms of GHG reduction can't be assessed at this stage.

2.5. Solid waste management

Hebron waste management service collects nearly 220 tons per day (68,640 tons per year). Waste composition shows a lower proportion of bio waste than in other cities of the West Bank (35% bio waste – 12% carton – 10% plastic - 3 % glass – 4 % mix).

The service operates 17 old vehicles to collect and carry the waste to the transfer station located in Hebron industrial zone. From there it goes by 40 tons trucks to Al Menia landfill, managed by the Joint Council Service gathering various Municipalities from the Southern part of the West Bank.

Hebron Municipality pays 30 NIS/ton of waste entering the landfill when it ensures waste collection on its own. It pays 50NIS/ton when collection is managed by JCS.

Short-term actions

The Municipality already engaged in various actions to **improve waste management efficiency**:

- Trucks management controlled by GIS,
- Optimization of the service with adequate container for the suitable neighborhood,
- Improvement of transfer to sorting station and landfill,
- Improvement of collaboration with the private sector.

The Municipality also run a **pilot project** to **collect bio-waste** from markets and food industries. This bio-waste is currently used to produce compost (450 tons per month) but could be later used to produce biogas (methane), for example in the bio-digester that could be built linked to the Wastewater Treatment Plant.

Additionally, the Municipality, which is very concern by the need to improve cleanliness of the city,

would like to design and implement a plan to **raise public awareness** to promote waste management, reduce waste generation and develop recycling.

Long-term actions

Following on the bio waste collection pilot project, the Municipality would like to develop a comprehensive waste management strategy promoting three waste streams:

- Bio-waste
- Recyclable materials: plastic bottles, cartons
- RSW (residual solid waste) to be used as fuel

Bio waste will go first to compost and ideally at a later stage to biogas production. Bio waste separate collection already started in market place and food industries. It could be extended as a test in certain parts of the city engaging citizens to sort their waste in the three different streams. The optimum target (mid term) would be to collect 15 tons a day (20% of the total potential).

Plastic bottles and cartons can generate new business activities connected with recycling industries in Jordan or Israel. Groups of entrepreneurs could be sponsored by the Municipality to start collecting these products and sell these material to companies engaged in this business [2] . The optimum target (mid term) would be to collect 10 tons a day (40% of the total potential).

Waste to energy strategy / PRIORITY ACTION #4

The Residual Solid Waste representing at least 195 tons/day could be processed to produce energy in a gasification unit. Such a plant transforms waste into gas, which can then produce heat and electricity. Gasification is far more efficient than classical incineration process, and avoids releasing hazardous substances in fumes. For this very reason, gasification has more chance to be accepted by Israel than incineration, which will always be subject to opposition for the potential pollution it may generates.

A first investigation has been conducted demonstrating that the amount of waste collected in Hebron could feed in a gasification unit connected to an 8MW electricity production plant. It would require a 40 m€ investment, offering an 8,5 years pay back period. The unit could also be designed to accept waste coming not only from Hebron city, but also from neighboring villages and from other municipalities in Southern West Bank. Hebron now looks for private investors to joint with the Municipality in a Public Private Partnership that would build and manage the gasification plant.

2.6. Other services and long-term responsibilities

Municipal fleet

The fleet is composed of 80 vehicles and heavy machinery. All this equipment is pretty aged and lack efficiency.

5 years ago Hebron set up a very sophisticated system to monitor vehicle use allowing significant cuts in energy consumption

Actions proposed:

- Continue upgrading the fleet management tool and invest more in people awareness.
- Replace old cars with new ones, looking for leasing to avoid heavy investments.

Public procurement policy

The Municipality being an important “buyer” of goods and services could introduce energy and climate change criteria in its public procurement rules.

Sustainable urban planning

The Municipal Council in partnership with CHF / Global communities is currently designing its Master Plan. Deciding how urban development will shape has a very important role to play on long term climate and energy performance of the entire city.

This Master Plan should also bring consistency in designing or improving the electric network, the water and sewage system, the traffic management, etc.

This strategic urban development plan should also promote specific areas for industrial development, for greenery and recreation, specifying for each of these areas the type of road infrastructure, street lighting, water management, waste collection services, to be organized to cope as closely as possible

[2] As an example, Tulkarem recently awarded contract to small companies to collect recyclable material (plastic and cartons)

with the demand and avoid wastage of space, energy, water…

Skills and expertise development

Availability of a local authority staff presenting the adequate skills and expertise in terms of technical knowledge (energy efficiency, renewable energies, efficient transport) or project management (data management, financial forecasting and investment planning, communication skills, green public procurement, etc.) need to be developed everywhere in Palestine.

2.7. Awareness campaign

Like everywhere in Palestine there is in Hebron a huge need for more awareness on environmental issues. It is not only good to educate Municipality staff for them to make necessary efforts to promote energy conservation and environmental protection in their daily work, it is also necessary to develop the Municipality capacity to promote awareness among all stakeholders in Hebron.

Short-terms actions

Environment awareness unit at Municipality level / PRIORITY ACTION #5

As municipality staff, population and local stakeholders lack information and need to be mobilized to act on energy conservation, energy efficiency and more generally on environmental protection, it is necessary to strengthen efforts to inform and engage all the publics in contributing to the implementation of the different components of the SEAP.

Hebron Municipality will set up a dedicated unit, focusing on raising awareness in different publics to optimize the impact of the measures proposed to reduce energy consumption and improve the quality of life in the city, including proper management of energy, water and waste.

Such a unit would be part of the communication department of the Municipality, been connected with HEPCO, the electrical company, the water service and the waste management unit.

The unit should work as a focal point to develop initiatives that will engage the public to change behaviour, to preserve energy and water, and actively contribute to the cleanliness of the city. The unit will work in partnership with different stakeholders in order to facilitate the duplication of initiative and reach out more people. In that sense the Awareness unit will be a key component of the SEAP implementation, as most of the impacts expected for the action plan, depends on the adequate mobilization and engagement of stakeholders to cease the opportunities offered to reduce their energy consumption and, doing so contribute to the success of the programme.

The unit will launch its mission focusing on 3 priority targets - Municipality staff; children; mothers – to inform on issues at stake regarding climate change, energy management and environment challenges in the city; provide guidance to behavioural changes; and invite all stakeholders to engage in concrete actions to help reducing energy consumption, and improve the urban environment (preserving water, reducing waste and littering to promote a cleaner city).

The unit will develop its activities engaging cooperation with existing groups and institutions:

- Spreading **information and training material** (posters, brochures, stickers, etc.) to remind everyone of the importance of energy saving. This must include training given by Municipality employees.
- Develop an annual event "**Energy festival or Energy day**" where best practices could be demonstrated and innovative projects celebrated. Such a festival could be promoted through a large advertising campaign mobilizing all traditional media but also social networks online.
- Unroll specific awareness campaigns among specific target groups
    - Developing a network of "**Positive energy schools**" producing more energy than they consume, through a combination of energy conservation / energy efficiency measures and the development of Solar PV on schools roofs. Teachers should be engaged in such programmes to use all the potential of the technical development, as support for training students. Hebron is already engaged in a specific programme with schools: improved design for 10 schools per year, refurbish old schools, raise children awareness, develop specific projects engaging kids in energy saving activities…
    - **Mobilize families** through the training of women/mothers
    - Promoting an **awareness raising campaign in mosques**, developing solar heating and solar PV equipment and inviting imams to promote responsible behaviour regarding energy consumption.

3. Action plan for Hebron's urban area

3.1. Residential and tertiary buildings

The residential and tertiary building sector is the first one in terms of energy consumption (43% with 357 GWh/year) and GHG emission (38% with 168 $ktCO_2eq$/year). The Hebron distribution company HEPCo, which buys electricity from the IEC in Israel, distributes the electricity used in residential and tertiary buildings.

There are almost 68,000 electricity consumption units (residential places, shops, factories, service buildings) serviced by HEPCo. It is noticeable that due to the political context in Hebron (Israeli settlement in the heart of the city and Israeli rules dividing the city in two parts, H1 and H2, meaning that some houses, shops and SME are completely isolated from the rest of the city) a significant proportion of units (around 20%) are not paying their bills although they get electricity from the grid. It is almost impossible for HPCO to impose any payment in this context.

Like in many other Palestinian cities, solar heating (for water) is widely spread in Hebron: around 64% of dwellers are equipped.

Short-term actions

There is a lot to do to **raise public awareness** on energy issues, inviting inhabitants to reduce their consumption and, as a consequence, cut their energy bill. An awareness campaign doesn't require a huge amount of money and can bring interesting results for both parties: the client learning to use less energy, the company improving its services.

Such awareness campaign to promote efficient behaviour should focus on few points:

- Promoting the proper temperature at home: usually homes are too hot in winter and too cold in summer when a reasonable heating/cooling temperature can result in 20 to 30% cut in energy consumption.
- Promoting behavioural changes at home: turning off lights, proper management of refrigerator, replacing classical bulbs with efficient device…
- Promoting energy efficient cooling/heating devices, as the one on the market are not good enough. People buy cheap equipment without taking into account the higher level of energy consumption, which results in a higher "global cost" over a certain period of time.

A rough calculation allows considering that a widespread awareness campaign could result in a 30 % reduction of electricity consumption (estimation being more difficult on other fluids) in 50% of households and private buildings.

Long-term actions

On the long term it would be necessary to develop a **renovation programme** targeting less energy efficient building where basic insulation could improve comfort while reducing energy consumption.

To design and implement an adequate energy-retrofitting plan for housing and tertiary buildings, the Municipality should engage in the following steps:

- Assess the need through a detailed mapping of housing, registering average energy consumption per square meter, date of construction, location…
- Train small local companies, which will have the flexibility to work in different type of conditions while performing adequate retrofitting programmes that result in significant reduction of energy consumption.
- Develop a partnership with a bank acting as a "third party investor" that will support the investment (for example through a process where the bank will cover the cost of the loan from a part of the savings allowed by the retrofitting programme).
- Promote retrofitting in selected targets offering the best potential in terms of return on investment and, elaborating on these showcases further deploy the plan.

The Municipality should also work on promoting **energy high-performance for new building** to be constructed. Note that Hebron benefits from the support of the Italian cooperation to develop a building certification scheme that includes specific requirements on energy efficiency.

3.2. Transport

Transport is one of the key concerns to be addressed, as this sector is the first energy consumer (40% with 335 GWh/y) and the first GHG emitter (25% with 114 Kt CO2 equivalent / year).

Transportation within the city depends on private cars, shared taxis, private taxis… and the same for outside the city with larger buses and shared taxis. There are no public transports operated by the Municipality. All services are ensured by private companies: 865 companies offering services between Hebron center and surrounding villages; more than 1900 taxis operating inside the city.

As the city is separate in two parts, from the middle of it, by Israeli settlements, designing a traffic plan is a very complex issue to solve. In many situation, to reach a point distant from few hundred meters, one has to do a detour of many kilometers as road are closed to “protect” settlers.

Possible short-term actions

There are only few options to reduce energy consumption (and thus reduce GHG emission) from traffic in Hebron. It seems that the only option would be to promote a negotiation process with all transport providers to adopt a common **charter for global improvement of transport services** aiming at clarifying routes, stops, timing, in order to promote synergies and avoid competition that will hamper the development of an efficient system.

Possible long-term actions

A lot of work needs to be done on public awareness and behaviour. However, behavioural change would be only possible when real alternatives are offered to allow people to actually change their current practices.

Ideally a city committed to reduced energy consumption and GHG emission would design and implement a Sustainable Urban Mobility Plans (SUMP) that could entail the following:

- Integrating transport and city planning policies, while prioritizing public transportation and active modes of mobility for people, low emission modes for goods.
- Structuring the urban transport sector by empowering a public transport authority to take action for the improvement of urban transport in the city. In the case of Palestine, this would mean a close collaboration between the Municipality council and the Ministry of Transport and the evolution of some of the current rules, which appear to be counterproductive.
- Developing communication and participation strategies involving the public, with the aim of facilitating behavioural changes.
- Encouraging the rollout of new engine technologies in private and collective vehicles to help reduce fossil fuel consumption, in particular.
- Promoting active modes of transport, especially walking and cycling, in particular by providing safer conditions for the users and developing the use of electric bicycle.
- Implementing a common methodology to measure GHG emissions, report on them and monitor all other benefits deriving from the development of sustainable urban mobility.

3.3. Industry

Hebron is a commercial and industrial center in the region, and today accounts for around one third of the West Bank GDP.

Hebron's stone industry is generating big incomes. This industry is also a high energy and water consumer. The special limestone found in the area is used for building throughout the region. Others important economic sectors are shoes and leather products as well as pottery and glassblowing workshops. Yet many local producers face difficulties in exporting their products, or even sending them to Jerusalem, due to restrictions imposed by the Israeli authorities.

Industry in Hebron must be a serious concern as it consumes 16% of the energy (136 GWh/y) and is the third GHG emitter (19% with 84 Kt CO2 equivalent / year).

Short-term actions

Three options could be promoted on the short term to prepare a more interesting long-term impact:

- Get **a better understanding** of energy consumption and GHG emission of the industry in Hebron, in order to built a comprehensive action plan on a robust analysis of the sector.

- Raise **awareness** among business owners to invite them to think about any change they could promote to reduce their own energy consumption or to promote products and services that will help their clients to reduce their own energy consumption.
- Raise **awareness** among the business sector on the benefit of developing renewable energy solutions and the industry, which support this development.

Hebron also plans to promote **energy audit** for companies to help them reducing their energy consumption (and when possible develop renewable energy production).

Long-term actions

- Promoting renewable energy units on the roof tops of factories and work shops
- Reusing the water in stone industry through the use of the press machines technology
- Note: Depending on the detailed understanding of energy consumption from the industry, it will then be possible to identify more precise actions to be implemented in order to reduce energy consumption from the industry sector.

3.4. Agriculture and forestry

There are some agriculture activities surrounding the city. It is a mix of vegetable, fruits and animal production. Grapes from Hebron are very famous.

Possible actions

- **Raising awareness among farmers** to promote behavioural changes that would help reducing energy consumption
- Promotion of **sophisticated irrigation system** (drip irrigation) to reduce water needed and thus reduced energy consumption
- Develop a **comprehensive plan to collect green waste and animal manure** to potentially combine with bio-waste and feed in, for the time being a compost production unit, but could be directed later to a bio-digester that could be developed in the city.

Impacts on GHG emission will be negligible.

4. Results of action in the SEAP

Three documents complete the action plan (see below):

- The census and quantification table of all of the actions.
- The results in terms of energy consumption reductions (as well as the production of renewable energies).
- The results in terms of GHG emissions reductions (as well as the production of renewable energies).

Even though certain actions cannot be measured in details, the implementation of the action plan will enable Hebron to reach a **20% reduction in GHG emissions, compared to the BAU**, by 2020.

The total amount of avoided emissions, not including the knock-on effect (or only the actions included in the action plan), corresponds to 533,204 tCO2eq/year. The knock-on effect is noticeable mainly for the pilot projects, which can be reproduced by other local actors and thus generate additional GHG emissions reductions.

Section II: Overall strategy of the municipality

1. Introduction

The sustainable energy action plan (SEAP) is a strategic document as well as an operational tool. It defines a global framework, with quantifiable objectives to be reached by 2020, based on an emissions reference inventory and the detailed assessment of energy consumption.

Before providing a detailed account of the concrete measures undertaken to reduce greenhouse gas emissions and promote the development of sustainable energy, it is essential to describe the overall municipal strategy and its connection with the national energy transition and climate change mitigation policies.

Being totally dependent on imported energy, West Bank and Gaza Strip will obviously benefit from converging efforts to reduce energy consumption in all sectors and develop energy production from all renewable sources available. However, there is no clear and consistent energy transition policy promoted by the Palestinian Authority.

As a first step, the Palestinian Energy Authority (PEA) launched, in 2010, its sustainable energy policy road map with the aim to increase the operating and technical efficiency of distribution utilities, improve energy conservation and load management and diversify the sources of the regional electricity supply. In accordance with this policy, Resolution n°162012 on the use of renewable energy in Palestine was adopted. This resolution stipulates that, by 2020, 25% of total electricity consumption should come from renewable sources from Palestinian territories.

Other programs specifically target energy efficiency. This is the case of the Palestinian Energy Authority's National Energy Efficiency Action Plan (NEEAP), which is the result of regional and international efforts known as the "End-use electricity efficiency improvement and conservation guideline", a MED-ENEC EU funded project. This plan aims to achieve an initial target, specified in the National Energy Strategy, of a 5% reduction in electricity consumption by 2020. The plan is consistent with regional and international efforts known as the "Arab End Use Electricity Efficiency Improvement and Conversation Guidelines" which were approved by the Arab Ministerial Council of Electricity in 2010.

Despite these regulatory efforts to promote sustainable energy policies, Palestine lacks clear and coherent energy action plans at the national and local levels. Palestinian renewable energy and sustainability laws have had a limited impact due to their inconsistent enforcement.

Palestine must revise its strategic approach towards its energy resources and their use. One aspect of this new approach will be to significantly accelerate the adoption and implementation of energy efficiency and sustainability measures, as well as investments in carbon emission reduction targets. It is important to notice that the PNA acknowledges the fact that local authorities are playing and will continue to play a key role in the necessary energy transition the country should go through.

As a sign of this attention paid to local authorities, the Ministry of local government took the lead in promoting the deployment of the Covenant of Mayors in the West Bank. It is also with the support of the Local government development fund that this ministry supports efforts from municipalities to design their SEAP.

Today any local authority can adopt incentives for energy efficiency and development of renewable energy sources according to the regulations already in place. Local authorities can also develop information tools to stimulate the local or regional market of energy efficiency and renewable energy development in their city.

2. Objectives and targets

2.1. At the national level

At the national level, there are many initiatives, programs and projects that have been implemented by the PEA, governmental and non-governmental organizations, institutions and the private sector. They are summarized as follows:

Sustainable Energy Policy Roadmap Targets

Described in the introduction of this document, the goals of this roadmap are threefold:

1) 25% of total electricity consumption sourced from renewables by 2020.
2) 50% of electricity demand from local generation (of all fuels) by 2020.
3) 10% of total new electricity generation from renewables by 2020.

Palestinian Solar Initiative

In 2013, based on the Sustainable Energy target and in accordance with the Palestinian energy strategy, the PEA launched the PV solar initiative. The initiative's objective is to reach 5MW by the end of 2015 by installing 5 kW solar systems on the rooftops of 1000 Palestinian households. The output of these units will feed directly into the electrical network, with an allocated tariff subsidized by the Palestinian finance ministry.

The Palestinian National Energy Efficiency Action Plan (NEEAP)

Based on regional and international efforts known as the "End use electricity efficiency improvement and conservation guideline", a MED-ENEC EU funded project, the Palestinian Energy Authority developed the National Energy Efficiency Action Plan (NEEAP). The NEEAP's objective is to achieve a 5% reduction in electricity consumption by 2020. This plan is in keeping with regional and international efforts known as the "Arab End Use Electricity Efficiency Improvement and Conversation Guideline "which was approved by the Arab Ministerial Council of Electricity in 2010.

Considering current and projected total electricity consumption (until 2020), in current electricity prices, the target's achievement would result in energy savings of approximately 384 GWh/year by 2020. This would lead to savings of at least $55 M/year in total electricity costs in Palestine and a reduction of 285,000 tons per year in CO_2 emissions. In order to achieve this target, the PEA and PEC will have to implement a number of measures, scheduled according to a 3 years plan. In order to measure progress and complete a comprehensive review at the end of each phase, and before proceeding to the next, evaluation indicators will be identified.

2.2. At the local level

The SEAP is a road map for municipalities to integrate energy efficiency and renewable energy development into their short and medium-term objectives with an overall target of reducing greenhouse gas emission in order to fight climate change. The Municipality aims at cutting GHG by 20% in 2020 on the basis of 2014 emissions' level compared to the business as usual scenario.

Membership in the Convention of Mayors of the European Union provides leverage for the transmission of knowledge and good practices. It is also a forum to capitalize on the lessons learnt from the past experiences of other municipalities that have implemented SEAP.

Participation in the CES-MED project enables municipalities to:

- Conceive, develop and refer to SEAP by sector, including energy efficiency in public and private buildings, public lighting, etc. It also enables municipalities to specify which investments will be undertaken in order to reach consumption reduction objectives (within a publicly known schedule) and to calculate financial profitability (cost-benefit approach).
- Have access to a trained and mobilized team in the domain of sustainable energy.
- Have access to reference documents, developed according to a reference methodology, that facilitate the exchange of experience with other countries in the region and the EU.
- Share and acquire experiences as well as actively participate in international discussions, supported by the EU with southern and eastern EU countries, on renewable energy and GHG emissions reductions at the local level by having access to a platform such as the Convention of Mayors.

- Replicate successful projects implemented by other municipalities.
- Search for climate change adaptation and sustainable development funding from international backers.

3. Policy and legal framework

3.1. Current laws and regulations

3.1.1. Existing legal and administrative framework regarding energy supply

The Oslo II Interim Agreement and Paris Protocol Agreement of 1995 formally established the Palestinian Authority (PA) and created a new set of economic and political relations between the PA and neighboring countries. Through these agreements, the PA acquired certain monetary, taxing, licensing, and policing authorities.

The PA currently maintains territorial and functional control over 29% of the West Bank and 70% of the Gaza Strip. 95% of the Palestinian population resides in these territories, with the remaining 5% located in East Jerusalem. The PA provides administration (civil and legal) and security services in the West Bank and Gaza Strip. It does not enjoy full authority in terms of foreign relations or security related issues in the autonomous areas and international crossing points. This is also true in terms of water resources and the movement of people and goods within the West Bank and Gaza Strip. This situation negatively impacts the efficiency of the activities of the executive, legislative, and judicial branches of the PA government.

Petroleum and liquid gas
In 2012, The Palestinian Territories consumed 23,300 barrels per day (bbl/d) of petroleum and liquid gas. As the territories do not have domestic refining capabilities, these resources had to be imported. In recent years the majority of imported refined petroleum products have been either distillate fuel oil or liquefied petroleum gases. This sector is mainly distinctive of the following:

- Full dependence on Israel for imports,
- Vulnerability due to the PNA's incapacity to import from other sources.
- Lack of local storage capacity. Local market needs are imported on a semi-daily basis.

This creates risks and crises in the distribution system and difficulties in meeting local consumption demand for gas and petroleum derivatives in the Palestinian Territory.

Solar energy, through solar heater represents the most important renewable energy source, covering 18% of Palestinian energy needs. 70% of household are equipped with solar heater.

The electric sector also faces many obstacles, mainly:

- Almost no independent electricity production in the West Bank. High cost of electricity generated from the Gaza Power Plant and inability to exploit plant's full power.
- Thus, the Palestinian Territories are dependent on the Israel Electric Co. (IEC) for nearly all of their electricity needs in the West Bank. Close to 97% of electricity is imported from IEC at high tariff compared with neighboring countries. There is no purchase agreement with the IEC and the level of electrical services provided by the IEC is inadequate.
- Electrical Energy represents (31%) of total energy consumed. 75% of consumption is in domestic and services sectors, with a high annual rate of electricity consumption growth (7%).
- High electricity losses (25%) due both to the poor status of the electricity grid and to inefficient collection system and net lending issues, as well as illegal connections, and losses in electricity meters.

With an electricity consumption level of 583 kWh/person/year, the lowest consumption level in the region, the Palestinian Territories barely manage to satisfy their electric needs, whereas in Israel electricity consumption exceeds 6000 kWh/person. This gap can be mainly explained by an inadequate electricity infrastructure.

Five electricity distribution utilities are ensuring the connection between IEC production and final consumption: Gaza Governorate Distribution Company (GEDCO), Jerusalem District Electricity

Company (JDECO), South Electric Company (SELCO), Hebron Electric Power Company (HEPCO), and Northern Electricity Distribution Company (NEDCO). In addition, certain municipalities and rural councils provide power distribution services.

The legal and regulatory framework in the Electricity Sector can be outlined as follows:

Law Nº 12/1995 establishes the Palestinian Energy Authority (PEA) as an independent institution, with its own budget, falling under the direction of the President of the Palestinian National Authority. The Law determines that this official authority will work in the area of energy production, transfer and distribution in Palestinian, with the tasks of "providing sufficient power to satisfy Palestinians' current and future needs". PEA is responsible for rural electrification, regional interconnection, energy conservation and research that cannot be commercialized. Additionally, PEA focuses on the rehabilitation of the existing networks, extension of services to non-served communities and conducting research and studies for all energy resources.

General Electricity Law, Nº 13/2009 defines new institutions and their duties within the electricity sector (PERC, NTC). It also establishes an open licensing system for generation and distribution (with non-integration between generators and distributors), defines NTC as the Single Buyer in the system, and obliges all agents in the sector to be registered as commercial companies (even NTC though will continue to be a State owned monopoly).

Electricity tariff Law No. 04/2012 concerns tariffs and determines the selling price of electricity that electricity companies can charge their consumers. The price has been determined on the basis of transparency and fair issues for Licensed distribution companies and customers and is currently being defined by the Palestinian Electricity Regulatory Council (PERC).

There are several laws that do not directly concern the electricity, but relate to it as well as the institutions working in the sector. This is the case for the Corporations and **Environment Law #7/1999** which is tasked with protecting the environment from pollution in all its forms. It lays the foundation for environmental protection plans in the sphere of economic and social development and promotes the sustainable development of vital resources by taking into account the right of future generations. Moreover, it promotes the collection and dissemination of information about various environmental topics and increases public awareness of environmental issues.

3.1.2. Building sector

The Palestinian Engineers Association and the United Nations Development Program (UNDP) launched the National Green Building Guidelines in partnership with the Palestinian Higher Green Building Council on 23 May 2013, in Ramallah. The Green Building Guidelines will lay the foundation for a green building code and encourage the implementation of eco-sustainable infrastructure, using environmentally friendly materials and deploying renewable energies. It will also benefit the infrastructure sector in terms of improved architectural quality, reduced energy consumption, better quality of life, health and security.

The new guidelines have been developed over a two-year period in partnership with sustainable development experts and the different disciplines of the construction industry. The Palestinian Engineers' Association is also working with the Palestinian government on developing the Palestinian Green Building Code within the future Palestinian Construction Code.

3.1.3. Road transport sector

There are no legal instruments geared at reducing energy consumption from transport. Even more difficult, the complexity of the rules and regulations used to organize public and goods transports doesn't allow local authorities, like municipalities to design measures that would reduce the number of cars or to regulated car traffic in their jurisdiction.

As a result, to transport sector will remains one of the more complex domain to address when looking for energy saving and service efficiency improvement.

3.2. Complementarity between national actions and municipalities

Ideally, Municipalities should be able to count on a national set of rules and services allowing them to design and implement strategies to reduce energy consumption, improve energy efficiency and develop renewable energy production. However, as mentioned above the legal framework is still lacking bits and pieces and lacks consistency in order to fully promote locally designed energy

strategies that are truly sustainable and economically performing.

For example, the fact that electricity distribution utilities are not allowed to produce electricity from renewable sources is another limitation to such development although resources are available (particularly the sun) and current technologies offers interesting returns on investment.

On of the issue the PNA will have to address very soon is the electric grid organization in the West bank and in Gaza Strip to reduce electricity losses and to allow for more connection fueling into the grid, electricity coming for local production units relying on renewable sources.

3.3. Capacity reinforcement

3.3.1. Training actions

There are huge needs for training and capacity building on energy issues in all sector and all types of institutions and stakeholders. This is particularly true in Municipality services where key players are too often lacking the basic skills to ensure a proper management of the issue.

Various initiatives are now tacking place to provide technical support and training. For example, the AFD mobilized expertise from INES – National institute on Salon Energy in France – to provide technical guidance and training to Municipalities and companies willing to develop solar energy. Likewise, the Torino University offers technical support to Hebron city to experiment renewable energy solutions and develop production initiatives in the city.

However, needs are by large surpassing the offer and international funding agencies should be invited to support more initiatives of this type.

3.3.2. Awareness-raising actions

Awareness and communication are indispensable tools for the dissemination of good practices, to help reduce energy consumption on a day-to-day basis. However, the PNA is not equipped to develop campaigns all across the West Bank on this issue. One has to recognize that the PNA has other major priorities to address. On the contrary Municipalities, concerned with energy management on their territory and benefiting from a direct connection with their constituencies are the right institutions to develop awareness activities.

4. Strategic vision for sustainable energy

4.1. Guiding principles for the municipal strategy on sustainable energy

The Municipality adopted certain fundamental principles that aim to integrate sustainable development into all decision-making processes related to local development. The Municipality systematically considers these principles when taking into consideration future action programmes and their energy implications.

- Ensure the optimization of energy consumption and the integration of renewable energy development into all on-going activities and projects taking place in the territory in order to reduce fossil-based energy consumption.
- Include energy consumption reduction and renewable energy development in the city's development vision.
- Utilize energy cost-benefit analyses in on-going and future projects.
- Set an example in terms of responsible energy management, especially by promoting concrete initiatives energy efficiency and conservation research and innovation and infrastructure development, as well as.

- Partnerships: encourage individual, private sector, NGO participation in the development and management of energy resources and renewables in the municipality,
- Educate and inform the local population and actors about the new municipal vision in favor of energy efficiency and renewables.

4.2. Municipal vision and objectives

4.2.1. Municipal vision

The municipal vision is based on the strategy and medium to long-term objectives of the municipality, as well as those at the national level. Keeping in mind its specific context, the municipality is developing a strategy consistent with the Palestinian energy strategy and the sustainable development needs of the territory.

This strategy is structured around two levers:

- Reduce energy consumption in all sectors through energy conservation and efficiency, in order to provide better services while reducing costs and impacts.
- Promote energy production from locally available renewable resources in order to cover as far as possible energy needs from these decarbonized sources.

Obviously, this strategy will help the Municipality to reduce its dependency on energy imports from Israel, reducing by the way its financial needs to fund these imports. The strategy will also generate additional resources in the municipal territory through energy production from local and renewable resources.

As energy consumption is dependent on many stakeholders within a given territory, the strategy needs to include all of the concerned actors. All of the activities that take place within the territory will be included in the energy consumption reduction and renewable energy promotion measures. These measures also strive to protect the local environment (air, water, soil, waste) and contribute to the protection of the national and global environment (GHG).

The municipality will develop a SEAP that includes short and medium-term actions to reduce the consumption of energy and to increase the production of renewable energy in its territory.

In conformity with current regulation, the Municipality wants to promote a mix of incentive and coercive measures. These measures are in accordance with the municipal code and public policies that favor local development and the protection of energy resources and the environment. Doing so, the Municipality is participating in the reduction of greenhouse gas emissions and taking action to adapt to the impacts of climate change.

On-going information and awareness raising actions must lead to the strengthening of energy consumption reduction commitments and the increase in production of local renewable energy by actors operating in the territory.

These activities include the following sectors:

1. Housing stock (energy conservation and efficiency / renewables energy development)
2. Housing market (mobilization of professionals)
3. Transport and mobility (planning and reduction of urban traffic)
4. Active mobility (development of a cycling policy and promotion of walking pathways)
5. Mobilization of the local industrial sector
6. Management and treatment of solid waste and wastewater
7. Development and integration of renewable energies
8. Development of a local renewable energy market.

4.2.2. Municipal objectives

In accordance with national policy, the Municipality adopted the following strategic objectives within the framework of its sustainable energy development policy:

1. Reinforce and promote energy efficiency in municipal property, public infrastructure and other local activities.
2. Promote the integration of energy efficiency and renewables into public and private housing construction projects in the municipality.
3. Integrate the development of energy efficiency and renewable energy into the municipal sustainable development plan (job creation, local energy efficiency and renewables market, market for local services, etc.).
4. Implicate all of the territorial actors in the promotion of energy efficiency and the development of renewables,
5. Develop a sustainable energy action plan (SEAP) in the city.
6. Develop partnerships with all of the providers that are favourable to the implementation of the SEAP.
7. Reduce energy consumption and GHG emissions by 20% in the Municipality by 2020.
8. Inform the public about the true cost of energy and make known the incentives and initiatives that encourage energy conservation and efficiency.
9. Create energy conservation and efficiency, renewable energy development and environmental protection communication plans that target the local population and the socio-professional categories present in the territory of the city.
10. Reduce energy needs during peak periods by managing electricity demand and by changing energy and gas consumption behaviors and habits.
11. Coordinate with the government on the national strategy and energy efficiency and renewable energy action plan, as well as on the review of the municipal sustainable energy action plan.

The primary objectives of the municipality are:

Short-term objectives 2020

- Reduce energy consumption across the board by around 20 to 25%
- Reduce GHG emission by 20 % in 2020, compared to the business as usual scenario and using the 2014 baseline.

Medium and long term objectives 2030

- Continue efforts to reduce energy consumption and improve efficiency resulting in a continuous trend of improvement of energy intensity (Energy consumption compared to Gross development product)
- Continue reducing GHG emission with the objective of containing GHG per capita below 1,8 tons or less on the long term as a significant contribution to global efforts to combat climate change, in application of the Paris Agreement adopted at COP21.
- Improve services to inhabitants and all stakeholders in order to promote a better quality of life in the city.

4.3. Implementation of the strategy

The strategy's implementation requires the creation of a municipal SEAP based on detailed energy consumption and greenhouse gas emissions inventories.

The action plan will contain consumption reduction measures and put in place a set of supportive mechanisms to ensure that actions are implemented according to the agreed timeframe.

5. Organizational and financial aspects

The CES-MED project produced two national reports to be used as reference documents for the municipalities implementing their SEAP. The first concerns funding sources for energy efficiency and renewable energy development in local municipalities, whereas the second provides an institutional and regulatory analysis of energy efficiency and renewable energy development at the municipal level.

The first report summarizes the existing national and international funding available to support initiatives in energy management and renewable energy development that the municipalities are eligible to apply for. It also lists the types of funding available in order to assist developers seeking to finance their projects.

The second report provides an overview of existing energy efficiency and renewable energy legislation in Palestine, as well as the main institutions assigned to promote their development and create a specific market. It presents all of the texts related to legislation that promotes investment in the energy efficiency and renewable energy sectors.

5.1. Local and national coordination

The municipality should build relationships with regional actors that have a role to play in the exploitation, study and analysis, management and use of energy resources within the territory. These include various public institutions and administrations, local agencies and organizations, industries, public and private enterprises, universities and research centers and civil society actors (NGOs, neighborhood councils, etc.).

5.2. Organizational structures created to implement the SEAP

In order to implement the SEAP, the municipality should secure its sustainable energy activity unit. The unit will be in charge of all municipal energy related questions. This unit is directly connected with the the company HEPCO and with the Strategic planning unit in order to ensure that the sustainable energy strategy is deeply embedded in the strategic development plans the city will follow.

5.2.1. Constitution of the sustainable energy team

The implementation of the municipal sustainable energy policy requires the mobilization of human resources in order to develop and revise the sustainable energy action plan (SEAP). In addition, it will be critical to develop sustainable energy projects, assemble financial packages and establish partnerships and accompany the project at the political, technical and administrative level. Taking into account the existing political, technical and communication skills available within the municipality, members of the sustainable energy team will be selected during the first stages of the SEAP's implementation. Those with the knowledge, professional skills and the desire to participate may be designated as team members.

The estimated workload per person to ensure the project's success: Team members must be available during working hours. To maintain a reasonable workload, all new or additional tasks allocated to members must be balanced by delegating existing tasks to other colleagues.

Team stability is a condition for the longevity and continuity of the SEAP's implementation: The replacement of any team member may affect the implementation process and diminish overall team capacity through lost experience and time spent finding a replacement. In order to prepare for a replacement, any departure from the team must be planned for by training and reinforcing the skills of future members.

Project stability: To support the project development, its permanent improvement and refinement, the team will identify external actors with specific expertise, such as university researchers, companies or NGOs that could help strengthening the dynamic of the SEAP. The implication of specialized university researchers can contribute to the development of projects through studies and the integration and transferability of new technologies. The sustainable energy team also contributes to the understanding of and gives visibility to energy management in municipal property and buildings. The team must ensure the coherence of the overall municipal policy and all energy and renewable energy management actions.

Team missions include:

- Educating users about the implementation of the municipal policy on sustainable energy management.
- Training the technical personnel in charge of the service and ensuring the maintenance of renewable energy facilities.
- Communicating the results of implemented actions to municipal personnel and inhabitants.

The energy team's role also includes:

- Tracking energy consumption in municipal buildings, identifying problems and proposing solutions by reviewing how buildings are used and whether they require renovations.
- Ensuring the maintenance of facilities
- Working on the interaction between users and facilities. Listening to users and considering them as partners since they are first hand observers of what occurs in buildings.
- Carrying out technical studies and developing requirements specifications in order to choose materials best suited for buildings and overall energy efficiency.

5.2.2. Appointment of the elected official tasked with energy

Among municipal elected officials, it is critical that there be an elected official in charge of sustainable energy. This sends a strong political signal of the municipality's political will to local, regional and national authorities and gives political visibility to energy management at the international level (Convention of Mayors and other partners).

The elected official in charge of energy is appointed to:

- Demonstrate the political will of the municipality,
- Give political visibility to energy management,
- Provide direction to facilitate the development of partnerships with national and international backers,
- Manage transversal issues related to the energy transition.

Through the dynamism of the elected official in charge of energy and the sustainable energy team, energy management must progressively occupy a greater role in the different sectors that fall under the municipality's responsibility.

The official must work in collaboration with other elected officials and with the technical head of energy. They are a spokesperson for all subjects related to energy policy and municipal property and must be attentive to municipal personnel and users and provide momentum for the SEAP's implementation.

They also ensure the:

- Creation of inter-thematic connections and the integration of energy management into all municipal projects and actions.

- Facilitation of information sharing (completed tasks, projects, etc.) among different services, municipal departments and external actors.
- Communication with diverse audiences on energy management.

5.2.3. Role of the municipal council

The principle responsibilities of the municipal council are:

- Directing policy by setting priorities and objectives for the municipal energy policy;
- Integrating the action plan into the budget planning process and prioritizing/ensuring its implementation;
- Validating the completion of the actions and managing the budget;
- Adapting the objectives and action plans to the evolution of the projects as well as human and financial capacity (budget);
- Proposing new actions and integrating them into the action plan;
- Delegating and assigning tasks to implement the SEAP.

5.3. Involvement of stakeholders and citizens

The municipality adopted a participative approach during the elaboration phase of the SEAP. In addition, its implementation phase engages all of the stakeholders, including: institutions, agencies and organizations, professional organizations, socio-economic actors, NGOs, local councils, etc.

The consultation and exchange meeting contributes to and enhances the SEAP by incorporating stakeholders' opinions, criticisms and propositions. Stakeholder participation is a measurement of the SEAP's successful implementation.

To ensure to success of project implementation within the framework of the sustainable energy strategy, certain capacity reinforcement and awareness-raising actions for different sectors of the local population must be carried out. These include:

- **Lectures:** organizing and facilitating a series of conferences and lectures given by professionals and experts. These meetings are meant for a diverse audience: local authorities, enterprises and the general public. The main objective is to educate local actors and encourage them to take action.
- **Workshops:** holding thematic workshops on sustainable energy (energy consumption reduction, energy efficiency and renewable energies) that enrich municipal personnel's knowledge on the subject and, thus, facilitate the SEAP's implementation.

5.4. Citizen awareness promotion plan

The elaboration of the « Citizen awareness promotion plan » is meant to educate and inform the municipal population and actors. It allows all actors to be involved in and contribute to the SEAP's implementation.

It could encompass several actions, including:

- The creation of a permanent municipal information point
- The organization of an open house
- The publication of articles in local and regional newspapers
- The distribution of brochures and posters
- The distribution of an information letter that includes current events on sustainability as well as local success stories.
  - ✓ Information on national energy policies and local implications
  - ✓ The prevailing energy conditions in the municipality

- ✓ The state of progress of the different actions implemented within the framework of the sustainable energy strategy and the SEAP.
- ✓ Successful projects in national and foreign municipalities, notably in municipalities that are members of the Convention of Mayors.

Facilitating a local skills network: The municipality's information and awareness raising actions contribute to demand creation in the sustainable energy market. To create supply, similar actions that support the local economic fabric should be undertaken.

To promote the local economy, the municipality will organize meetings to exchange with different socio-economic actors. As part of its SEAP and sustainable development strategy, these meetings enable the municipality to ensure that the supply of skills within its territory responds to existing, or future, demand.

The elaboration of a regional skills directory (municipality and neighboring territories), which includes the renewable energy and energy efficiency sectors, gives visibility to the skills and actors present in the territory.

5.5. Budget

In its annual budget, the municipality should undertake certain sustainable energy priority actions and initiate communication campaigns that inform and educate all of the stakeholders.

Access to national and international financing will help assure the SEAP's success by tapping into funds that support the implementation of its activities.

5.6. Foreseen financing sources for the investments within the action plan

5.6.1. Financing of the national EE programme and renewable energies

Municipalities can get direct access to funding agencies but also can count on the support of additional resources coming from funding agencies through the Municipal Development and Lending Fund that connect the PNA negotiated supports with municipalities presenting specific projects.

Palestinians in the West Bank and Gaza Strip receive one of the highest levels of aid in the world due to the on-going political conflict. The international community, including international NGOS, offers aid to the PNA and other Palestinian NGOs. Entities that provide aid to the Palestinians can be categorized in seven groups: Arab nations, the European Union, the United States, Japan, international institutions (including agencies of the UN system), European countries and other nations. Some of international funding agencies include:

- The World Bank
- The Islamic Development Bank (IDB)
- The United Nations Development Program
- The Arab Fund for Social and Economic Development
- The European Commission (EC)
- The United States Agency for International Development (USAID)
- The French Development Agency (AFD)
- The Kreditanstalt fur Wiederaufbau (KFW)
- The German Technical Cooperation (GIZ)
- The Japan International Cooperation Agency (JICA)

Funding the energy sector

Since the creation of the Palestinian Authority in 1995, most energy projects have been funded by international aid. Aid usually comes from donors seeking to improve the security and stability of the Palestinian energy sector in the WBGS. Norway, Italy, France, the Word Bank and the E.U. have provided support to reform the institutions and regulations in the sector.

Some new grants for sustainable energy and sustainability actions include the EU's SUDEP grant for

local governments and municipalities, as well as the Word Bank's recently created Trust Fund programme, a funding assistance mechanism for the Palestinian Territories. The European Union, along with the Word Bank -International Finance Corporation (IFC)-, issued programmes for knowledge products and grants for the fiscal year 2016 that focus on municipal services, energy, water and solid waste management. Palestine is a beneficiary of these grants.

Application and awarding process

Each grant has a unique set of requirements and application process. Generally, however, the first step includes the submission of concept notes and, after an initial agreement, the beneficiaries submit a full proposal.

Most often, grants are awarded based on the number of people who will benefit from, as well as the sustainability and lasting impact of, the proposed project.

5.6.2. Financing the SEAP

The municipality must identify all of the potential funding sources for the investments to be made within the framework of the SEAP. One of the principle issues for a successful strategy is the municipality's ability to finance ambitious energy management and renewable energy projects.

The traditional systems of public and private funding may not be able to adapt to the new projects that come out of the SEAP. As a result, new and innovative finance mechanisms will be needed. It will be necessary to innovate by mixing loans, subsidies, third party financing, cooperative solutions and funds, etc.

Guaranteeing the funding of the SEAP's actions is the most critical step. The municipality cannot finance the entirety of its SEAP in its annual budget and will have to turn towards external funding at the national and international level. There are additional benefits to attracting external funding, including:

- The involvement of various actors in the SEAP's implementation helps to create a local, or even regional, sustainable energy market that the actors can participate in as suppliers, installers and beneficiaries, etc.
- The engagement of local actors is a gage for the socio-economic integration of sustainable energy.
- The cooperation with international backers gives more visibility to local actions and attracts greater investment and funding in case of success. It also encourages local deciders to support the projects and actions undertaken in the framework of the SEAP.

Section III: Baseline emissions inventory

1. Considered scope and methodological principles

a. Some orders of magnitude

To apprehend the results of this Baseline Emissions Inventory (BEI), it is useful to know the main orders of magnitude in the world and in Palestine.

- World human GHG emissions: 50 billion tCO_2eq/year
- Palestine GHG emissions in 2010: 4,15 million tCO_2eq/year
- Palestine GHG emissions per capita: **1,0 tCO_2eq/capita/year**

These average values are valid for the whole Palestinian Territory, including Gaza Strip. In all 3 West Bank cities studied by the team, GHG emissions per capita are twice higher (between 1.9 and 2.3 tCO_2eq/capita/year). This is not surprising as GHG emissions mainly come from urban and industrialized areas. As industry and agriculture remain limited in Palestine, the main part of emissions comes from urban areas.

Knowing that the IPCC set a target of dividing by 2 the global human GHG emissions, currently reaching in average 7 tCO_2eq/capita/year, we observe that emissions of Palestinian citizens are already far lower than the target (3.5 tCO_2eq/capita/year). However, Palestinian GHG emissions tend to increase and could exceed this limit in the coming years. This is another reason why Palestinian cities need to develop strategic plans to reduce their energy consumption and their GHG emissions.

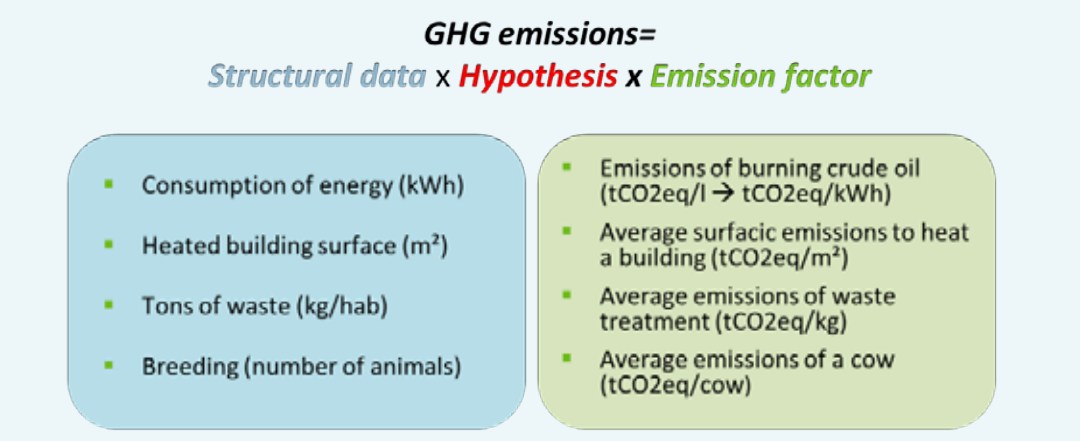
b. Methodological principles of the inventory

The methodological principles of an inventory are the following:

- Emissions are **assigned to energy consumers**.
- Inventories **must be** addible: For example, if all localities of the governorate make their inventory, the sum of inventories equals the governorate inventory**.**
- A recent reference year: 2014, to describe a territory evolving rapidly.

c. Calculation method

The BEI is a calculation, not a measure. In order to get a complete consumption and emissions inventory, we used several statistical data from reliable sources (electricity distribution, building surface, energy bills for municipal buildings, etc.) on which calculation hypothesis were applied when necessary (energy costs, unitary consumption of buildings, etc.) to obtain energy consumptions (all sectors) and non-energetic emissions (waste, water, agriculture).



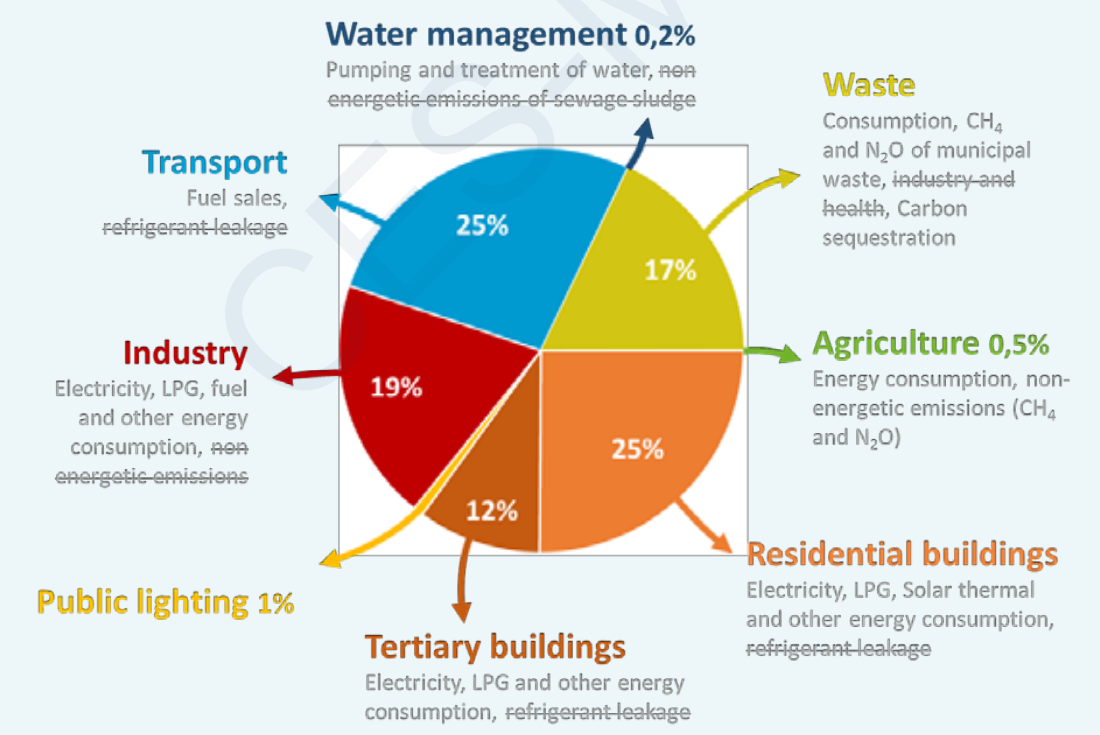
Calculation principle of the inventory

This simplified calculation approach is likely to be tainted by various uncertainties:

- Structural/Activity data: low uncertainty
- Hypothesis medium to high uncertainty
- Emission factors: low to medium uncertainty

d. Considered scope

Building this BEI, we judged necessary to include the following sectors, but could not find sufficient hypothesis or structural data on stroke out topics:



Compared to the Convention of Mayors recommendations for SEAPs:

- Have been taken into account: non-energetic and energetic GHG emissions for waste management, energetic GHG emissions for water and wastewater management (pumping, treatment, etc.), because all 3 cities are planning actions on both of these topics.
- Have not been taken into account: Non-energetic emissions of industrial activities, refrigerant leakage of buildings and vehicles, sewage sludge of wastewater treatment since information on these topics wasn't sufficient and not mandatory to be included in the BEIs.

It is important to understand what are called tertiary buildings, namely all buildings that are neither residential, nor industrial or agricultural: stores, offices, hospitals, transport buildings, sport buildings, leisure, and other private services.

2. Detailed methodology of each sector

We adapted our methodological targets to Hebron, according to what has been described in the last chapter. This part explains details on the methodology used to build the first Hebron BEI. An Excel file was created in order to collect and work on data provided by the municipality or obtained from the Palestinian Central Bureau of Statistics (PCBS), describing each source, year of reference and calculations made. Helped by this report, the Excel file named *150921_BEI-Hebron-v10* is the best way to understand very precisely the methodology and sources used.

a. Common data sets

i. Population statistics

Population statistics have been downloaded directly from PCBS website for the city[3] and Palestine[4].

Population is often used in order to create or apply national or district ratios to the population.

	2007	2008	2009	2010	2011	2012	2013	2014
Hebron City	160 702	166 094	171 653	177 387	183 312	189 444	195 733	202 172
Hebron Governorate	543 891	562 141	580 955	600 364	620 417	641 170	662 454	684 246
Palestine	3 719 189	3 825 512	3 935 249	4 048 403	4 168 860	4 293 313	4 420 549	4 550 368
West Bank	2 323 469	2 385 180	2 448 433	2 513 283	2 580 168	2 649 020	2 719 112	2 790 331

In 2014, the population of Hebron city is **202 172 inhabitants**, which corresponds to about 29.5% of the governorate population.

ii. Employment statistics

The PCBS offers two different data sets on employment with an important difference:

- Number of employed persons among the population, which is delivered in the national 2007 Census on Population, Buildings, Housing and establishment for all governorates. The numbers correspond to inhabitants of a locality who have a job, wherever this job is actually located.
- Number of employed persons in the Private Sector, Non-Governmental Organization Sector and Government Companies inside the locality, delivered in national and governorate

[3] Localities in Hebron Governorate by Type of Locality and Population Estimates 2007-2016, PCBS, 2007
[4] Estimated Population in the Palestinian Territory Mid-Year by Governorate 1997-2016, PCBS, 2007

Statistical Yearbooks[5]. Since we need this information to estimate the consumption of tertiary and industrial building of the locality, we use the following dataset:

		Number of Employed Persons (Private, NGO, Gov)			
		Mining / quarrying	Manufacturing	Construction	Total
Hebron (2009)	City	nd	nd	nd	23 690
	Gov	995	11 987	821	43 389
Palestine (2007)		**1 851**	**62 832**	**4 557**	**296 965**
Palestine (2012)		**1 796**	**74 667**	**5 530**	**384 778**

iii. Energy demand in Palestine per sector and energy type

One of the key reports used for producing these BEI is the Energy Balance report published by the PCBS for 2008[6]. One of its tables describes energy consumption in TJ/year or in sectorial units (kg, MWH, etc.) per type of energy (Solar, Electricity, Gasoline, Bitumen, Kerosene, Diesel, Oils, LPG, Olive cake, Wood and charcoal) and domain of activity (Mining, Manufacturing industry, Construction, Road transport, Households, Internal trade and services, Agriculture).

	Solar	Electricity	Gasoline	Kerosene	Diesel	LPG	Olive cake	Wood and charcoal
Consumer	**MWh/y**	**MWh/y**	**1000ltr/y**	**1000ltr/y**	**1000ltr/y**	**tons/y**	**tons/y**	**tons/y**
Households	1 074 237	2 187 428		2 664	1 564	109 284	12 348	253 992
Internal trade		68 050		151		2 766		242
Services		484 632	303	32	1 182	4 879		259
Agriculture		10 928	164	93	3 398	338		963
Water and Elec		66		1	125	127		4
Mining		4 575	24		5 218	119		3
Manufacturing		282 148	128	432	6 053	5 456		723
Construction		8 553	1 405	111	3 267	101		2
Road transport			129 845		127 948			
Other transport		7 759		83		61		

It will often be referred to this table in the following chapters, usually by calling a *consumption ratio per capita or employee for a given energy and sector from PCBS report on Energy Demand 2008*.

For example, to estimate tertiary LPG consumption in Hebron, we built such a ratio using the following formula:

Ratio = LPG Pal 2008 / Pop Pal 2008 = 28.5 kg/capita/year

LPG Pal 2008: Consumption of LPG for households in 2008 = 109 million kg/year

Pop Pal 2008: Population of Palestine in 2008 = 3 825 512 inhabitants

This figure is then multiplied by the city population in 2014.

iv. Emission factors of energy consumption (IPCC, UNFCCC)

Emission factor for energy combustion used in the BEI to convert consumption in GHG emission come

[5] Hebron Governorate Statistical Yearbook n°3, PCBS, November 2011
[6] Energy Balance in the Palestinian Territory 2008, PCBS, December 2009

from IPCC Guidelines 2006 [7], using default values provided. In this report, a distinction is being made for different activity sectors, but also between stationary and mobile combustion. Considered gases are CO_2 (Carbon dioxide), N_20 (Nitrous Oxide) and CH4 (Methane).

Since the territorial inventory method consists in assigning emissions of the whole energy production chain to the consumers, emission factors have been added for what is named upstream emissions (extraction, refining, production and transport of energy). These factors come from 2006 UNFCC publication[8].

For electricity, the emission factor is the one provided by the GHG Protocol, via a tool to calculate GHG emissions of purchased electricity [9]. The emission factor is the Israeli one, and equals 727 gCO2eq/kWh, since all electricity consumed in the city comes from Israel producers. It includes all upstream emissions, such as transport and losses. For other fossil fuels, all average emission factors are resumed in the following table:

	Combustion *gCO2eq/kWh*	Upstream *gCO2eq/kWh*	Global *gCO2eq/kWh*
Electricity	-	-	727
Natural gas	203	40	243
LPG	228	41	269
Diesel	269	79	348
Gasoline	251	64	315
Other fossil fuel	266	71	337

b. Residential buildings

In Palestine, households consume various type of energy for their homes: Electricity, Liquid gas, Diesel (rarely gasoline), solar thermal, and sometimes wood, though wood is marginal in urban areas, such as the city of Hebron.

The municipality provided yearly consumption per energy sources. Some values seem consistent compared to households' energy surveys conducted by PCBS, some are not and had to be put aside. The following table shows what information was provided and judged consistent or not, and what method was used to estimate lacks:

	Value provided	Method	Final value
Electricity	118 GWh/y	Consistent value	118 GWh/y
Liquid gas	7 236 t/y		91,5 GWh/y
Diesel and gasoline	846 200 litres/y		7,8 GWh/y
Solar energy	64%	Average consumption per household	58 GWh/y

Solar thermal energy consumption is estimated using the percentage of households with solar heater (provided by all municipalities), multiplied by the population in Hebron in 2014, which is then multiplied by an average energy consumption ratio per capita using a solar heater (built from PCBS report on Energy Demand and percentage of households using a solar heater in Palestine in 2008).

Refrigerant leakages of residential buildings have not been considered in these BEI.

c. Tertiary buildings and public lighting

Tertiary buildings are composed of two different categories: municipal buildings and other buildings. In fact, we call tertiary building every building which is not a dwelling, nor an industrial company or dedicated to agriculture. It is composed of: shops, office building, administration, hotels, restaurants, transport building, health buildings, sport center, cultural building, leisure buildings, etc.

[7] IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Chapter 2-3), IPCC, 2006
[8] Methodological tool "Upstream leakage emissions associated with fossil fuel use" version 1, UNFCCC, 2006
[9] GHG emissions from purchased electricity calculation tool, Greenhouse Gas Protocol, December 2014

Energy consumption for all energies have been provided for municipal buildings and public lighting. All data was kept as such.

	Consumption
All municipality buildings (schools, mosqs)	2 122 MWh/year
Street lighting	5 860 MWh/year

For private tertiary buildings, consumption was directly provided for electricity. For other types of energies, consumption has been estimated using a ratio of consumption per capita extracted from PCBS report on Energy Demand 2008 (Internal trade + Services, each energy).

	Value provided	Method	Final value
Electricity	70 900 MWh/y	Consistent, kept	70 900 MWh/y
Liquid gas	Not provided	National ratio per capita	8 700 MWh/y
Diesel and gasoline	Not provided		1 300 MWh/y
Other	Not provided		320 MWh/y

Refrigerant leakages of tertiary buildings have not been considered in these BEI.

d. Industry

Hebron is a city with an important industrial activity on building materials, especially stone quarrying. Except for electricity, which consumption was directly provided, an estimation was made

	Value provided	Method	Final value
Electricity	98 850 GWh/y	Consistent	98 850 MWh/y
Liquid gas	Not provided	National Ratio per capita	8 150 MWh/y
Diesel and gasoline	Not provided		27 700 MWh/y
Other	Not provided		900 MWh/y

As there are no statistics on number of employees per sector at city scale, a first estimation is made at district scale using a ratio of consumption per employee based on the PCBS report on Energy Demand 2008 per type of energy (electricity, LPG, Diesel, gasoline, wood and charcoal, kerosene) and for each sector (mining and quarrying, manufacturing industries, construction). Then, a percentage of that district consumption is allocated to the city using the percentage of total employed of the governorate that are in the city.

Energy consumption for manufacturing industries was not distinguished between agro-food and other manufacturing industries. To do so, we apply the part of employees for each sector at Palestine scale (Economic survey series 2008, PCBS).

Non-energetic emissions have not been considered in the BEI.

e. Transport

Municipal fleet fuel consumption (diesel and gasoline) were given by the municipality and are all judged consistent.

	Volume	Consumption
Gasoline	19 000 litres/year	180 MWh/year
Diesel	227 000 litres/year	2 200 MWh/year

The Ministry of Finance of Palestine provides information on fuel sales at district scale in 2014. Using these data, we calculated a ratio of consumption per capita in litre/capita/year applied to the city population.

	District consumption	City estimation
Gasoline	36 500 000 litres/y	95 500 MWh/y
Diesel	98 750 000 litres/y	239 000 MWh/y

Refrigerant leakages of vehicles have not been considered in the BEI. Unfortunately, no statistics in Palestine enables to make a distinction between public, private and goods transport.

f. Waste management

Diesel consumption for waste treatment and transport has been provided and judged consistent.

Municipality services provided the amount of waste collected: 68 640 tons/year. To this quantity of waste generated by the city, we apply a composition of waste to estimate tons of (1) organic waste, (2) paper and cardboard and (3) other domestic waste (the three type of waste emitting CH4 when landfilled), taken from a SweepNet report[10].

	% of mass
Glass	2%
Plastic	14%
Metal	3%
Paper and cardboard	10%
Organic waste	59%
Other	12%

In the West Bank, 42% of all waste is landfilled[10], but in Hebron, the municipality declared that 100% of waste is landfilled without methane capture. Then, an emission factor of CH4 and CO2 sequestration for landfilling waste without CH4 capture is applied, from an international study directed by the RECORD[11] Institute, and selected in the Bilan Carbone method.

	CH4 leakage	CO2 Sequestration
	kg eqC/t	kg eqC/t
Cardboard	720	224
Paper	746	198
Organic waste	466	36
Other waste	320	63

Emissions for open burning waste are not considered, since they mainly appear in rural areas.

g. Water management

Electricity consumption for water management are provided by the dedicated municipality service: 1012 MWh/y in 2014. This value is considered consistent, and is supposed to comprise pumping, production and wastewater treatment, although it seems quite low.

Since water treatment non-energetic emissions have a low importance for urban BEI and since municipalities do not plan any action on water treatment, non-energetic emissions have not been considered in the BEI.

h. Agriculture

From the Agricultural Census 2010 at city scale and Palestine scale, we extract for each species the number of animals, and for each culture the surface of crops, we apply a factor a ratio at Palestinian level using:

[10] Country report on the solid waste management in Occupied Palestinian Territories, SWEEPNET, 2014
[11] Application de la méthode « bilan carbone® » aux activités de gestion des déchets, RECORD, 2008

- For energy: An estimation of electricity consumption provided by the municipality is used: 140 MWh/year. For other energies, PCBS report on Energy Demand 2008 is used to create a ratio, which is applied per ha of crops.
- For non-energetic CH4 emissions: Emission factors are directly taken from the national inventory of emissions[12] or estimated from it, and applied to local number of animals.

	Number of animals	*in kgCH_4/animal/y*	
		Manure management	Enteric fermentation
Dairy Cows	-	2	40
Other cattle	818	1	31
Sheep	3 275	0	5
Goats	3 188	0	5
Camels	240	2	46
Horses	90	2	18
Mules and Asses	126	1	10
Poultry	5 200	0	0
Other	-	0	0

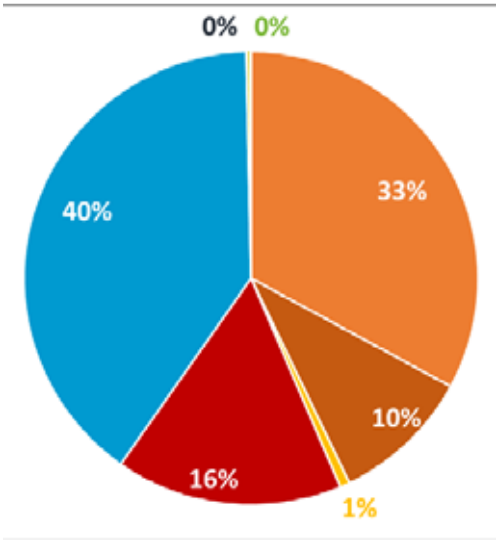
- For non-energetic N2O emissions: A ratio of N2O emissions per dunum of crops is built from the national inventory of emissions[12] to estimate N2O due to artificial fertilization, crop residues and pasture. It is applied to the 8 421 dunums of Hebron, around 842 ha.

3. Results

a. Energy consumption

The total energy consumption on Hebron city perimeter is estimated to be **839 GWh FE/year** in 2014, which corresponds to about **4.15 MWh/person/year** (equivalent to 2.5 barrel of oil per year per person). The following table and pie chart shows its distribution among branches:

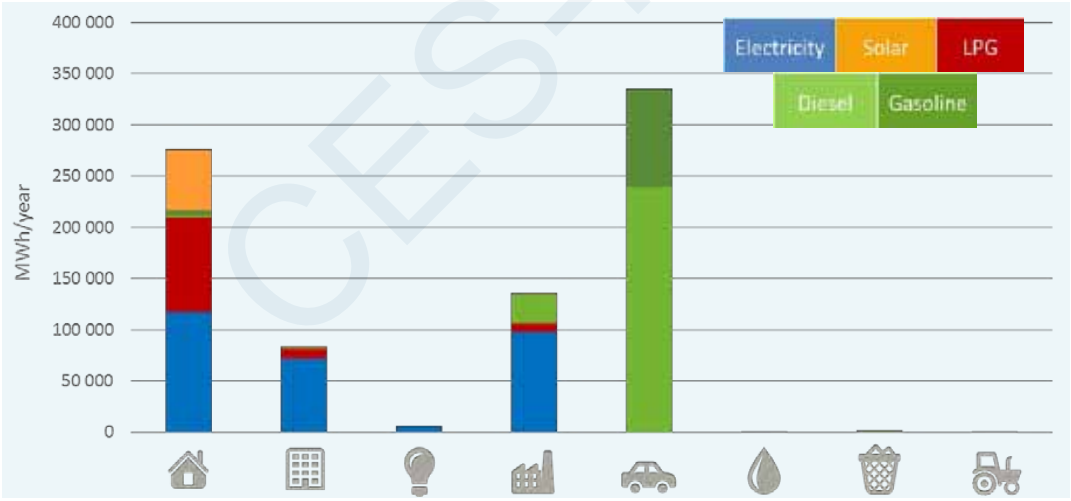
[12] Green House Gas Emissions 2010 (Methodological Report), PCBS, August 2012



	GWh/y
Residential buildings	276
Tertiary buildings	84
Public lighting	6
Industry	136
Transport	335
Water management	1
Waste treatment	1
Agriculture	0

Energy consumption in Hebron (2014)

Municipal buildings consumptions are here included under tertiary buildings, although it is detailed in the dedicated chapter (cf. zoom on municipal assets) and in the BEI Excel file. If we look more precisely and analyze consumption per energy and sectors, we realize that the main energy demand sources are fuels for transport and electricity for buildings, especially residential buildings. Compared to other Arabic countries, solar thermal energy production in dwellings is very high as it is equivalent to half of the household's electricity consumption. If all water were heated with 58 GWh of electricity instead of solar energy, it would increase residential GHG emissions by 38%.



Energy consumption per sector and energy in Hebron (2014)

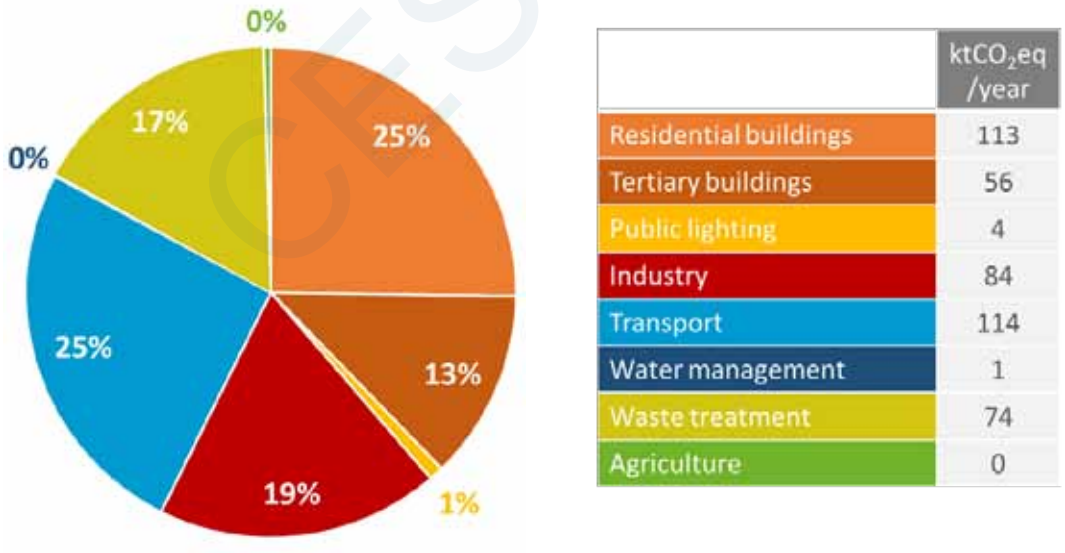
GWh FE/year	Electricity	Solar	LPG	Diesel	Gasoline	Total
Residential buildings	118,2	58,3	91,6	7,8	0,1	**275,9**
Tertiary buildings	73,0	0,0	8,7	1,4	0,3	**83,5**
Public lighting	5,9	0,0	0,0	0,0	0,0	**5,9**
Industry	98,9	0,0	8,1	27,7	0,9	**135,6**
Transport	0,0	0,0	0,0	334,9	0,0	**334,9**
Water management	1,0	0,0	0,0	0,0	0,0	**1,0**
Waste	0,0	0,0	0,0	1,4	0,0	**1,4**
Agriculture	0,1	0,0	0,0	0,2	0,0	**0,4**
Total	**296,9**	**58,3**	**108,5**	**373,5**	**1,3**	**838,6**

Table of energy consumption per sector and per energy in Hebron (2014)

Note that electricity losses have not been shown in this energy inventory to comply with the Covenant of Mayors tables, but the GHG Protocol emission factor used considers it. Losses are substantial in all Palestinian cities. They are due to a combination of technical problems on the grid, unregistered and illegal connections, and customers not able or not willing to pay due to their status (for example refugees).

b. GHG emissions

Global GHG emissions of Hebron city are estimated to be **448 $ktCO_2eq/year$** in 2014, which corresponds to about **2.22 $tCO_2eq/person/year$** (equivalent to 11000 km drive by car). This is significantly higher than average emissions per person in Palestine (1.0 tCO_2eq/person/year), which is due to two factors: urban areas consume more energy, and the BEI scope does not exactly correspond with the national inventory one (in which electricity production is assigned to Israel).



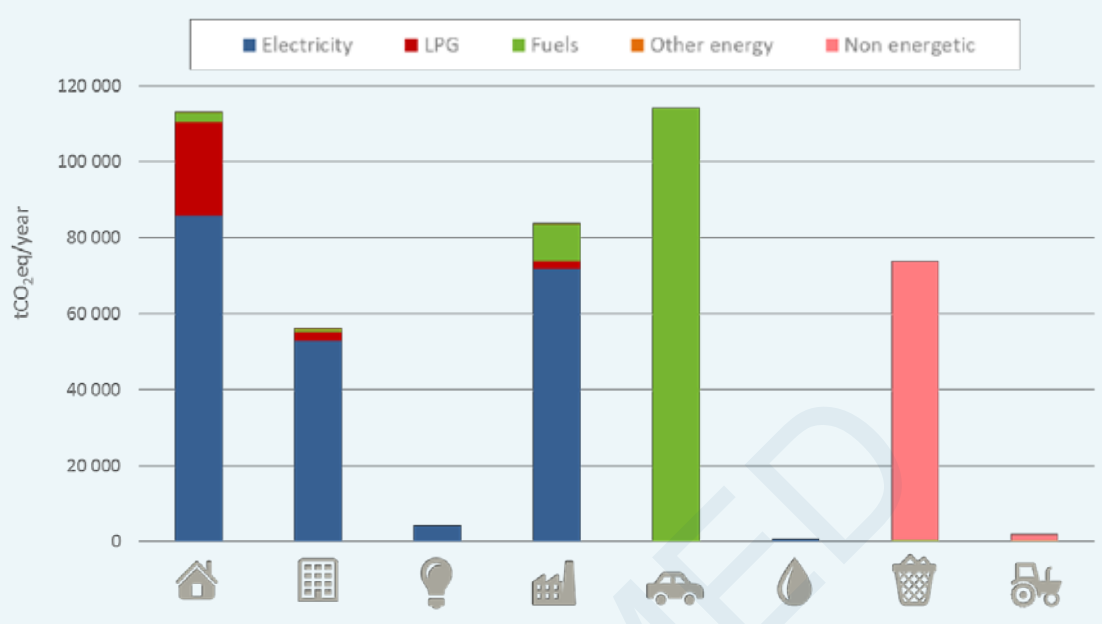
	$ktCO_2eq$ /year
Residential buildings	113
Tertiary buildings	56
Public lighting	4
Industry	84
Transport	114
Water management	1
Waste treatment	74
Agriculture	0

GHG emissions in Hebron (2014)

The distribution of GHG emissions among sectors is as presented in the graph above. Municipal buildings consumptions are here included under tertiary buildings, although it is detailed in the

dedicated chapter (cf. zoom on municipal assets) and in the BEI Excel file.

Emissions comprise combustion (IPCC Guidelines 2006) and upstream emissions for producing and delivering energy (UNFCC Guidelines). The emission factor used for electricity is the Israel value which is 727 gCO_2eq/kWh (GHG Protocol).



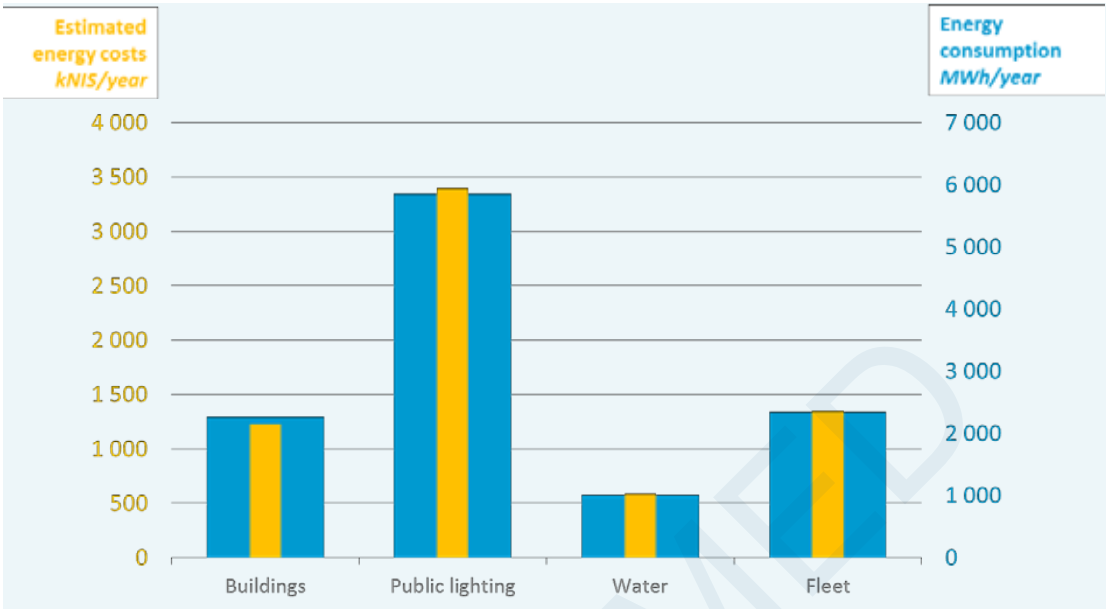
GHG emissions per sector and per energy in Hebron (2014)

ktCO2eq/year	Electricity	LPG	Fuels	Other energies	Non energetic	**Total**
Residential buildings	85,9	24,6	2,5	0,0	0,0	**113,1**
Tertiary buildings	53,1	2,4	0,5	0,1	0,0	**56,1**
Public lighting	4,3	0,0	0,0	0,0	0,0	**4,3**
Industry	71,9	2,2	9,6	0,2	0,0	**83,8**
Transport	0,0	0,0	114,2	0,0	0,0	**114,2**
Water management	0,7	0,0	0,0	0,0	0,0	**0,7**
Waste	0,0	0,0	0,5	0,0	73,5	**74,0**
Agriculture	0,0	0,0	0,1	0,0	2,0	**2,1**
Total	**215,9**	**29,2**	**127,3**	**0,3**	**75,4**	**448,1**

GHG emissions per sector and per energy in Hebron (2014)

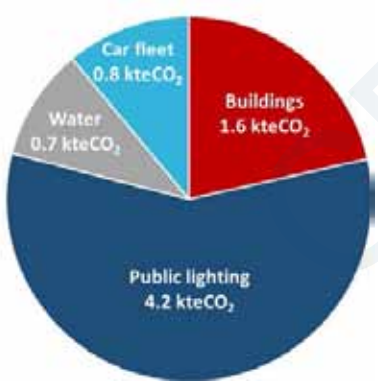
c. Zoom on municipal assets

The energy consumption of Hebron municipality belongings (buildings, public lighting, water management and fleet) is **11.5 GWh FE/year**, about 1.4% of the total consumption of the city. The following chart shows the distribution of consumption and costs among different services of the city. Costs have been estimated using average energy costs. Costs have been estimated using average energy costs (0.54 NIS/kWh for electricity).



Energy consumption of municipal assets in Hebron (2014)

Total GHG emissions (without waste treatment) are **7.4 ktCO2eq/year**, about 1.7% of all city emissions.



Public lighting is the main source of emissions of the municipality assets, but also in terms of energy costs and consumption, although less than 1% of the global city emissions.

Distribution of GHG emissions of Hebron municipality services (2014)

	Consumption *MWh/year*	Costs *kNIS/year*	GHG emissions *tCO2eq/year*
Municipal buildings	2 260	1 230	1 600
Public lighting	5 900	3 400	4 260
Water management	1 000	590	730
Municipal fleet	2 350	1350	820

Consumption, costs and GHG emissions of municipal assets in Hebron (2014)

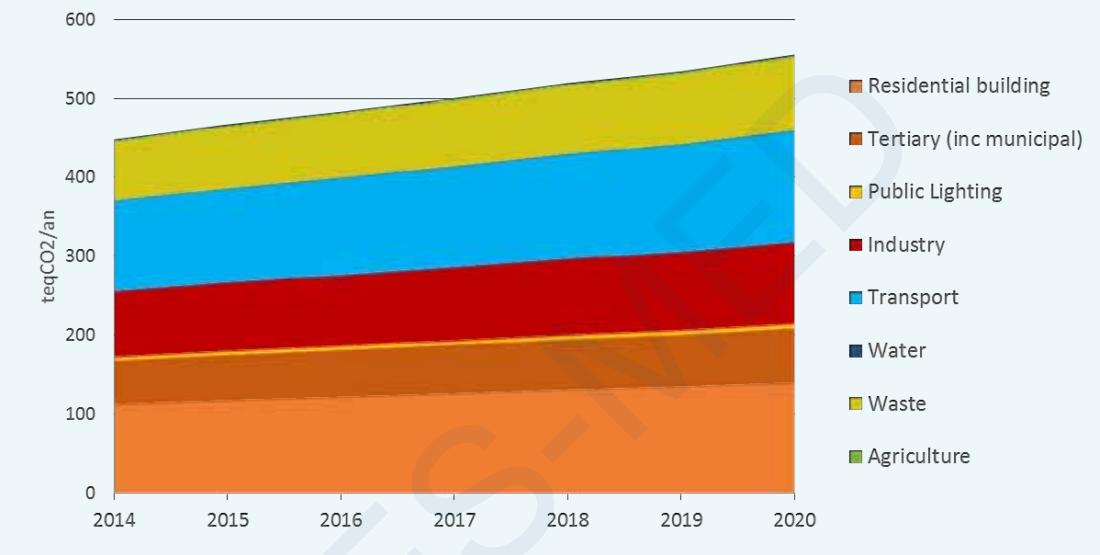
d. Business-as-usual scenario

Information isn't consistent enough in Palestine to create a BAU[13] factor for 2020. Thus, as advised by the JRC report, we apply BAU factors of Jordan for GHG emissions assessment. Applying these factors, we can imagine how GHG emissions will evolve in Hebron.

	2014	2015	2016	2017	2018	2019	2020
BAU factor for Jordan	1,24	1,19	1,15	1,11	1,07	1,04	1

BAU factor in Palestine/Jordan

Supposing an increase of 24% of GHG emissions on all sectors, total GHG emissions in Hebron will reach in 2020 a total of about **556 teqCO_2/year**.



BAU trend scenario for Hebron GHG emissions 2014-2020

[13] Projection to 2020 for setting emission reduction targets in the Southern Mediterranean Partner Countries, JRC, 2013

4. Complete BEI tables

Energy consumption in MWh EF/year in 2014

		Electricity	Liquid gas	Diesel	Gasoline	Coal	Other fossil fuel	Solar thermal	Total
Non municipal assets	Tertiary buildings	70 900	8 710	1 093	247	167	160		**81 277**
	Residential buildings	118 151	91 563	2 837	4 946	89		58 318	**275 903**
	Industry	98 850	8 149	26 144	1 563	307	592		**135 605**
	Agriculture	54	24	231	10	28	6		**352**
	Transport			237 103	95 405				**332 508**
	Total	**287 955**	**108 446**	**267 408**	**102 170**	**590**	**758**	**58 318**	**825 645**
Municipal assets	Municipal buildings	2 122	38	105					**2 265**
	Public lighting	5 860							**5 860**
	Waste			1 429					**1 429**
	Water	1 012							**1 012**
	Municipal Fleet			2 166	180				**2 346**
	Total	**8 994**	**38**	**3 700**	**180**	**0**	**0**	**0**	**12 912**
Total		**296 949**	**108 484**	**271 108**	**102 350**	**590**	**758**	**58 318**	**838 557**

GHG emissions in tCO_2eq/year in 2014

		Electricity	Liquid gas	Diesel	Gasoline	Coal	Other fossil fuel	Non energetic	Total
Non municipal assets	Tertiary buildings	51 544	2 341	380	78	74	54		**54 471**
	Residential buildings	85 896	24 608	986	1 557	39			**113 086**
	Industry	71 864	2 187	9 069	491	137	39		**83 787**
	Agriculture	39	6	80	3			1 952	**2 081**
	Transport			83 103	30 237				**113 340**
	Total	**209 343**	**29 142**	**93 618**	**32 365**	**250**	**93**	**1 952**	**366 764**
Municipal assets	Municipal buildings	1 543	10	36					**1 589**
	Public lighting	4 260							**4 260**
	Waste			497				73 470	**73 967**
	Water	736							**736**
	Municipal Fleet			759	57				**816**
	Total	**6 539**	**10**	**1 292**	**57**	**0**	**0**	**73 470**	**81 369**
Total		**215 882**	**29 152**	**94 910**	**32 422**	**250**	**93**	**75 423**	**448 132**

Section IV: Sustainable energy action plan (planned actions)

This section is structured in four parts

- **Background information** – Very brief overview of basic information on Hebron city
- **Municipality building and services** – Presentation of activities that fall under the direct responsibility of the Municipality council (the buildings it manages and the services it implements as part of its core competencies)
- **Action plan on Hebron area** – Presentation of activities that can be run by stakeholders independently from the Municipality, but that need a to be stimulated and steered by the Municipality services in order to ensure everyone is acting in a consistent plan

NOTE: These two parts will mainly focus on energy conservation and energy efficiency measures, while the fourth part will focus on renewable energy consumption.

- **Energy supply and renewable energy development** – Presentation of main constraints faced regarding energy supply and plans to development renewable energy production.

1. Background information

Overall population	202.172	2014 figures	
Municipality area	42 km2		
Electricity consumption	297 GWh/y	Electricity per capita	1,468 KWh/y
Energy consumption	839 GWh/ y	Energy per capita	4.150 KWh/y
GHG emission	448 KTon eqCO2/y	GHG per capita	2,22 t eqCO2/y
Mayor	Dr. Daoud Al Zatari		

Hebron or, Al-Khalil in Arabic, is named after Prophet Abraham, and known in Arabic as Khalil Alrahman. It is the second oldest inhabited city in the world. Its history dates back more than 5500 years. Hebron's Old city is one of the ancient, historical and heritage sites in Palestine which dates back to the Mamluk and Ottoman period and that has witnessed the development and sophistication of Hebron.

Hebron City is part of Hebron Governorate. The city is located on the southern part of West Bank, about 32 km south of Jerusalem, at an average altitude of 1032m above sea level.

According to the Palestinian Central Bureau of Statistics, in 2014, the total population of Hebron Governorate was approximately 684,246 residents while Hebron City reached a bit more than 200,000 residents.

Hebron is a busy hub in West Bank, mainly dependent on the trade sector: nearly 50% of the total labor force in the city is engaged in the trade sector. Agriculture forms the second sector, which residents depend on, and accounts for 15% of the labor force. The industrial sector is similar to the agriculture and is also considered as the backbone of Hebron economic and represents about 15% of the labor force.

The industry is very diverse and includes: shoes, plastic, leather, cutting stones, marble, glass blowing, concrete, and cleaning substances factories, in addition to spongy mattress as well as steel construction and manufacture, nylon bags, embroidery, and potato chips as well as food production. These industries are considered as high quality in Palestine and the neighborhood. They develop alongside prominent traditional industries: pottery, porcelain, leather tanning, soap production, and antiques. It is worth mentioning that Hebron's contribution to Palestinian economy represented 38 to 40% of Palestine GDP.

Hebron city suffered considerably from the Israeli occupation. According to municipal officials, some 40 square kilometers of Hebron Governorate land were confiscated during the Second Intifada. Furthermore, Hebron city is surrounded by the Israeli settlements of Qiryat Arbaa' and Ramat Mamre (Kharsine) on the East, Hagai on the South and the occupied Hebron Jewish Quarter in the center of the Hebron city. Additionally, a bypass road runs through the northern part of the city, and a segregation wall borders Hebron city on the East and the North.

In 1997, Hebron was divided into two parts, H1 (Hebron 1) and H2 (Hebron 2). H1 is under Palestinian control while H2 is under the Israeli control (security wise). However, Hebron Municipality is in charge of the two parts in providing services, which makes its duty in H2 a big challenge as it is under Israeli control and some religious Israelis settlers live in it.

The presence at the very heart of the city close to the Patriarchs tomb, of a growing Israeli colony (400 settlers and 2000 soldiers) represents one the main constraints imposed on the Municipality to manage its development. The colony itself and the control on its access road divide the core of Hebron city in two parts. Moving from one part to the other imposes long deviation. This also results in some roads being totally closed and around 600 shops being shut by Israeli decision. In fact, 40% of the urban area is actually under Israeli control. This makes any plans (on traffic regulation, urban planning, water supply, energy management) almost impossible to design.

2. Municipal vision

The mayor and the municipality council are willing to work together with the participation of citizens to build and develop an economically thriving city, where quality of life is a common commodity for all, based on modern infrastructure and advanced administration, while at the same time taking into consideration the preservation of the cultural heritage of the city of Hebron. The ultimate goal is to become one of the most distinguished cities in the Arab world.

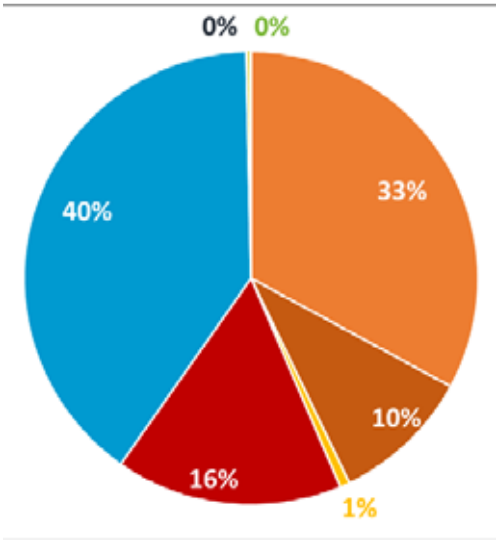
The municipality aims to build and administer the basic structure and public facilities, and provide citizens with municipal services, smoothly and transparently, while preserving the heritage and cultural wealth of the city of Hebron. The municipality strives to keep the city of Hebron a distinguished city where citizens and guests live in dignity. By means of proper utilization of human and material resources as well as commitment to the principles of equity, impartiality, and transparency, the municipality seeks to achieve viable and sustainable development in the city in partnership with civil society.

Sustainable development should be a key driver for the city. Sound management of basic resources – energy and water – is essential both to minimize costs for all, and to reduce the overall environmental footprint of the city. As the Hebron wants to become one of the most distinguished cities in the Arab world, it all need to carefully reduce this environmental footprint, as sustainable cities will be the only one actually recognized as leaders.

3. Summary of the Baseline emissions inventory

3.1. Energy consumption

The total energy consumption on Hebron city perimeter is estimated to be **839 GWh FE/year** in 2014, which corresponds to about **4.15 MWh/person/year** (equivalent to 2.5 barrel of oil per year per person). The following table and pie chart shows its distribution among branches:

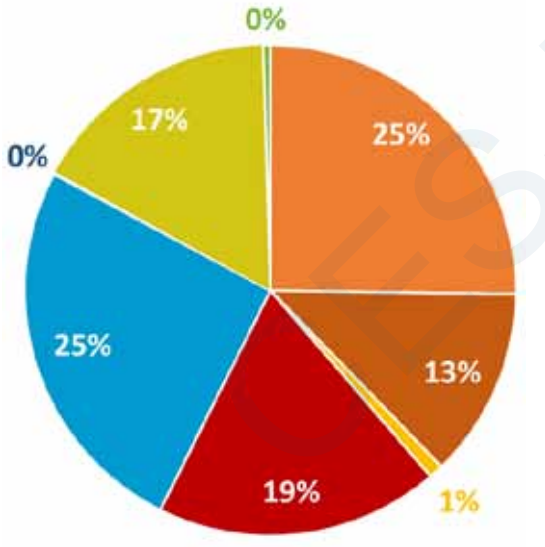


	GWh/y
Residential buildings	276
Tertiary buildings	84
Public lighting	6
Industry	136
Transport	335
Water management	1
Waste treatment	1
Agriculture	0

Note: Municipal buildings consumptions are included here under tertiary buildings. One can find the details in the dedicated chapter of the BEI document.

3.2. GHG emissions

Global GHG emissions of Hebron city are estimated to be **448 $ktCO_2eq$/year** in 2014, which corresponds to about **2.22 tCO_2eq/person/year** (equivalent to 11000 km drive by car).



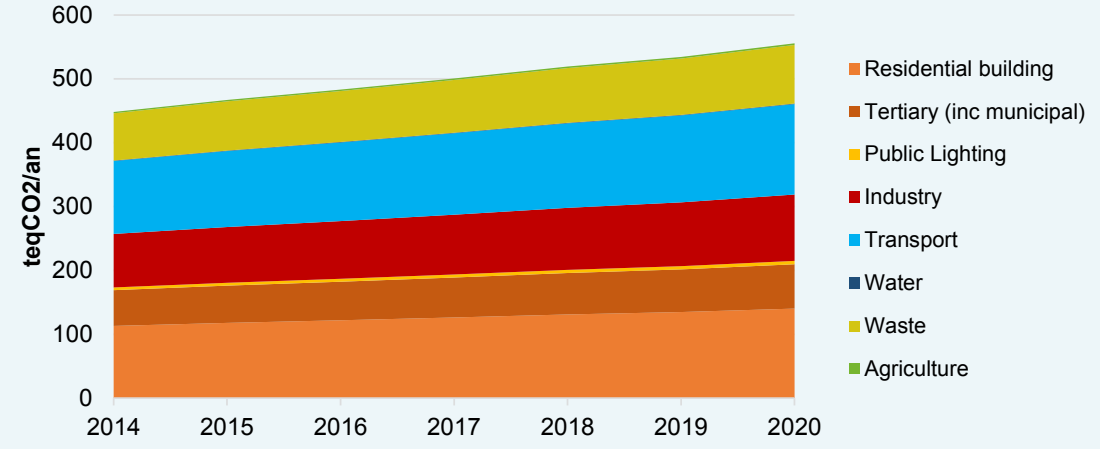
	$ktCO_2eq$/year
Residential buildings	113
Tertiary buildings	56
Public lighting	4
Industry	84
Transport	114
Water management	1
Waste treatment	74
Agriculture	0

This amount of GHG per capita is pretty low compare to other countries in the region:
2,5 in Jordan; 2,4 in Egypt; 4,6 in Algeria, 9,4 in Israel. However, this shouldn't refrain Hebron to develop all efforts to contain these emissions while the city will continue to expand.

3.3. Business-as-usual scenario

The BAU scenario gives an indication on how GHG will evolve if no actions were implemented. As data are not consistent enough to define a specific BAU for Palestine, and following JRC recommendation, BAU factors from Jordan were used.

Applying such BAU factors and considering an evenly shared growth among the different sectors, the overall GHG emission will go through a 24% increase by 2020.
GHG emissions in Hebron will then reach a total of about **556 $teqCO_2$/year** in 2020.



4. Action plan on municipal buildings and services

The first priority of the Municipality Council should be to act on its direct perimeter of responsibility: municipal buildings and services (street light, water distribution & sanitation, waste management). It is only while being exemplary on its own perimeter that the Municipality Council will be able to promote the mobilization of all stakeholders, inviting them to reduce their energy consumption and contribute to the development of renewable energy capacities.

This commitment to act on its own perimeter, also constitutes a field for investigation to test actions, assess results and impacts, in order to design appropriate recommendation that could be then proposed to the citizens, the companies, the citizen groups that will have to act to promote the local energy transition.

4.1. Municipal buildings

4.1.1. Current status

Hebron Municipality was established in 1882, it is a public “service” organization working under specific regulations and by-laws enacted and improved over years in order to render the best municipal services for its citizens.

The municipality owns many buildings in different locations representing a total of 133.000 square meters that could be detailed as follows:

- 60.000 square meters of offices (including, the city hall, administrative sites, water and sanitation offices, electricity management building, library, cultural center, etc.)
- 13.000 square meters of commercial facilities, warehouse and technical equipment and
- 60.000 square meters of schools.

These buildings represent a potential of 32.000 square meters of roofs to be equipped with solar PV.

Municipality buildings consume 2,122 MWh of electricity per year (2014 reference) and 2,265 MWh when counting all types of energy. This consumption is composed of electricity - lighting, cooling and heating, office equipment (computer, copiers, etc.), elevator, etc. - but also in minor parts, of gas and diesel. The electricity bill from municipality buildings alone represents 271 K€.

Lighting (in buildings): Some efforts were made to switch to efficient bulbs, however there is still no tight control of lighting and no automatic device to turn it off after a certain time or when there’s nobody in a room or a building. There is a habit to switching light on whatever will be the availability of natural lights, even if this natural light is sufficient most of the time. Raising awareness among staff and changing habits should be a priority. Beyond changing behaviour, specific devices (like motion sensors) can be installed.

Electric equipment: So far electric equipment (computers, copiers, printers, etc.) is basic. Reduction in consumption could also come from switching to more energy efficient devices.

Cooling and heating: Most of the buildings are equipped with AC/heater split systems. Only few

offices are under a centralized temperature control system. There is still an important margin for improvement to ensure proper management of heating and cooling, temperature inside building being often too high in winter and too low in summer. According to a study conducted in Tulkarem municipality buildings, if staff was ensuring a more balanced used of heating and cooling, energy consumption in such buildings could be cut by 30 %.

Renewable energy: Some of the potential sites have been identified, and there are already pilot projects to test the benefit of solar PV. The Municipality is designing a strategic plan to develop renewable energy on its buildings and beyond (see section 5. of the SEAP).

4.1.2. Energy savings/short-term actions

The Municipality is willing to develop initiatives to reduced energy consumption but so far no consistent plan was implemented. More efforts should be done in **raising staff awareness** on simple change of behaviour to save energy without significant investment:

- Open curtains and window shutters during daytime to avoid artificial lighting.
- Keep inside temperature between 21°C maximum in winter, and 24°C minimum in summer to ensure good comfort all year long and make strong cut in energy consumption.
- Avoid elevator and choosing stares when going up or down one or two floors.
- Turn off electric equipment at end of working time or when not actually used.

It would be interesting to promote a challenge between services / units to invite all workers from the Municipality to make efforts to save energy. The best performing service would be celebrated as “energy saver/ climate saver", and would get a special gratification.

The Environmental awareness unit, to be set up within the Municipality communication department, will promote these activities (see priority action #5).

4.1.3. Energy-savings/long-term actions

Beyond promoting awareness and behavioural change, it is necessary to develop a clear and comprehensive plan to replace old devices and equipment and **install energy efficient** systems that will help reducing electricity consumption. Ideally, this programme should be implemented, in a first phase, in a small number of buildings (starting with the more symbolic one: the city hall) but covering all type of devices and equipment, in order to concentrate many initiatives on the selected buildings and demonstrate the benefit of these structural changes:

- Switch from AC / Heating reverse systems to central management of heating and cooling.
- Switch to LED lighting and install motion sensors in offices. This device turns the lights off during un-occupied periods. This can reduce lighting consumption by 20% to 80% depending on the occupancy type of these areas. A case study, conducted in Tulkarem, demonstrates that a 30% cut could be easily achieved installing such sensors in key areas, with a pretty limited investment (1,200€ / 100 square meters) and very short payback period (22 months)[14].

These technical projects need to be tightly monitored to register impact on energy consumption reduction to prepare progressive enlargement to a larger number of targeted building.

Obviously the design and construction of new buildings should follow more stringent rules and new requirements allowing far better energy performance.

4.1.4. Expected results

Energy in MWh/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
GHG in tCO2eq/year	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
All municipality buildings	**2,265**	**1,589**	**- 815**	**- 581**	**1,970**	**29 %**
Staff awareness campaign			- 453	- 318		16 %
Switch to LED lighting and sensor systems in buildings			- 362	- 263		13 %

Note: Impact of long-term measures can’t be assessed without more detailed plans

[14] Promotion of energy efficiency & renewable energy in strategic sectors in Palestine, Tulkarm Municipality Report. 19, June 2012.

4.2. Street lighting

4.2.1. Current status

Street lighting in Hebron consumes 5,860 MWh of electricity per year (2014 reference), which represents an overall annual cost of 775K€.

The structure of the system can be described as follows:

Lamp power in Watt	Number of units
400	235
250	2535
150	1347
100	1318
70	587
Total	6022

Some initial test has been made to explore ways to reduce this energy consumption:

- Convert 190 HPS or Mercury lamps to LED
- Reduce lighting power by 50% after 11pm
- Install Solar PV powered lamps

These different pilots demonstrate that it is actually very interesting to develop a comprehensive plan to reduce electricity consumption from street lighting.

4.2.2. Short-term actions

Replacement of HPS lamps / PRIORITY ACTION #1

From initial investigations run in Hebron and other cities, replacement of old lamps by modern technologies (LED), appears to be very cost effective.

One option could be to set up an initial fund (200 to 500K€) to feed in a revolving fund dedicated to old lamps replacement. Hebron electrical department, managing street lighting, would set up a tight budget monitoring mechanism to precisely measure reduction in electricity consumption. The money saved would be invested again in lamp replacement. This set up can allow replacement of all lamps over time (5 to 7 years depending on technical choices) and ensures full replenishment of the initial investment fund.

The detailed process for this revolving fund is described in the priority action presentation fiche.

4.2.3. Long-term actions

Based on the Master plan currently in preparation in cooperation with CHF/Global communities, it will be soon possible to design a **street lighting strategic plan** identifying areas of differentiated usage, where lighting would be then adapted to the actual needs per specific area.

- Main roads, avenue and city entrances where high intensity lighting should be necessary at least between sunset and midnight and before sunrise. Note that lighting intensity could be easily reduced, even in these areas between midnight and few hours before sunrise.
- Secondary streets where reduced lighting intensity should ensure safety while allowing low energy consumption.
- Specific areas (parks, narrow streets, pedestrian areas, etc.) where motion sensors should be installed to light up when people are around and avoid lighting when nobody is there.

Such an improvement in urban planning and street infrastructures linked with tighter management of public demand, should lead to designing a system combining qualitative lighting and reduced energy consumption. This evolution will require a combination of technical solutions (sensors, midnight automatic reduction, etc.) and social dialog to improve acceptance of different approaches (i.e. reduced lighting after midnight, appropriate lighting in narrow streets, parks, etc.).

A possible work plan could unroll as follows:

1. Based on the existing Master plan and elaborating on the first return on experiments of the two tests performed since July 2015, identify 3 or 4 types of streets and areas according to their specific lighting needs.
2. Organise public consultation to ensure proper acceptance of the new lighting system propose and collect ideas to continue improving the plan.

3. Define the appropriate technical solutions for each type and design the implementation program tacking into account priorities per type of areas (for example, identifying one specific block of streets, places and avenues where the new lighting system would be implemented as a show case for the rest of the city).
4. Implement step by step the plan, organizing all along the implementation process, a control and assessment mechanism – including public participation – to continuously improve the system based on performance assessment of the option adopted. Such monitoring must measure energy consumption reduction and highlight what it means in budget cuts.

It will also be important to set up a sophisticated monitoring system to measure consumption per area and assess the performance of different models of lighting proposed.

4.2.4. Expected results

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Street lighting	**5,860**	**4,260**	**- 3,422**	**- 2,487**	**5,282**	**47,1 %**
Expand LED deployment (priority 1)			- 2,813	- 2,044		38,7 %
Street lighting strategic plan			- 609	- 443		8,4 %

4.3. Water delivery

4.3.1. Current status

Water is a very scarce and strategic commodity in Palestine. Daily life of citizens, as well as the entire economy, depends on water availability. This is even more complex in Hebron, as the city has no direct access to water (no wells, no natural springs) and has to buy all its water from Israel. Thus the city faces many difficulties due to the limited quantities allocated by the Palestinian Water Authority in accordance with the “agreement” signed with Israel (Hebron protocol).

The Municipality aims at distributing 20.000 cubic meters per day (more or less 100l/capita or 7.3 million cubic meters/year). However, this capacity should be 40.000 m3 to take into account losses on the network and growing industrial needs.

As delivery can’t be secured 24 hours / 7 days, people have to store water on top of their buildings. Despite this temporary storage, water shortage remains frequent. As a result, the black market of water tends to develop parallel to water shortage.

Water bought from Israel is pumped into a buffer reservoir (13.000 cbm) containing only half a day needs for the entire city. There are no reservoirs on the heights of the city that would reduce the need of pumping water in each multi stores building. Note that many residents have to pump the water they need up their roof, spending a lot of electricity to do so.

The Municipality consumes 1,012 MWh/year for water distribution, representing a cost of 134K€.

4.3.2. Short-term actions

Efforts will continue to promote energy efficiency through working on pumping engines (adopting variable speed pumps). Improved management of pumps can reduce consumption by 15 to 20%.

4.3.3. Long-term actions

The only significant change that would both improve the quality of delivery and reduce energy consumption will come from a different structure of the water delivery system. This new model must be based on big reservoirs placed on the heights of the city, using gravity to distribute water to all buildings. Energy consumption of both Municipality and residents would be then reduced. Hebron geography allows such a set up.

Ideally, the pumping station attached to the two or three reservoirs that would be installed must be surrounded with solar PV, to cover, at least part of, the electricity needs of the pumping stations.

The first step of this action is to run a detailed **feasibility study** that will help define the appropriate size and location of the reservoirs.

It is important to mention that such a new water delivery system, will not only improve daily life of people and companies in Hebron, it will also generate significant cuts in energy consumption, reducing pumping needs, but also reducing transport of water by truck made necessary by water shortage on the network.

4.3.4. Expected results

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Water delivery	**1,012**	**736**	**- 152**	**- 110**	**912**	**12 %**
Water distribution improvement			- 152	- 110		

4.4. Water treatment

4.4.1. Current status

So far sewage from the Hebron Governorate runs untreated through populated areas causing a substantial damage to the aquifer and the health of residents. These environmental and sanitary impacts have been a serious challenge for many years as the sewage affects the communities living alongside the stream in Wadi As-Samen and pollutes the eastern aquifer used as a supply of potable water for the southern West Bank.

On April 22nd, a group of funding agencies - World Bank, US Aid, AFD - approved a US$ 67 million grant for the building the Hebron Regional Wastewater Management Plant. This plant will reduce environmental pollution from wastewater produced in the Hebron Municipality.

The wastewater treatment plant will treat the entire sewage stream coming from Hebron city. The project should be launched in 2015 and the plant would start operating end before 2020.

Hebron Municipality should explore the opportunity to add a bio-digester to the plant that could also process bio-waste collected in the city to produce methane (and then electricity).

Water recuperation and local development / PRIORITY ACTION #3

This “local economy” will avoid importing fodder, meat, milk, and cheese from Northern West bank and from Israel, reducing energy consumption of transport and cutting GHG linked to these avoided transports.

It is important to mention that this project is not only a smart way to give added value to exhaust from the wastewater treatment plant, it is also an interesting plan to adapt to climate change.

Note: The impact of this component in terms of GHG reduction can’t be assessed at this stage.

4.5. Solid waste management

4.5.1. Current status

The solid waste issue gained significant attention in recent years, not only due to its environmental impacts, but also for its social and economical consequences.

Hebron waste management service collects nearly 220 tons per day (68,640 tons per year). Waste composition shows a lower proportion of bio waste than in other cities of the West Bank (35% bio waste – 12% carton – 10% plastic - 3 % glass – 4 % mix).

The service operates 17 old vehicles to collect and carry the waste to the transfer station located in Hebron industrial zone. From there it goes by 40 tons trucks to Al Menia landfill, managed by the Joint Council Service gathering various Municipalities from the Southern part of the West Bank.

Hebron Municipality pays 30 NIS/ton of waste entering the landfill when it ensures waste collection on its own. It pays 50NIS/ton when collection is managed by JCS.

4.5.2. Short-term actions

The Municipality already engaged in various actions to **improve waste management efficiency**:

- Trucks management controlled by GIS,
- Optimization of the service with adequate container for the suitable neighborhood,

- Improvement of transfer to sorting station and landfill,
- Improvement of collaboration with the private sector.

Considering the cost difference between collection by the Municipality and by JCS, and taking into account the difficulty to optimize the waste collection, Hebron council came to the conclusion that it would be better for the Municipality to subcontract JCS to ensure collection of the total of waste produced in the city. Equipment used so far for this task will be then allocated to other missions.

The Municipality also run a **pilot project** to **collect bio-waste** from markets and food industries. This bio-waste is currently used to produce compost (450 tons per month) but could be later used to produce biogas (methane), for example in the bio-digester that could be built linked to the Wastewater Treatment Plant.

Additionally, the Municipality, which is very concern by the need to improve cleanliness of the city, would like to design and implement a plan to **raise public awareness** to promote waste management, reduce waste generation and develop recycling.

4.5.3. Long-term actions

Following on the bio waste collection pilot project, the Municipality would like to develop a comprehensive waste management strategy promoting three waste streams:

- Bio-waste
- Recyclable materials: plastic bottles, cartons
- RSW (residual solid waste) to be used as fuel

Bio waste will go first to compost and ideally at a later stage to biogas production. Bio waste separate collection already started in market place and food industries. It could be extended as a test in certain parts of the city engaging citizens to sort their waste in the three different streams. The optimum target (mid term) would be to collect 15 tons a day (20% of the total potential).

It is important to consider that developing separate waste collection will impose reorganizing the process, for example using small trucks ensuring collection of different type of waste at different time of the day in main commercial streets (where there is no space to put waste containers). It will also require the Municipality to install different type of underground containers (one for biowaste on for RSW) if it decides for this type of system. **Plastic bottles and cartons** can generate new business activities connected with recycling industries in Jordan or Israel. Groups of entrepreneurs could be sponsored by the Municipality to start collecting these products and sell these material to companies engaged in this business[15].
The optimum target (mid term) would be to collect 10 tons a day (40% of the total potential).

Waste to energy strategy / PRIORITY ACTION #4

The Residual Solid Waste representing at least 195 tons/day could be processed to produce energy in a gasification unit. Such a plant transforms waste into gas, which can then produce heat and electricity. Gasification is far more efficient than classical incineration process, and avoids releasing hazardous substances in fumes. For this very reason, gasification has more chance to be accepted by Israel than incineration, which will always be subject to opposition for the potential pollution it may generates.

A first investigation has been conducted demonstrating that the amount of waste collected in Hebron could feed in a gasification unit connected to an 8MW electricity production plant. It would require a 40 m€ investment, offering an 8,5 years pay back period. The unit could also be designed to accept waste coming not only from Hebron city, but also from neighboring villages and from other municipalities in Southern West Bank. Hebron now looks for private investors to joint with the Municipality in a Public Private Partnership that would build and manage the gasification plant.

Note: Diverting waste from the Al Menia the landfill to feed in the gasification plant will impact the mid term economy of the landfill. However, it will expand the lifetime of this equipment, which was initially supposed to be full by 2040.

[15] As an example, Tulkarem recently awarded contract to small companies to collect recyclable material (plastic and cartons)

4.5.4. Expected results

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Solid waste management	**1,429**	**73,967**	**- 214**	**- 55,075**	**91,719**	**60 %**
Improve waste management through improved collection			- 214	- 75		0,01 %
Waste gasification unit development			+ 40,000	- 55,000		60 %

4.6. Other services and long-term responsibilities

4.6.1. Municipal fleet

The fleet is composed of 80 vehicles and heavy machinery. All this equipment is pretty aged and lack efficiency.

5 years ago Hebron set up a very sophisticated system to monitor vehicle use allowing significant cuts in energy consumption

Actions proposed:

- Continue upgrading the fleet management tool and invest more in people awareness.
- Replace old cars with new ones, looking for leasing to avoid heavy investments.

Expected result

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Municipality fleet	**2,346**	**816**	**- 503**	**-189**	**1,012**	**18,6 %**
Improve fleet management			- 315	- 124		12,2 %
Progressive fleet replacement			- 165	- 65		6,4 %

4.6.2. Public procurement policy

The Municipality being an important “buyer” of goods and services could introduce energy and climate change criteria in its public procurement rules.

4.6.3. Sustainable urban planning

The Municipal Council in partnership with CHF / Global communities is currently designing its Master Plan. Deciding how urban development will shape has a very important role to play on long term climate and energy performance of the entire city.

Hebron is already a crowded and very dynamic city. However, the urban development tends to preserve the deeply rooted identity of the city, characterized by the presence in many places of orchards (grapes, olive trees, figs, etc.), greenhouse fro vegetable production and trees, offering open spaces between buildings providing the city with a very specific shape. One of the trends to be promoted is the vertical development of the city: may multi-stores building are constructed with shops, workshops, storage facilities on the first floor and apartments in the upper levels. This model, mixing business, services and housing is very efficient one as it results it a denser but still nice urban environment contributing to preserve the economic dynamic in all parts of the city.

This Master Plan should also bring consistency in designing or improving the electric network, the water and sewage system, the traffic management, etc.

This strategic urban development plan should also promote specific areas for industrial development, for greenery and recreation, specifying for each of these areas the type of road infrastructure, street lighting, water management, waste collection services, to be organized to cope as closely as possible with the demand and avoid wastage of space, energy, water…

4.6.4. Skills and expertise development

Availability of a local authority staff presenting the adequate skills and expertise in terms of technical knowledge (energy efficiency, renewable energies, efficient transport) or project management (data management, financial forecasting and investment planning, communication skills, green public procurement, etc.) need to be developed everywhere in Palestine.

Hebron Municipality is looking to improve its staff experience and develop knowledge and expertise for

serving the sustainable development of the city.

4.7. Awareness campaign

4.7.1. Current situation

Like everywhere in Palestine there is in Hebron a huge need for more awareness on environmental issues. It is not only good to educate Municipality staff for them to make necessary efforts to promote energy conservation and environmental protection in their daily work, it is also necessary to develop the Municipality capacity to promote awareness among all stakeholders in Hebron.

4.7.2. Short-term actions

Environment awareness unit at Municipality level / PRIORITY ACTION #5

As municipality staff, population and local stakeholders lack information and need to be mobilized to act on energy conservation, energy efficiency and more generally on environmental protection, it is necessary to strengthen efforts to inform and engage all the publics in contributing to the implementation of the different components of the SEAP.

Hebron Municipality will set up a dedicated unit, focusing on raising awareness in different publics to optimize the impact of the measures proposed to reduce energy consumption and improve the quality of life in the city, including proper management of energy, water and waste.

Such a unit would be part of the communication department of the Municipality, been connected with HEPCO, the electrical company, the water service and the waste management unit.

The unit should work as a focal point to develop initiatives that will engage the public to change behaviour, to preserve energy and water, and actively contribute to the cleanliness of the city. The unit will work in partnership with different stakeholders in order to facilitate the duplication of initiative and reach out more people. In that sense the Awareness unit will be a key component of the SEAP implementation, as most of the impacts expected for the action plan, depends on the adequate mobilization and engagement of stakeholders to cease the opportunities offered to reduce their energy consumption and, doing so contribute to the success of the programme.

The unit will launch its mission focusing on 3 priority targets - Municipality staff; children; mothers – to inform on issues at stake regarding climate change, energy management and environment challenges in the city; provide guidance to behavioural changes; and invite all stakeholders to engage in concrete actions to help reducing energy consumption, and improve the urban environment (preserving water, reducing waste and littering to promote a cleaner city).

The unit will develop its activities engaging cooperation with existing groups and institutions:

- Spreading **information and training material** (posters, brochures, stickers, etc.) to remind everyone of the importance of energy saving. This must include training given by Municipality employees.
- Develop an annual event "**Energy festival or Energy day**" where best practices could be demonstrated and innovative projects celebrated. Such a festival could be promoted through a large advertising campaign mobilizing all traditional media but also social networks online.
- Unroll specific awareness campaigns among specific target groups
    - Developing a network of "**Positive energy schools**" producing more energy than they consume, through a combination of energy conservation / energy efficiency measures and the development of Solar PV on schools' roofs. Teachers should be engaged in such programmes to use all the potential of the technical development, as support for training students. Hebron is already engaged in a specific programme with schools: improved design for 10 schools per year, refurbish old schools, raise children awareness, develop specific projects engaging kids in energy saving activities…
    - **Mobilize families** through the training of women/mothers
    - Promoting an **awareness raising campaign in mosques**, developing solar heating and solar PV equipment and inviting imams to promote responsible behaviour regarding energy consumption.

Raising awareness would be the support to gather more people, university researchers, businessmen, communication experts and local citizen groups, beyond the Municipality team, to work together on a broad mobilization to reduce energy consumption and develop renewable energy production.

Raising awareness should also be seen as a tool to push citizen to take ownership of the energy issues, engage in energy conservation efforts or participate in renewable energies take off, and doing so, actively contribute in the implementation of the local and sustainable energy strategy, that will reduce dependency on Israeli energy sources and will improve local economy.

Note: Results of awareness activities are specifically noticed in sectors (municipal building, tertiary and residential buildings, mobility) where these activities will be developed.

5. Action plan for Hebron's urban area

Beyond its direct scope of responsibility (on buildings and services), the Municipality council also has to mobilize all stakeholders acting in its boundaries. It is only through the overall commitment of residents, shops, businesses, local groups, farmers, etc. that significant reduction in energy consumption and development of renewable energy will be achieved

5.1. Residential and tertiary buildings

5.1.1. Current situation

The residential and tertiary building sector is the first one in terms of energy consumption (43% with 357 GWh/year) and GHG emission (38% with 168 $ktCO_2eq$/year). The Hebron distribution company HEPCo, which buys electricity from the IEC in Israel, distributes the electricity used in residential and tertiary buildings.

There are almost 68,000 electricity consumption units (residential places, shops, factories, service buildings) serviced by HEPCo. It is noticeable that due to the political context in Hebron (Israeli settlement in the heart of the city and Israeli rules dividing the city in two parts, H1 and H2, meaning that some houses, shops and SME are completely isolated from the rest of the city) a significant proportion of units (around 20%) are not paying their bills although they get electricity from the grid. It is almost impossible for HPCO to impose any payment in this context.

Like in many other Palestinian cities, solar heating (for water) is widely spread in Hebron: around 64% of dwellers are equipped.

5.1.2. Short-term actions

There is a lot to do to **raise public awareness** on energy issues, inviting inhabitants to reduce their consumption and, as a consequence, cut their energy bill. An awareness campaign doesn't require a huge amount of money and can bring interesting results for both parties: the client learning to use less energy, the company improving its services.

Such awareness campaign to promote efficient behaviour should focus on few points:

- Promoting the proper temperature at home: usually homes are too hot in winter and too cold in summer when a reasonable heating/cooling temperature can result in 20 to 30% cut in energy consumption.
- Promoting behavioural changes at home: turning off lights, proper management of refrigerator, replacing classical bulbs with efficient device…
- Promoting energy efficient cooling/heating devices, as the one on the market are not good enough. People buy cheap equipment without taking into account the higher level of energy consumption, which results in a higher "global cost" over a certain period of time.

A rough calculation allows considering that a widespread awareness campaign could result in a 30 % reduction of electricity consumption (estimation being more difficult on other fluids) in 50% of households and private buildings.

5.1.3. Long-term actions

On the long term it would be necessary to develop a **renovation programme** targeting less energy efficient building where basic insulation could significantly improve comfort while reducing energy consumption.

To design and implement an adequate energy-retrofitting plan for housing and tertiary buildings, the Municipality should engage in the following steps:

- Assess the need through a detailed mapping of housing, registering average energy

consumption per square meter, date of construction, location…

- Train small local companies, which will have the flexibility to work in different type of conditions while performing adequate retrofitting programmes that result in significant reduction of energy consumption.
- Develop a partnership with a bank acting as a "third party investor" that will support the investment (for example through a process where the bank will cover the cost of the loan from a part of the savings allowed by the retrofitting programme).
- Promote retrofitting in selected targets offering the best potential in terms of return on investment and, elaborating on these showcases further deploy the plan.

The main constraints of such a plan will be the mobilization of appropriate resources to fund renovation programmes, as in many cases house owners will not have the fund to invest at the appropriate level. This is why such a programme requires a partnership between the Municipality offering the guarantee that retrofitting will result in actual energy bill reduction, and the bank providing the funds.

Such a plan should include adoption of efficient cooling/heating devices. It could also include the installation of solar PV to contribute to renewable electricity production.

The Municipality should also work on promoting **energy high-performance for new building** to be constructed. Note that Hebron benefits from the support of the Italian cooperation to develop a building certification scheme that includes specific requirements on energy efficiency.

5.1.4. Expected results

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Residential & tertiary buildings	**357,180**	**167,455**	**- 63,584**	**- 29,764**	**207,644**	**14,3 %**
Awareness to reduce consumption			- 53,572	- 25,118		12,1 %
Housing renovation plan			- 9,912	- 4,646		2,2 %

5.2. Transport

5.2.1. Current situation

Transport is one of the key concerns to be addressed, as this sector is the first energy consumer (40% with 335 GWh/y) and the first GHG emitter (25% with 114 Kt CO2 equivalent / year).

Transportation within the city depends on private cars, shared taxis, private taxis… and the same for outside the city with larger buses and shared taxis. There are no public transports operated by the Municipality. All services are ensured by private companies: 865 companies offering services between Hebron center and surrounding villages; more than 1900 taxis operating inside the city.

As the city is separate in two parts, from the middle of it, by Israeli settlements, designing a traffic plan is a very complex issue to solve. In many situation, to reach a point distant from few hundred meters, one has to do a detour of many kilometers as road are closed to "protect" settlers.

In this context, the Municipality already reviewed the traffic organization to make more fluid in the main center. This is working very well and a part from the rush hours access to the center is easy and cars are not anymore stuck in traffic jam for hours. As a result, air quality improved and consumption of diesel and gasoline from cars decrease (and GHG also decrease).

Beyond this initial effort it is really hard to identify solutions to reduce the number of private cars in the city.

5.2.2. Possible actions

➔ **Short term**

There are only few options to reduce energy consumption (and thus reduce GHG emission) from traffic in Hebron. It seems that the only option would be to promote a negotiation process with all transport providers to adopt a common **charter for global improvement of transport services**

aiming at clarifying routes, stops, timing, in order to promote synergies and avoid competition that will hamper the development of an efficient system.

➔ **Longer term**

A lot of work needs to be done on public awareness and behaviour. However, behavioural change would be only possible when real alternatives are offered to allow people to actually change their current practices.

Ideally a city committed to reduced energy consumption and GHG emission would design and implement a Sustainable Urban Mobility Plans (SUMP) that could entail the following:

- Integrating transport and city planning policies, while prioritizing public transportation and active modes of mobility for people, low emission modes for goods.
- Structuring the urban transport sector by empowering a public transport authority to take action for the improvement of urban transport in the city. In the case of Palestine, this would mean a close collaboration between the Municipality council and the Ministry of Transport and the evolution of some of the current rules, which appear to be counterproductive.
- Developing communication and participation strategies involving the public, with the aim of facilitating behavioural changes.
- Encouraging the rollout of new engine technologies in private and collective vehicles to help reduce fossil fuel consumption, in particular.
- Promoting active modes of transport, especially walking and cycling, in particular by providing safer conditions for the users and developing the use of electric bicycle.
- Implementing a common methodology to measure GHG emissions, report on them and monitor all other benefits deriving from the development of sustainable urban mobility.

Such a comprehensive plan would require a strong leadership from the Municipality Council.

5.2.3. Expected results

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Transports	**332,508**	**113,340**	**- 46,795**	**- 16,434**	**140,541**	**11,6 %**
Charter for transport service improvement			- 15,625	-5,667		4,0 %
Sustainable urban mobility plan			- 31,170	-10,767		7,6 %

5.3. Industry

5.3.1. Current situation

Hebron is a commercial and industrial center in the region, and today accounts for around one third of the West Bank GDP.

Hebron's stone industry is generating big incomes. This industry is also a high energy and water consumer. The special limestone found in the area is used for building throughout the region. Others important economic sectors are shoes and leather products as well as pottery and glassblowing workshops. Yet many local producers face difficulties in exporting their products, or even sending them to Jerusalem, due to restrictions imposed by the Israeli authorities.

Unfortunately, the business sector doesn't feel concerned enough with energy saving and it is not easy for the Municipality services to engage with it.

Hebron Municipality set up a Techno-park with the support of its Italian partners: Genova, Torino, Milano. The plan is to support small industries and start up engaging in the renewable industry.

Industry in Hebron must be a serious concern as it consumes 16% of the energy (136 GWh/y) and is the third GHG emitter (19% with 84 Kt CO2 equivalent / year).

5.3.2. Short-term actions

Three options could be promoted on the short term to prepare a more interesting long-term impact:

- Get **a better understanding** of energy consumption and GHG emission of the industry in Hebron, in order to built a comprehensive action plan on a robust analysis of the sector.
- Raise **awareness** among business owners to invite them to think about any change they could promote to reduce their own energy consumption or to promote products and services that will help their clients to reduce their own energy consumption.
- Raise **awareness** among the business sector on the benefit of developing renewable energy solutions and the industry, which support this development.

Hebron also plans to promote **energy audit** for companies to help them reducing their energy consumption (and when possible develop renewable energy production).

5.3.3. Long-term actions

- Promoting renewable energy units on the roof tops of factories and work shops
- Reusing the water in stone industry through the use of the press machines technology
- Note: Depending on the detailed understanding of energy consumption from the industry, it will then be possible to identify more precise actions to be implemented in order to reduce energy consumption from the industry sector.

5.3.4. Expected results

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Industry	**135,605**	**83,787**	**-13,560**	**-8,379**	**103,896**	**8,1 %**
Awareness among business holders			-13,560	- 8,379		8,1 %

5.4. Agriculture and forestry

5.4.1. Current situation

There are some agriculture activities surrounding the city. It is a mix of vegetable, fruits and animal production. Grapes from Hebron are very famous.

5.4.2. Possible actions

- **Raising awareness among farmers** to promote behavioural changes that would help reducing energy consumption
- Promotion of **sophisticated irrigation system** (drip irrigation) to reduce water needed and thus reduced energy consumption
- Develop a **comprehensive plan to collect green waste and animal manure** to potentially combine with bio-waste and feed in, for the time being a compost production unit, but could be directed later to a bio-digester that could be developed in the city.

Impacts on GHG emission will be negligible.

6. Energy supply and renewable energy development

Due to the political context, Hebron city as other cities and villages in Palestine rely almost entirely on Israel for its energy supply. Electricity, gas, fuel and gasoline are all imported from Israel.

Solar heaters are widely spread like anywhere in Palestine, but solar PV development is still in its infancy. As energy demand continues to grow, energy conservation, energy efficiency and development of renewable sources are key challenges to be taken in Hebron.

Inside the Municipality boundaries 98% of the urban area is covered by electrical network, but in the surrounding area the percentage is slightly lower (around 80%).

Regarding electricity, Hebron municipality established HEPCo as the electricity distribution company

for Hebron region. Following a Presidential decree for privatizing the energy sector to alleviate the burden off the government and encourage private investors to participate in developing the energy sector, HEPCo was founded in 2000 as a new power utility.

In 2005, HEPCo was fully operating, supported by a highly qualified staff using the latest technologies in meter reading and financial systems. It succeeded to be one of the fastest growing energy companies present in the Palestinian territories. HEPCo service covers 92 square kilometers and provide electricity to about 68,000 electric customers throughout Hebron and the surroundings.

Since its inception, efforts have been exerted in upgrading the system, rehabilitating the old networks, and replacing most aerial lines into underground cables in residential areas. HEPCo was also the first company to install high voltage capacitors to manage power factor and minimize the impact of consumption peak.

However, there are still 22% losses in the electricity grid due to both technical losses and unpaid consumptions.

Interestingly, HEPCo proposed tariff incentives for low consumption rates, offering social tariffs when consumption remains below 160KWh/month (compare to average consumption around 250). The company is also exploring a mechanism to absorb consumers' debt (as too many consumers didn't pay their energy bill towards the utility) while inviting them to produce electricity (from solar PV) paying back their debt with local production.

There is no electricity production plant in the municipality boundaries. The objective of the Municipality is to reduce electricity consumption and develop renewable electricity production in order to minimize its dependency on IEC.

6.1. Actions to be developed

6.1.1. Grid improvement

The reduction of losses (technical and commercial) is the main priority as losses still represent 22% of the overall amount of electricity imported from Israel (82Gwh/y). This includes:

- Upgrade lines from 6,6KV to 11kV to reduce technical losses on the grid;
- Develop prepaid meter system, which is a good way to reduce theft. The monitoring imposed by the prepaid systems is also a good incentive for consumers to control and reduce their consumption. 25.000 consumers are already under prepaid system among a total of 68.0000 consumers registered by HEPCO.

6.1.2. Promotion of energy efficiency

The Municipality in a comprehensive approach of the necessary energy transition is willing to support all efforts that will help reducing energy consumption, either chasing unnecessary consumption or promoting energy efficient solutions.

It that sense the Municipality aims at developing an Environmental awareness unit that will promote behavioural changes and provide guidance to all HEPCo customers helping them to reduce their electricity consumption and, as a consequence reduce their energy bill. This unit will promote actions mentioned in 3.1.2 / 3.3.2 / 3.4.2 above.

6.1.3. Solar-PV development

There are many opportunities to develop solar PV and it would be very efficient to promote a comprehensive plan for the Hebron area, targeting different objectives:

- Develop **solar PV units on all municipality buildings**: Potential of Solar PV equipment has been explored for various public buildings and the fist experiments seems to be very promising (in the Sport center and in the Korean-Palestinian Cultural center).
- Develop **specific projects for public buildings**: schools, mosques, hospitals…
- Implement **solar "umbrella"** on parking lots, bus stations, etc.
- Production of guidelines for solar PV on individual rooftops to be connected to the grid with net metering and contribution to pay previous debt.

Hebron is engaged with RENEP – a solar PV development project in partnership with Torino – to install 5KW units everywhere starting with a pilot of 5 units. This first phase will help collecting data and learn to prepare expansion with the idea of developing a smart grid. The main limitation so far

being that HEPCO is not allowed to produce energy, production units should be managed by the Municipality which then sell electricity to HEPCo.

Taking into account the fact that cost of PV installations is going down and considering the pretty high cost of electricity in Palestine, return on investment is now getting attractive (5 to 6 years).

Solar PV on all public buildings and available public spaces / PRIORITY ACTION #6

The plan is to develop solar PV units connected to the grid wherever possible and appropriate. A rough inventory demonstrates that close to 60.000 square meters could be equipped only using buildings roofs. This includes Municipality buildings, schools, university, marketplace, warehouses, bus terminal, etc.

If only 50% of this surface would be equipped the system will represent a 7.5 MW capacity, will produce close to 12 GWh per year, requiring 10 m€ investment with a pay back over 10 years.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Investment	2 000 000	2 000 000	2 000 000	2 000 000	2 000 000					
Installed capacity/year KW	1 500	1 500	1 500	1 500	1 500					
Total installed capacity KW	1 500	3 000	4 500	6 000	7 500	7 500	7 500	7 500	7 500	7 500
Production in KWh	2 400 600	4 800 000	7 200 600	9 600 000	12 000 600	12 000 600	12 000 600	12 000 600	12 000 600	12 000 600
Revenues in €	276 069	552 000	828 069	1 104 000	1 380 069	1 380 069	1 380 069	1 380 069	1 380 069	1 380 069
Cumulated revenues	276 069	828 069	1 656 138	2 760 138	4 140 207	5 520 276	6 900 345	8 280 414	9 660 483	11 040 552

Assumptions: Cost of a 1KW unit = 1500 US$ - 1335 €. Annual production 1600 KWh / installed KW, KWh purchased at 0,58 ILS / Change ILS to € at 0,23 / Change € to US$ at 0,89

Other options could be proposed to exploit this PV potential:

- **Negotiate a 1 Million € loan** to install 900 KW in 2 years. The production of year 1 and 2 will be then invested to install another 70 KW/year capacity. After 10 years the Municipality will save 296K€ per year from reduction in electricity import, and will be able either to reimburse the initial investment or to launch a new program to deploy more PV units.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Capacity installed each year KW	300	600	70	70	70	70	70	70	70	70
Total capacity installed KW	300	900	970	1 040	1 110	1 180	1 250	1 320	1 390	1 460
Investment in €	400 500	801 000	93 450	93 450	93 450	93 450	93 450	93 450	93 450	93 450
Initial subsidy	*400 000*	*600 000*								
Production in KWh		480 000	1 440 000	1 552 000	1 664 000	1 776 000	1 888 000	2 000 000	2 112 000	2 224 000
Production in €		64 032	192 096	207 037	221 978	236 918	251 859	266 800	281 741	296 682
Net income in €		64 032	-38 822	113 587	128 528	143 468	158 409	173 350	188 291	203 232
Cumulated net income		64 032	25 210	138 797	267 324	410 793	569 202	742 552	930 843	1 134 074

- **Pass a deal with a private company** that will invest and pay a rent to the municipality for using the roofs. The Municipality will buy the electricity produced reducing its dependency on IEC. This model is probably easier to manage for the municipality but it will not provide as much resources on the long run than the previous one.
- **Negotiate a 1 Million € subsidy** to install 900 KW in 2 years. The production of year n-1 will be then invested to install as much capacity as possible, growing from 70 KW in year 3, and up to 350 KW in year 10. In this process, after 10 years the Municipality will save 467 K€ (in year 10) from reduction in electricity import, and will be able to continue developing solar PV units at a good pace to reach 10MW installed in year 20 without any additional support. By then (after 20 years) Hebron will be able to produce up to 15GWh from solar PV.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Capacity installed / year	300	600	70	140	160	190	220	265	300	350
Total capacity in KW	300	900	970	1 110	1 270	1 460	1 680	1 945	2 245	2 595
Investment in €	400 500	801 000	93 450	186 900	213 600	253 650	293 700	353 775	400 500	467 250
Initial subsidy	*400 000*	*600 000*								
Production in KWh		480 000	1 440 000	1 552 000	1 776 000	2 032 000	2 336 000	2 688 000	3 112 000	3 592 000
Production in €		64 032	192 096	207 037	236 918	271 069	311 622	358 579	415 141	479 173
Net income in €		64 032	-38 822	20 137	23 318	17 419	17 922	4 804	14 641	11 923
Cumulated net income	0	64 032	25 210	45 347	68 665	86 084	104 006	108 811	123 451	135 374

The plan is to develop solar PV units in every possible place invited residents to contribute to this

development. Through this process residents will benefit additional income after the pay back period and will become energy producers as well as being energy consumers.

Assumptions:
Cost of a 1KW unit = 1500 US$ - 1335 €.
Annual production 1600 KWh / installed KW
KWh purchased at 0,58 ILS
Change: ILS to € at 0,23 / € to US$ at 0,89

		US $	Euro	KWh/an	Prod €	Prod $	ROI
Cost	5kv	7 500	6 675				
Prod	5kV			8 000	1 067	1 199	6,3

The economical model could be as follows: The investor installs a 5KW unit. He sells the electricity produced to the Municipality. After 6 years, the investment has been paid back and the owner gets additional revenue from its production unit.

Different options could be proposed to develop this process:

- **The municipality proposes residents to invest and install 5KW units on their roof.** The electricity produced goes to the Municipality (or the Electric company it will have set up for this purpose). After 6 years the total value of electricity produced matches the initial investment and the PV unit get transferred to the resident who will then get incomes from the electricity sold to the Municipality. In this system the financial balance remains the same for the Municipality. It covers the initial investment and receives in return electricity, which will not be bought from IEC generating an economy equivalent to the initial investment. When the PV unit gets transferred to the resident, it buys electricity for him and not from IEC, reducing the dependency from Israel.
- **The municipality invites resident to share the investment**. In that case the resident will cover part of the investment and will then get parts of the revenue from the production as soon as the PV unit gets installed. The pay pack period remains more or less the same or could be slightly longer depending on the way the investment gets shared. The overall economy of the system remains the same. However, one can consider that sharing the investment with residents will push them to get more ownership on the energy issue and been then more conscious on the benefit of working for energy conservation and efficiency.
- **The municipality pass a deal with a bank that will offer attractive loans to residents**. Resident, benefiting form the loan, covers 100% of the investment. The Municipality offers its guarantee to secure the loan, as it commits to buy all the electricity produced. This mechanism could allow a faster development of PV units.

If the Municipality sets up a 1 million € fund to be engaged over a 4 year period of time it will allow itself to install 188 KW each over 4 years reaching 750 KW installed in the fourth year. In this set up, the Municipality will avoid imports 138K€ of electricity from Israel every year and will be able to reimburse the initial 1 million € required to set up the revolving fund after 9 years.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Investment	250 000	250 000	250 000	250 000						
Installed capacity/year MW	188	188	188	188						
Total installed capacity MW	188	375	563	750	750	750	750	750	750	750
Production in KWh	300 075	600 150	900 225	1 200 300	1 200 300	1 200 300	1 200 300	1 200 300	1 200 300	1 200 300
Revenues in €	34 509	69 017	103 526	138 035	138 035	138 035	138 035	138 035	138 035	138 035
Cumulated revenues	34 509	103 526	207 052	345 086	483 121	621 155	759 190	897 224	1 035 259	1 173 293

Such a mechanism will also require a proper maintenance unit to be set up in order to ensure that PV units are producing at their full potential, offering the shortest pay back period possible. This will obviously generate jobs and more business around the development of solar PV.

6.1.4. Solar heating

Solar heating is widely used for covering households' needs. However, Solar heating could also be

6.1.4. Solar heating

Solar heating is widely used for covering households' needs. However, Solar heating could also be used in some industries, shops restaurants, etc. that require hot water. Modern equipment is allowing very good performance to match specific industrial needs.

This component of the plan could then:

- Identify specific need of industry related to heat and hot water requirement.
- Identify technical solutions to match these needs with solar heating devices.
- Develop pilot projects to promote these new usages

6.1.5. Other renewable energy sources

The question for Municipality will also be to define if it enters other energy domains beyond Solar PV and Solar heating, to explore technical opportunities: geothermal energy, micro-hydro on water pipes, wind energy, etc.

A proper assessment of these different potential would be needed.

6.1.6. Expected results

Energy in MWh/year GHG in tCO2eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Electricity*	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Electricity supply & renewable energy	**296,949**	**215,582**		**- 12,584**	**267,322***	**4,7 %**
Grid efficiency improvement Base line losses in 2014: 83,134 MWh Gain in losses reduction 821 MWh/y			- 4,105	- 2,984		1,1 %
Solar PV in public buildings			+ 12,000	- 8,724		3,3 %
Solar PV for households & private buildings			+ 1,200	- 872		0,3 %

* 267,322 tCO_2 equivalent is the expected GHG generated from electricity (bought from Israel) in 2020, according to the Business as usual scenario (24% growth from 2014 to 2020).

In 2015, 100 % of electricity comes from Israel where it is produced with a significant carbon load: 0,727 tCO2 eq/kWh. When locally produced electricity from PV replaces electricity from Israel, the carbon load per KWh goes down to 0 reducing GHG emission on electricity consumption.

7. Conclusion

The current action plan will result in achieving a 20% reduction in GHG emission compared to the business as usual scenario, where emission would reach 553,203 tCO2eq/year in 2020.

Such a plan allows Hebron to be in line with the Covenant of mayor commitments.

8. Hebron SEAP overview

	Title / Type of action /Content		Situation in 2014		Expected results in 2020		GHG cut in %	Economy		Time frame
			Energy MWh/year	GHG emissions tCO2eq/year	Energy MWh/year	GHG emission tCO2eq/year		Cost Investment	Return €/y	
Municipal building			**2,265**	**1,589**	**- 815**	**- 581**	**29%**			
1	Staff awareness campaign to reduce energy consumption (light, cooling/heating, equipment)				- 453	- 318	16%	20K€/y	54,000	Starts 2016
2	Switch to LED lighting and sensor systems in 50% of buildings (300unit x 1000sqm x 1200€)				- 362	- 263	13%	360K€	48,000 ROI 7,5 y	Starts 2017
3	Energy rehabilitation programme Improved insulation and EE in heavy equipment				Still to be defined					
Street lighting			**5,860**	**4,260**	**- 3,422**	**- 2,487**	**58%**			
4	Expand LED deployment based on lessons learned from the pilot project	**1**			- 2,813	- 2,044	48%	400K€	362K/y ROI 5 year	Starts 2016
5	Street lighting strategic plan Additional gain: potentially 20%	**1**			- 609	- 443	10%	50K€	77K€/y	Starts 2016
Water delivery			**1,012**	**736**	**- 152**	**- 110**	**15%**			
6	Water distribution system improvement				- 152	- 110	15%	100K€	19,000 ROI 5 y	Starts 2016
7	Water reservoirs development Initial study	**2**			tbd	tbd		150K€	tbd	Starts 2016

	Title / Type of action /Content		Situation in 2014		Expected results in 2020		GHG cut in %	Economy		Time frame
			Energy MWh/year	GHG emissions tCO2eq/year	Energy MWh/year	GHG emission tCO2eq/year		Cost or Investment	Return €/y	
Waste water management			No indication available							
8	Hebron WWTP Water recuperation from the treatment plant	**3**	Impact / Costs and return on investment to be assessed as part of the feasibility study to be launched in 2016 (if funds are available). Implementation should start in 2017.							Starts 2016
Solid waste management			**1,429**	**497**	**- 214**	**- 75**	**15%**			
9	Improve waste management efficiency through better monitoring of collect process				- 214	- 75	15%	20K/y	30,000	Starts 2016
10	Waste to energy strategy Investigation to install a waste gasification unit							100K		Starts 2016
	Waste gasification unit development	**4**		*73Kt GHG from landfill*	***Add prod 40GWh/y***	**- 55Kt GHG** non energetic	75%	40m€	7 m€ /y ROI 6 y	Starts 2018
Municipality fleet			**2,346**	**816**	**- 503**	**-189**	**19 %**			
11	Short term: Improve fleet management and more eco friendly driving practices				- 315	- 124	12 %		49K/y	Starts 2016
12	Long term: Progressive fleet replacement 8 vehicles / year over 10 years improving efficiency by 20% for each new vehicle				- 165	- 65	7 %	160K/y	6.5 K€/y	Starts 2017

	Title / Type of action /Content		Situation in 2014		Expected results in 2020		GHG cut in %	Economy		Time frame
			Energy MWh/year	GHG emissions tCO2eq/year	Energy MWh/year	GHG emission tCO2eq/year		Cost or Investment	Return €/y	
Residential and tertiary buildings			**357,180**	**167,455**	**- 63,584**	**- 29,764**	**14 %**			
13	**Public awareness unit** action to promote energy consumptions *Assumption: the unit will generate 15 % saving in electricity consumption in 50 % of private households and tertiary buildings.*	**5**			- 53,572	- 25,118	12 %	Already mentioned in block 1		Starts 2016
14	**Housing renovation plan** Promote renovation plan to reduce energy consumption at home / Train local companies to develop expertise / Develop partnership with a bank to support funding for renovation programmes. *Assumption: this work will generate 30 % saving in energy consumption in 10 % of private households and tertiary buildings.*				- 9,912	- 4,646	2 %	12K€/ household	1,200€/y ROI 10 y	Starts 2017
Transport (people and goods)			**332,508**	**113,340**	**-46,795**	**- 16,434**	**12 %**			
15	**Charter for transport service improvement** Setting up new rules to improve the global efficiency of the overall transport systems *Assumption: this process will generate 5% less traffic in the city*				- 15,625	-5,667	4 %	20K€ process facilitation	2.2 m€/y Direct benefit for drivers driving less	Starts 2016
16	**Sustainable urban mobility plan** *Assumption: The plan when actually implemented should result in generating a 10 to 15% reduction in traffic all over the city*				- 31,170	-10,767	8 %	200K for the study	4.4m€/y Direct benefit for drivers + Indirect benefits for the city	Study in 2017

Note. 1MWh in transport generates in average 140€ in energy expenses

	Title / Type of action /Content		Situation in 2014		Expected results in 2020		GHG cut in %	Economy		Time frame
			Energy MWh/year	GHG emissions tCO2eq/year	Energy MWh/year	GHG emission tCO2eq/year		Cost or Investment	Return €/y	
17	**Industry**		**135,605**	**83,787**	**-13,560**	**-8,379**	**8 %**			
	Raise awareness on energy efficiency *Assumption: this process will generate 10% energy efficiency gains*				-13,560	- 8,379	8 %			Starts 2017
	Long term: still to be defined									
18	**Agriculture and forestry**		**352**	**129**						
	Promote EE among farmers while demonstrating the benefit for their business Promote drip irrigation Organise green waste collection				Impact on the sector can be interesting but it will remain marginal for the entire city.					Starts 2017
	Energy supply and renewable development				**- 4105 + 13,200**	**- 11,451**	**4,7 %**			
19	Continue Grid efficiency improvement *Assumption: Improvement will generate 1% /year over a period of 5 years reduction in electricity losses on the grid, thus reducing GHG linked with electricity losses.*		2014 losses amounts 82,134 Mwh		- 821/y so - 4,105/5y	- 2,984 in 2020	1,1%	200K€/y	547K€/y after year 5	Starts 2016
20	Develop Solar PV in public buildings, schools, mosques, parking place, markets… *Assumption: 6,5Mw capacity installed over 5 years*	**6**			+ 12,000 per year	- 8,724 in 2020	3,3% on total elec consumption	10 m€	1.2m€/y ROI 7y	Starts 2016
21	Develop Solar PV for households & private *Assumption: 1 Mw capacity installed over 5 years*				+ 1,200 per year	- 872 in 2020	0,3% on total elec consumption	2.6 m€	1.2m€/y ROI 7y	Starts 2016

HEBRON SEAP Overview

	Title / Type of action /Content		Situation in 2014		Expected results in 2020			
			Energy MWh/year	GHG emission tCO2eq/year	Reduction energy consumption MWh/y	Additional energy production MWh/y	Reduction in GHG emission tCO2eq/year	
Non Municipal	Residential and tertiary buildings		357,180	167,557	- 36,698		- 17,205	
	Transport		332,508	113,340	- 46,795		- 16,434	
	Industry		135,605	83,787	- 13,560		- 8,379	
	Agriculture and forestry		352	2080				
	Renewable energy development					1,200	- 872	
			825,645	**366,764**	**- 97,053**	**1,200**	**- 42,890**	**9,5 %**
Municipal assets	Municipal building		2,265	1,589	- 815		- 581	
	Street lighting		5,860	4,260	- 3,422		- 2,487	
	Water delivery		1,012	736	- 152		- 110	
	Waste water management		No indication available					
	Solid waste management		1,429	73,967	- 214	+ 40,000	- 55,075	
	Municipality fleet		2,346	816	- 503		-189	
	Grid up-grading				- 4,105		- 2,984	
	Renewable energy development					+ 12,000	-8,724	
			12,912	**81,368**	**- 9,211**	**52,000**	**- 70,150**	**69,5 %**
	TOTAL		**838,557**	**446,132**	**- 106,264**	**53,200**	**113,040**	**20 %**

The current work plan results in a 20% GHG emissions cut compared to the BAU scenario where GHG emissions would reach 533,204 tCO2eq/year

9. Monitoring

In order to ensure the longevity of the Sustainable energy action plan (SEAP), and to verify that Hebron is on track to meet its commitments, it is necessary to provide the municipality with a simplified tool to evaluate the SEAP's actions. For actions with quantifiable impacts, an action's impact is evaluated with the use of monitoring and piloting indicators for the actions with quantifiable impacts.

To estimate impacts in terms of energy, energy efficiency gains (or unitary gains) will be applied to each action depending on the availability of data at the municipal level. As a result, it will be necessary to rely on local experiences (for example, an assessment of thermal renovation projects in the municipality) and the work undertaken by the municipal energy advisor.

The work done on the SEAP in 2015 made it possible to develop a piloting and decision-making tool to consolidate the action plan for 2015-2020 and to highlight the level of effort required to meet the SEAP's objectives. On the basis on of a summary table that aggregates the data concerning GHG emissions, energy consumption and the development of renewables, a monitoring process will be carried out on a yearly basis. All of the impact measures from the 2015-2020 SEAP may not be implemented simultaneously nor updated at the same pace. Thus, the tool must indicate the state (on-going, under consideration, etc.), the coordinator, the indicator, the quantified objective and emissions targets (numbers and percentages) for each action.

A simplified excel tool (see above) will be provided to the municipalities so that all of the parties involved in implementing an action, or actions, will be able to use the evaluation tool. The tool must enable the user to verify if the objectives set by the action plans are met and to identify which actions are problematic in terms of implementation.

The municipality should routinely monitor the SEAP's implementation in order to support and promote the actions. Several options will be developed depending on the expectations of the municipality:

- Holding an annual or semi-annual meeting of municipal actors based on the technical consultation workshops organized in 2015. In order to limit the number of meetings held and to encourage transversal collaboration that reinforces synergies between actors and to deal more efficiently with the interactions between the SEAP and other public policies, the meetings will be organized thematically.
- Accompanying strategic actors in formulating their commitments (based on the ranking produced during the consultation phase in 2015).
- Holding a yearly assessment meeting with all of the actors mobilized after the consultation in 2015. This meeting will provide the opportunity to:
    - present the updated territorial and regulatory carbon assessments
    - present the monitoring tool that measures the action plan's effects on the reduction of GHG emissions and the progression of renewable energy production.
    - recognize new commitments that have been made since the first celebration organized after the consultation.
- Updating, if necessary, the documents which promote the SEAP in order to mobilize actors and encourage new commitments
- Responding to the specific requests of the municipality

In 2016, actors that were still wavering in their commitments in 2015 should be targeted. Depending on their strategic importance (in terms of their ability to influence the action plan's objectives) the municipality should closely accompany these actors so that they become fully committed and engaged participants.

In order to convince more actors to participate, the municipal council should highlight the benefits that actors engaged in the SEAP have experienced and the overall benefits that the monitoring tool provides.

Sector	Subsector	Year	Content of the action	Status	Responsible for action	Indicators	Quantified goal	Cut of GHG emission expected		Goal achievement	Achievement of emission goal		% goal
Municipal building	Staff	2016	Staff awareness campaign to reduce energy consumption			Persons reached		318	tCO2eq/year	0	0	tCO2eq/year	0
Municipal building	Lighting	2017	Switch to LED lighting and sensor systems in 50% of buildings			LED lamps and sensors		263	tCO2eq/year	0	0	tCO2eq/year	0
Municipal building	Equipment	TBD	Energy rehabilitation programme					TBD		0	0		0
Street lighting	Lighting	2016	Expand LED deployment			LED lamps	6.000	2.044	tCO2eq/year	0	0	tCO2eq/year	0
Street lighting	Strategic plan	2016	Street lighting strategic plan			LED lamps and sensors		443	tCO2eq/year	0	0	tCO2eq/year	0
Water delivery	Distribution system	2016	Water distribution system improvement			Decrease on loss of water	liters	110	tCO2eq/year	0	0	tCO2eq/year	0
Water delivery	Reservoirs	2016	Water reservoirs development, initial study			Number of reservoirs		TBD		0	0		0
Waste water	Water recuperation	2016	Hebron WWTP					TBD		0	0		0
Solid waste	Waste management	2016	Improve waste management efficiency			Solid waste	tons	75	tCO2eq/year	0	0	tCO2eq/year	0
Solid waste	Waste gasification	2016	Waste to energy strategy: investigation for gasification unit and unit development			Add production	40 GWh/y	55.000	tCO2eq/year	0	0	tCO2eq/year	0
Municipality fleet	Fleet management	2016	Short term: Improve fleet management and more eco friendly driving practices			Persons reached		124	tCO2eq/year	0	0	tCO2eq/year	0
Municipality fleet	Fleet replacement	2017	Long term: Progressive fleet replacement, 8 vehicles / year over 10 years			Vehicles	80	65	tCO2eq/year	0	0	tCO2eq/year	0
Residential and tertiary buildings	Public awareness	2016	Public awareness unit action to promote energy consumptions			Persons reached		25.118	tCO2eq/year	0	0	tCO2eq/year	0
Residential and tertiary buildings	Housing renovation	2017	Housing renovation plan			m2 renovated		4.646	tCO2eq/year	0	0	tCO2eq/year	0
Transport	Transport system	2016	Charter for transport service improvement					5.667	tCO2eq/year	0	0	tCO2eq/year	0
Transport	Mobility plan	2017	Sustainable urban mobility plan					10.767	tCO2eq/year	0	0	tCO2eq/year	0
Industry	Awareness	2017	Raise awareness on energy efficiency			Persons reached		8.379	tCO2eq/year	0	0	tCO2eq/year	0
Agriculture and forestry	Awareness	2017	Promote EE among farmers while demonstrating the benefit for their business			Persons reached		marginal		0	0		0
Energy supply and renewable dev	Grid efficiency	2016	Continue Grid efficiency improvement			Derease on loss of energy		2.984	tCO2eq/year	0	0	tCO2eq/year	0
Energy supply and renewable dev	Solar PV	2016	Develop Solar PV in public buildings, schools, mosques, parking place, markets			PV panels	m2	8.724	tCO2eq/year	0	0	tCO2eq/year	0
Energy supply and renewable dev	Solar PV	2016	Develop Solar PV for households & private			PV panels	m2	872	tCO2eq/year	0	0	tCO2eq/year	0

ANNEXES

ANNEX I – PROJECT FICHES

HEBRON – Priority action # 1 for SEAP

1. General presentation

STREET LIGHTING EFFICIENCY IMPROVEMENT	**# 1**	Area(s) of Intervention: **A**

Summary of the Action	Location: **HEBRON**
Street lighting in Hebron consumes 5,860 MWh of electricity per year (2014 ref) representing a cost of 750K€ per year. The system uses 235 HPS 400W units; 2535 HPS 250W units; 1347 150W lamps; 1318 100W lamps; 587 70W lamps. Some initial tests have been made to explore ways to reduce energy consumption in street lighting. Using LED devices allows for 50 % energy saving. This replacement doesn't require additional expertise from the Municipality services. The plan is to contract a loan to start replacing lamps, and continue the replacement process using savings from reduced consumption and, after 5 years reimburse the initial loan.	Start date: **2016** Project lifetime: **5 years** End date: 2021 Estimated cost € 400K€ initial investment (to be reimbursed after 5 years)

General Objectives of the project	Status of the Action:
Replacing low efficiency street lamps to reduce energy consumption and cost, while improving street lighting quality. Reduction in electricity consumption will reduce GHG linked to this electricity consumption.	~~• New~~ ~~• Planned~~ ~~• Under implementation~~ • Following previous action.

Principal partners and stakeholders	Contact person in the local authority
• Hebron Street Lighting unit	Nader Betar – Hebron counsellor

2. Technical description

Link to municipal development plan

The street lighting improvement is one of the change processes to be promoted to demonstrate possible reduction in energy consumption in public services. Even if street lighting remains a rather small consumption center, it is highly symbolic to demonstrate that the right choice can result in close to 50% energy consumption reduction.

Implementation plan ½

Component 1: The project consists in replacing all old lamps with LED ones. This should be done in a dynamic way (reaching a critical mass of streets concerned with the change) in order to emphasize the fact that change is possible and will benefit the entire city. The following investment plan could be proposed. It depends on an initial loan of 400.000 € to be contracted to change close to 50% of all lamps in year 1. The savings will be reinvested in new replacement. After 5 years the Municipality will be able to reimburse the initial loan.

		A1	A2	A3	A4	A5	Total 5Y
Investment	*400 000 €*		200 000 €	200 000 €	100 000 €		900 000 €
Nb unit replaced		2 759	1 379	1 379	690		
New lamp		2 759	4 138	5 517	6 207	6 207	
Still to be replaced	6 000	3 241	1 862	483			
Usual lighting cost	750 000 €	750 000 €	750 000 €	750 000 €	750 000 €	750 000 €	4 500 000 €
Actual lighting cost	750 000 €	577 562€	491 379 €	405 172 €	387 931 €	387 500 €	2 969 397 €
						Net saving	**630 603 €**

Assumptions: Average cost per LED lamp 145€ - Average consumption per lamp (before replacement): 125€/y
Energy saving for each lamp replaced by a LED one: 50%.

Implementation plan 2/2

Component 2: Design a **street lighting strategic plan** identifying areas of differentiated usage, where lighting would be then adapted to the actual needs per specific area.

- Main roads, avenue and city entrances where high intensity lighting should be necessary at least between sunset and midnight and before sunrise. Note that lighting intensity could be easily reduced, even in these areas between midnight and few hours before sunrise.
- Secondary streets where reduced lighting intensity should ensure safety while allowing low energy consumption.
- Specific areas (parks, narrow streets, pedestrian areas, etc.) where motion sensors should be installed to light up when people are around and avoid lighting when nobody is there.

Component 2 and 1 should be implemented at the same time, the component 2, giving guidance to inform and structure the replacement plan.

3. Organization and procedures

Formal approval	Staff allocated to prepare, implement, monitor action
City council needs to decide for the implementation of the plan.	Nader Betar – City council member To be identified - Street lighting chief manager
Staff training needs	**Role of Partners**
The street lighting team need to receive a proper training on two subjects: • Technical maintenance of LED lamps • Understanding of strategic street lighting design and implementation.	HEPCO will be invited to participate in the project's implementation. Local groups representing citizens should be invited to specific workshop to design the strategic street lighting plan, in order to take into account their recommendations in designing the plan, but also to convince them that a different lighting system (and at time less lighting intensity) will not disturb their life and will offer more collective benefit.

4. Summary of related Awareness Raising (AR) actions

A communication plan need to be develop to highlight the benefits of the strategic street lighting plan and use it as a show case to demonstrate the benefit of promoting energy savings.

5. Assumptions and risks (3)

As tests have already been implemented and as the technology is now mature enough, risks are rather limited.

The design of the strategic lighting plan is probably the more complex aspect of the project, however the only risk would be to "limit" the saving to the 50% technical reduction allowed by the sole lamp replacement, when a more strategic approach (with differentiated approach per area) could result in saving going far beyond 50%.	
6. Key success factors (3)	
• High cost of electricity means that any saving will be a significant incentive • The time length of LED lamps (3 to four times higher than usual lamps) make the investment more attractive • Public participation can help designing an ambitious street lighting plan	
7. Cost estimates	
Technical support for designing the strategic plan	30,000 €
Training for Municipality staff	5,000 €
Rolling fund (possibly loan to be reimbursed after 5 years): Hebron electrical department, managing street lighting, would set up a tight budget monitoring mechanism to precisely measure reduction in electricity consumption. The money saved would be invested again in lamp replacement. This set up can allow replacement of all lamps over time (5 to 7 years depending on technical choices) and ensures full replenishment of the initial investment fund.	400,000 €
Approximate annual cost saving (after initial investment reimbursement) Taking into account that the Municipality should reserve 40K€ per year to build a fund that would be used to renew lamps after 10 years.	320,000 €/year
Return on Investment (draft calculation)	The loan could be paid back in year 5. The project then generates significant cost saving every year.
8. Available and foreseen sources of funding	
Local authority's own resources: The Municipality allocates staff from its street lighting unit	**National Funds and Programs**
International Financial Institutions	**EU Funds & Programs and other external funds**
Public-Private-Partnerships (available or to raise)	**Lined up private investments**
Loans and potential borrower AFD could be providing the loan, offering to cover cost of loan interests	**Expected annual cost savings to City budget** 320,000 €
9. Projected Energy Estimates in 2020 (or other set target year)	
Energy savings MWh/y	3,422 MWH/year
Renewable energy production MWh/y	Not relevant
CO2 reduction t CO2/a	

- Reference Year	2014
- Target Year	2020
- Percentage of net reduction on the territory	0.56 %
- Reduction as related to BAU scenario	2,487 tCO2 eq/year
- Per capita calculated reduction	0.01 TCO_2 equivalent

HEBRON – Priority action # 2 for SEAP

1. General presentation

RESTRUCTURATION OF WATER DISTRIBUTION	**# 2**	Area(s) of Intervention: **C**

Summary of the Action	Location: **HEBRON City**
Water delivery is particularly complex in Hebron, as the city has no direct access to water (no wells, no natural springs) and has to buy all its water from Israel. The city faces many difficulties due to the limited quantities allocated by the Palestinian Water Authority in accordance with the "agreement" signed with Israel (Hebron protocol). The Municipality is allowed to distribute 20.000 cubic meters per day. However, this capacity should be 40.000 m3 to take into account leakages on the network to ensure more or less final delivery of 100 litres/capita. As delivery can't be secured 24 hours / 7 days, people have to store water on top of their buildings. Despite this temporary storage, water shortage remains frequent. As a result, the black market of water tends to develop parallel to water shortage. Water bought from Israel is pumped into a buffer reservoir (13.000 cbm) containing only half a day needs for the entire city. There are no reservoirs on the heights of the city that would reduce the need of pumping water in each multi stores building. Many residents have to pump the water they need up their roof, spending a lot of electricity to do so. The Municipality alone consumes 1,012 MWh/year for water distribution, representing a cost of 134K€. To improve the overall water distribution network and to significantly reduce cost for pumping water up in buildings, the Municipality plans to entirely reorganize its distribution system, installing big reservoirs on the height of the city, ensuring then water distribution only by gravity. This will result in significant cut in electricity consumption at municipality level but mainly at household levels. The municipality will also look into replacing existing pipes with significant leaks to avoid unnecessary losses.	Start date: **2016** Project lifetime: **10 years** End date: 2026 Estimated cost € 150.000 €

General Objectives of the project	Status of the Action:
At this stage the action to be implemented is a comprehensive feasibility study to design the new water distribution model and assess the investment necessary.	• New • ~~Planned~~ • ~~Under implementation~~ • ~~Following previous action.~~

Principal partners and stakeholders	Contact person in the local authority
• Hebron: Water service and Economic development unit. • Palestinian water authority	Nader Betar – Hebron counsellor

2. Technical description

Link to municipal development plan

This project is another component of the strategic plan the city wants to implement to improve quality of life of Hebronites across the board. It is important to mention that the new water delivery system, will not only improve daily life of people and companies in Hebron, it will also generate significant cuts in energy consumption, reducing pumping needs, but also reducing transport of water by truck made

necessary by water shortage on the network.

Implementation plan
The only significant change that would both improve the quality of delivery and reduce energy consumption will come from a different structure of the water delivery system. The new model must be based on big reservoirs placed on the heights of the city, using gravity to distribute water to all buildings. Energy consumption of both Municipality and residents would be then reduced. Hebron geography allows such a set up. The first step of this action is to run a **detailed feasibility study** that will help define the appropriate size and location of the reservoirs and assess the level of investment required. The feasibility study would also help define actions required to reduce water leakages in the network (and this reduce energy consumption and cost), specifically the potential replacement of existing pipes with significant leaks. Ideally, the pumping station attached to the two or three reservoirs that would be installed must be surrounded with solar PV, to cover, at least part of, the electricity needs of the pumping stations. Necessary actions: • Draw the detailed remits of the study • Identify appropriate expert team to run the study • Monitor progress and analyze the study outcome • Negotiate funding to implement the study recommendations

3. Organization and procedures	
Formal approval	Staff allocated to prepare, implement, monitor action
The feasibility study needs to be approved	Nader Betar – City Counsellor
Staff training needs	Role of Partners
No staff training needs at this stage.	No specific contribution expected at this stage.

4. Summary of related Awareness Raising (AR) actions
Public awareness around the project will be important to highlight that the first measure to be taken by every citizen remains water conservation. It will be far easier to deliver water in appropriate amount when people and industries will manage their water consumption with the upmost sense of responsibility.

5. Assumptions and risks (3)
As water is a very sensitive issue in the West Bank, there is always a possibility that plans to restructure the water distribution system may be blocked by Israeli authorities. However it is very important for the Municipality to get this feasibility study completed in order to be able to negotiate necessary authorization.

6. Key success factors (3)
• Water delivery and cost of pumping are such important issues that any attempt to improve the system will be well received by all stakeholders. • Municipality determination to act in a comprehensive way on the issue

7. Cost estimates	
Initial and start-up expenses: basic **Feasibility study**	150,000 €
Approximate operational Costs (including maintenance)	Not relevant at this stage

Approximate annual income for energy producing projects	Not relevant
Return of Investment (draft calculation)	Impossible to assess at this stage

8. Available and foreseen sources of funding	
Local authority's own resources: The Municipality allocates staff to the water unit to guide and monitor the feasibility study.	**National Funds and Programs**
International Financial Institutions: The German Corporation for International Cooperation (GIZ) and the Japan International Cooperation Agency (JICA)	**EU Funds & Programs and other external funds**
Public-Private-Partnerships (available or to raise)	**Lined up private investments**
Loans and potential borrower	**Expected annual cost savings to City budget**

9. Projected Energy Estimates in 2020 (or other set target year)	
Energy savings MWh/y Impossible to assess at this stage as most of the saving will come from the establishment of a distribution process per gravity. The very design of the new system should include a proper assessment of future energy consumption and its comparison with current situation.	One can estimate a 15% gain in electricity consumption for pumping. This would mean saving around 152MWh/year.
Renewable energy production MWh/y	Not relevant
CO2 reduction t CO2/y	Estimation 110 ton CO2 eq 12% compare to BAU

HEBRON – Priority action # 3 for SEAP

1. General presentation

WATER RECUPERATION AND LOCAL DEVELOPMENT	**# 3**	Area(s) of Intervention: **C**

Summary of the Action

One of the big challenges for local development is access to water. Due to climate change, rains are decreasing in Hebron area and access to water is a growing problem for agriculture. In this context, recuperation of 10.000 cubic meters coming out every day from the wastewater treatment plan near Qalqes, which is under construction and set to be operational by 2020, is a strategic issue for Hebron Municipality. The wastewater treatment plant will settle at a short distance (5km) from Zeef where 7000 dunums (700 ha) are available for agriculture. This area could then receive 14 cubic meters/ha/day of treated water coming from the plant, to produce animal feed for traditional herders living in the area and contribute to the development of qualitative animal products (meat, milk, cheese), which would be marketed in Hebron and beyond. Around 1000 jobs could be created in the area from development of agriculture and animal production and indirectly from activities linked with transformation and marketing of these products.

The project consists in building the appropriate system to collect water at the plant exit, convey it to Zeef area, store it and distribute to production parcels. The project will also offer technical support to local farmers and herders to optimize local production.

A specific investigation needs to be conducted to define the appropriate pricing system that would preserve agriculture competitiveness in Zeef, while allowing the appropriate management and maintenance of the irrigation system.

Location: **HEBRON City**

Start date: **2016**

Project lifetime: **10 years**

End year: 2026

Estimated cost €

160.000 € for 2 years

General Objectives of the project

The project combines three components:

- **Design and implement the irrigation system** to convey water from the plant to Zeef area and distribute it according to its geographical specificities.
- **Define the appropriate pricing system and the governance model** that would ensure a sustainable management of water from the plant.
- **Set up and implement the technical support system** answering the needs of local farmers to ensure they will get the best advantage of water from the plant to develop qualitative productions and generate substantial incomes.

Status of the Action:

- New
- ~~Planned~~
- ~~Under implementation~~
- ~~Following previous action.~~

Principal partners and stakeholders	Contact person in the local authority
• Hebron: Water service and Economic development unit. • Ministry of Environmental affairs and Ministry of Agriculture • Local NGOs – Farmers groups	Nader Betar – Hebron counsellor XXX

2. Technical description

Link to municipal development plan

The project makes an interesting link between different issues the municipality needs to address: Sewage treatment; support to agriculture activities in the surrounding; food supply from local products to reduce transport from longer distances… Additionally this project is a key contribution on adaptation to the changing condition imposed by climate change. It could be an interesting demonstrator to promote efficient use of water, which is a key strategic resource in the region.

Implementation plan

Component 1: **Design and implement the irrigation system**

- Design the entire system to collect water at the plant exit, convey it to Zeef area and distribute it according to local geographical specificities in order to get as much production surface irrigated at the optimum.
- Secure funding for the water distribution system.
- Design and set up a water quality control mechanism to monitor exit water quality and the spoiled water retention to avoid any contamination risks that would undermine agro production in Zeef.

Component 2: **Define the appropriate pricing system and the governance model**

- Design the appropriate pricing model to ensure long lasting maintenance of the water distribution system, defining the level of fees to be paid by farmers getting access to water, to cover for maintenance costs while preserving farmer's competitiveness.
- Design the appropriate governance model to actually engage farmers in the management and maintenance of the entire water distribution system but also in the comprehensive management of the production area to get the best of the area, promoting synergies between fodder production and animal husbandry.
- Such models (for pricing and governance) need to be co-produced with the famers themselves from the outset. The design process will be key to ensure that all stakeholders will be considered and that all local interests will be factored in to ensure the long-term viability of the project.

Component 3: **Set up and implement the technical support system**

- In order to adapt their practices to new conditions offered by permanent irrigation, farmers need to be trained to get the best of these new conditions.
- The global efficiency of the production area will depend on the overall capacity of farmers to combine their strength in order to promote synergies between fodder production (knowing that it will not be possible to grow vegetables irrigated with water coming out of the wastewater treatment plant) and animal production. This is why technical support should be provided to help farmers building synergies and avoid unnecessary competition between similar practices.
- Technical support should also be directed at producers ensuring animal product transformation in order to secure the development of qualitative productions that would offer better incomes for Zeef producers. This component of technical support should elaborate on local knowledge, combining with modern technologies that will help valuing local products on Hebron market and beyond.
- Define how this technical support should be factored in the governance model in order to align project management, technical needs and the overall financial model.
- Technical support should go as far as exploring to value animal manure and agro by product to be used to produce energy locally (through a bio-digester for example) in order to cover local needs.

Initial phase: The detailed plan needs to be design through a comprehensive feasibility study that will cover the three components:

- Design the water collection and distribution system and assess the investment required.
- Design the pricing and governance model.
- Design technical support needs and assess costs of this technical support over the first 5 years of the project.

3. Organization and procedures

Formal approval	Staff allocated to prepare, implement, monitor action
The project concept has already been approved as an add-on to the	Nader Betar – City Counsellor

wastewater treatment plant.	
Staff training needs	Role of Partners
Staff training needs will be assessed as part of the identification of technical support needs for farmers.	Local stakeholders in Zeef, including the treatment plant's management, need to be engaged from the outset to contribute to the design of the different components of the project. This process will be essential to ensure the right level of buy-in and appropriation from local farmers, which is essential for its long-term success.

4. Summary of related Awareness Raising (AR) actions

Public awareness around the project will be essential on three aspects:

- Demonstrate that Zeef products are safe although irrigation comes from the waste water treatment plant
- Highlight the importance of efficient water management in the context of climate change
- Promote local products and local productions as another component of collective efforts to reduce GHG emission coming from consumption of products coming from a long distance.

5. Assumptions and risks (3)

The key challenge will be to set up the entire project in order for its actual launch before the first drop of water gets out of the plant. If the project wasn't ready by then it will be easy for Israeli authorities to get a grip on this water and take advantage of if it for their own interest behind the "green line" depriving Palestinian farmers from this essential resource. Quality of water getting out of the plant will also be a key issue as any sanitary problem could be a killer for the entire project. This is why permanent quality control will be key and need to be connected with the governance of the project.

6. Key success factors (3)

- Water scarcity means that any available drop of water will be a significant incentive
- Local farmers are waiting for any form of support to develop their production
- Municipality determination to act in a comprehensive way on the issue

7. Cost estimates

Initial and start-up expenses: basic equipment for the unit – Initial investigation	160,000 €
Approximate operational Costs (including maintenance)	Not relevant at this stage
Approximate annual income for energy producing projects	Not relevant
Return of Investment (draft calculation)	Cost of maintenance and a part of the initial investment will be easily covered through the development of local production. Additional energy production from bio-waste generated in the project could also be factored in as another component to improve return on investment.

8. Available and foreseen sources of funding

Local authority's own resources: The Municipality allocates staff to the unit and provides an office and basic working equipment.	**National Funds and Programs**
International Financial Institutions: The German Corporation for International Cooperation (GIZ) and the Japan International Cooperation Agency (JICA)	**EU Funds & Programs and other external funds**

Public-Private-Partnerships (available or to raise)	**Lined up private investments**
Loans and potential borrower	**Expected annual cost savings to City budget**
9. Projected Energy Estimates in 2020 (or other set target year)	
Energy savings MWh/y Impossible to assess at this stage as most of saving will come from re-localization of fodder and food production avoiding energy expenses and GHG emission from long distance transport to import fodder and food in Hebron.	Impossible to assess at this very early stage
Renewable energy production MWh/y	Not relevant
CO2 reduction t CO2/a	Impossible to assess now

HEBRON – Priority action # 4 for SEAP

1. General presentation

WASTE TO ENERGY STRATEGY	**# 4**	Area(s) of Intervention: **C**

Summary of the Action

The Residual Solid Waste representing at least 195 tons/day could be processed to produce energy in a gasification unit. Such a plant transforms waste into gas, which can then produce heat and electricity. Gasification is far more efficient than classical incineration process, and avoids releasing hazardous substances in fumes. For this very reason, gasification has more chance to be accepted by Israel than incineration, which will always be subject to opposition for the potential pollution it may generates.

A first investigation has been conducted demonstrating that the amount of waste collected in Hebron could feed in a gasification unit connected to an 8MW electricity production plant. It would require a 40 m€ investment with an 8.5 years pay back period. The unit could also be designed to accept waste coming not only from Hebron city, but also from neighboring villages, and from other municipalities in Southern West Bank. Hebron now looks for private investors to joint with the Municipality in a Public Private Partnership that would build and manage the gasification plant.

However, Hebron Municipality needs to refine its plan and design a comprehensive strategy to define what would be the appropriate size of the waste treatment unit, and how would the waste collection should evolve towards a performing system that will offer the city the most appropriate waste management mechanism.

Location: **HEBRON City**

Start date: **2016**

Project lifetime:
- Study: 2 years
- Implementation: 5 y

Estimated cost €

200.000 € feasibility study

General Objectives of the project

This action is a detailed feasibility study to promote a performing waste to energy strategy:

- **Defining the appropriate waste collection model** to channel the right type of waste to the gasification unit, and diverting, if appropriate, organic waste to another type of treatment (bio-digester or composting unit).
- **Defining the appropriate size of the gasification unit** to avoid unnecessary investment in a too large unit that will struggle to find its economic model, or in contrary avoid undersized investment resulting in early saturation of the plant capacity, and imposing other solutions to absorb non-treated waste.
- **Identifying rules and procedures** to be set up for ensuring the appropriate management of the gasification plant in order to secure its long-term operation optimizing return on investment.
- **Defining the best approach to secure public acceptance of the plant**, as “waste treatment plants” are always subject to high public scrutiny and potential rejection.

Status of the Action:

- New
- ~~Planned~~
- ~~Under implementation~~
- ~~Following previous action.~~

Principal partners and stakeholders	Contact person in the local authority
• Hebron: Waste management department • Ministry of Environmental affairs of the PNA. • Local NGOs and media (to work on public acceptance)	Nader Betar – Hebron counsellor XXX - Waste management

• Local actors: representatives of individuals in charge of nearby landfills	unit

2. Technical description

Link to municipal development plan

Waste management, which comes with city cleanliness, is a central concern for Hebron Municipality attention, as the Municipality wants to improve for the urban environment and, doing so, increase Hebron attractiveness.

The "waste to energy strategy" will also be a key component of the energy strategy providing new capacities for Hebron to be less dependent on energy imported form Israel.

Implementation plan

The feasibility study should cover the following items:

- Detailed assessment of waste volumes and quality in order to define how the different waste streams should be managed to promote the most effective and efficient waste management system.
- Assessment of waste gasification detailed potential to define the appropriate size of the unit.
- Design the most appropriate governance model.
- Assess condition if success including ways to ensure the highest level of public acceptance.

Phase 1: Define the detailed remits of the feasibility study.

Phase 2: Launch a call for tender to select the appropriate team (as the Municipality doesn't have the appropriate expertise within its own services to run such a specific investigation).

Phase 3: Select the team.

Phase 4: Engage in a close monitoring process to benefit from the expertise of the commissioned team and gain in expertise for the future management of the waste to energy strategy.

Phase 5: Receive recommendations from the technical team and adopt the final plans.

Phase 6: Look for public and private partners to invest in the gasification plant.

Phase 7: Secure funding and actually launch the building process.

3. Organization and procedures

Formal approval	Staff allocated to prepare, implement, monitor action
Idea of the feasibility study already approved	Nader Betar – City counsellor
Staff training needs	**Role of Partners**
The team assigned to monitoring the study need to receive a proper training on two subjects: • Technical questions related to waste management and waste to energy solutions • Complex project design and management.	Stakeholders will be invited to contribute to the design of the strategy more specifically in helping assessing waste volumes and quality and exploring conditions for a good enough level of public acceptance of the gasification unit.

4. Summary of related Awareness Raising (AR) actions

The study can also help designing the "waste management component" of the awareness strategy that will be promoted by the Public Awareness Unit to be launched as Priority action #5.

5. Assumptions and risks (3)

The key challenge will be to define the appropriate size of the gasification unit.

- Too big it will generate unnecessary costs and will not offer the appropriate performance in energy production. It will also run the risk of "attracting waste" from other city or even from Israel generating trucks traffic and additional pollutions and nuisances
- Too small it will be soon saturated, imposing Hebron to invest in additional waste treatment units.
- Last but not least, such a strategy should come on top of a comprehensive plan to actually reduce waste production as a long-term commitment to a comprehensive sustainability strategy.

6. **Key success factors (3)**
• High cost of imported energy means that any local production could be more interesting for Hebron. • Such a strategy could be a driver to improve waste management across the city and as all players are very concern with city cleanliness they should support such development. • Municipality determination to act in a comprehensive way on the issue

7. **Cost estimates**	
Initial and start-up expenses: basic equipment for the unit – advertising material	
Approximate costs for the feasibility study Investment level (first approach)	200,000 € 40 m€
Approximate annual income for energy producing projects	5 to 7 million €/Y depending of the size of the unit.
Return of Investment (draft calculation)	If the investment reaches 40m€, R.o.I. could be 6 to 8 years.

8. **Available and foreseen sources of funding**	
Local authority's own resources: The Municipality allocates staff to commissioned and monitor the feasibility study.	**National Funds and Programs**
International Financial Institutions	**EU Funds & Programs and other external funds**
Public-Private-Partnerships (available or to raise)	**Lined up private investments**
Loans and potential borrower	**Expected annual cost savings to City budget**

9. **Projected Energy Estimates in 2020 (or other set target year)**	
Energy savings MWh/y	
Renewable energy production MWh/y	40.000 MW/y (average)
CO2 reduction t CO2/y ➔ As most of waste will no longer go to landfill 70% of GHG emissions from this landfill could be avoided	
- Reference Year	2014

- Target Year	2020-22
- Percentage of net reduction on the territory	13 %
- Reduction as related to BAU scenario	55.000 tCO_2 equivalent
- Per capita calculated reduction	0,27 tCO_2 equivalent

HEBRON – Priority action # 5 for SEAP

1. General presentation

ENVIRONMENTAL PUBLIC AWARENESS UNIT	# 5	Area(s) of Intervention: **ABC**

Summary of the Action	Location: **HEBRON City**
As municipality staff, population and local stakeholders lack information and need to be mobilized to act on energy conservation / efficiency and environmental protection, it is necessary to strengthen efforts to inform and engage all the publics in contributing to the implementation of the different components of the SEAP. Hebron Municipality will set up a dedicated unit, focusing on raising awareness in different publics to optimize the impact of the measures proposed to reduce energy consumption and improve the quality of life in the city.	Start date: **2016** Project lifetime: **5 years** End date: 2021 Estimated cost € 160.000 € for 5 years

General Objectives of the project	Status of the Action:
Focusing on 3 priority targets - Municipality staff / Children / Mothers: • **Inform** on issues at stake regarding climate change and energy management, • **Provide guidance** to **behavioural changes** to fight climate change, • **Invite all stakeholders to engage in concrete actions** to help reducing energy consumption, and improve the urban environment (water, cleanliness).	• New ~~• Planned~~ ~~• Under implementation~~ ~~• Following previous action.~~

Principal partners and stakeholders	Contact person in the local authority
• Hebron: Public relation + Customer service / HEPCO Comm. dept. • Ministry of Education – Local teachers • Local NGOs – Women' groups • Local media: radio and social media	Sara Jabari - Hebron Municipality Nader Betar – Hebron councilor

2. Technical description

Link to municipal development plan

The Awareness unit will be a key component of the SEAP implementation, as most of the impacts expected for the action plan depend on the adequate mobilization and engagement of stakeholders to seize the opportunities offered to reduce their energy consumption and, in doing so, contribute to the success of the SEAP.

Implementation plan 1/2

Phase 1: Setting up the unit – Allocating staff – Installing basic equipment

Phase 2: Priority programme targeting municipality staff with basic information on climate change and energy

- Reduce artificial lighting and take advantage of natural light.
- Manage temperature inside buildings to reduce use of AC/heater.
- Shut down electric equipment at end of working time…

Phase 3: Develop a specific programme "Positive energy schools", mobilizing youth groups…

- Working in schools, developing energy efficiency actions and renewable energy production.
- Informing kids on climate change and sustainable energy management / explain possible actions

in these domains that be enforced at school on a day-to-day basis.
- Make connection between water / waste and energy.
- Develop games and challenges to make behavioural change attractive and fun.
- Train kids for them to become change promoters at home.
- Organize a challenge between schools to reward the team – teachers & kids – getting the best results in terms of energy conservation.

Implementation plan 2/2

Phase 4: Expand the programme to raise awareness among women / mothers:
- Elaborating from actions in "Positive energy schools" promote activities that were done by kids.
- Inform mothers on climate change and energy management / explain possible actions in these domains at the household level on a day-to-day basis.
- Promote behavioural change that mothers can promote at home and raise potential benefits for the family.

3. Organization and procedures

Formal approval	Staff allocated to prepare, implement, monitor action
The mayor already approved the principle of setting up this unit.	Sara Jabari + other colleagues to be defined
Staff training needs	**Role of Partners**
The team which will be assigned to the unit need to receive a proper training on two subjects: • Technical questions related to climate change and energy • Pedagogy and communication to run efficient awareness programmes.	Stakeholders will be invited to contribute to the design of the different programmes and their implementation. The programme will be conceived and run to be relayed and implemented by many other stakeholders in order to get a bigger impact reaching out more people / groups.

4. Summary of related Awareness Raising (AR) actions

Some of the actions include:
- Spreading **information and training material** (posters, brochures, stickers, etc.) on how to save energy. To include training given by municipal staff.
- Creating an annual "**Energy festival/day**" to demonstrate best practices and celebrate innovative projects. Would be promoted through traditional media and online social networks.
- **Mobilizing families** by training women/mothers
- Developing a network of "**Positive energy schools**" that produce not only more energy than they consume, but where teachers integrate the project into their curricula to train students, develop projects, etc.

5. Assumptions and risks (3)

The key challenge will be to find the right messages to be promoted as people are suffering from many aspects of the colonization process and are not used to take responsibility on issues concerning the community / common interest on the mid and long term.

Likewise considering the many problems people are facing on their day-to-day life, it will take a smart concept to engage the public in collective actions that will generate individual benefits (saving money from their own budget through reduced energy and water consumption) as well as global impact (reducing dependency on Israel regarding energy, mitigating climate change, etc.)

6. Key success factors (3)

• High cost of energy means that any saving will be a significant incentive • A lot of efforts can be made without heavy investment • Municipality determination to act in a comprehensive way on the issue	
7. Cost estimates	
Initial and start-up expenses: basic equipment for the unit – advertising material	10,000 €
Approximate operational Costs (including maintenance)	30,000 € /year
Approximate annual income for energy producing projects	Not relevant
Return of Investment (draft calculation)	If the programme allows 15% saving in electricity in municipal buildings only, it will avoid 40,000 € expenses per year…
8. Available and foreseen sources of funding	
Local authority's own resources: The Municipality allocates staff to the unit and provides an office and basic working equipment.	**National Funds and Programs**
International Financial Institutions	**EU Funds & Programs and other external funds**
Public-Private-Partnerships (available or to raise)	**Lined up private investments**
Loans and potential borrower	**Expected annual cost savings to City budget**
9. Projected Energy Estimates in 2020 (or other set target year)	
Energy savings MWh/y *Potential: 15 % saving in electricity consumption in 50 % of all public buildings, private households and tertiary buildings.* *Note: in order to achieve these potential savings it will be of particular importance that the awareness-raising unit design and implement more actions that target households and the tertiary sector.*	14,000 MWH/year
Renewable energy production MWh/y	Not relevant
CO2 reduction t CO2/a	
- Reference Year	2014
- Target Year	2020
- Percentage of net reduction on the territory	2.3 %
- Reduction as related to BAU scenario	10.5 $ktCO_2$ equivalent
- Per capita calculated reduction	0,05 tCO_2 equivalent

HEBRON – Priority action # 6 for SEAP

1. General presentation

DEVELOPMENT OF SOLAR PV PRODUCTION ON PUBLIC BUILDINGS AND AVAILABLE PUBLIC SPACES	# 6	Area(s) of Intervention: **A**

Summary of the Action	Location: **HEBRON City**
Hebron Municipality wants to take benefit of the solar potential of the region to increase local production of renewable electricity and doing so reduce its dependency on Israeli sources. The Municipality will at installing PV wherever possible on Municipality buildings' roofs, parking, schools, universities, bus terminal, etc. The development of solar PV in Hebron can also be a booster for local economy, considering the huge potential of development of this technology and taking into account that installation and maintenance must rely on local companies.	Start date: **2016** Project lifetime: **10 years** End date: 2026 Estimated cost € 10 m€ investment

General Objectives of the project	Status of the Action:
• **Develop renewable electricity production** in order to reduce dependency on Israeli source and to improve energy sovereignty, install 7,5 MW capacity in different location and size to gain experience on the technology. • **Develop technical capacity locally** to promote the technology and provide support to any investor willing to develop solar PV in Hebron. • **Contribute to build a sustainable energy strategy** for the entire city.	~~• New~~ ~~• Planned~~ ~~• Under implementation~~ • Following previous action.

Principal partners and stakeholders	Contact person in the local authority
• HEPCO • Ministry of Education (for schools) • Private universities • Local business	Nader Betar – Hebron counsellor

2. Technical description

Link to municipal development plan

The SEAP is built on two drivers: reduce energy consumption and develop energy production. Solar energy offers significant potential and is pretty easy to develop. The project will also contribute to promote a "new culture" regarding energy considering that any citizen could be energy producer beyond being energy consumers.

Implementation plan

The plan is to develop solar PV units connected to the grid wherever possible and appropriate. A rough inventory demonstrates that close to 60.000 square meters could be equipped only using buildings roofs. This includes Municipality buildings, schools, university, marketplace, warehouses, bus terminal, etc.

If only 50% of this surface would be equipped the system will represent a 7.5 MW capacity, will produce close to 12 GWh per year, requiring 10 m€ investment with a pay back over 10 years.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Investment	2 000 000	2 000 000	2 000 000	2 000 000	2 000 000					
Installed capacity/year KW	1 500	1 500	1 500	1 500	1 500					
Total installed capacity KW	1 500	3 000	4 500	6 000	7 500	7 500	7 500	7 500	7 500	7 500
Production in KWh	2 400 000	4 800 000	7 200 600	9 600 000	12 000 600	12 000 600	12 000 600	12 000 600	12 000 600	12 000 600
Revenues in €	320 160	640 320	960 560	1 280 640	1 600 880	1 600 880	1 600 880	1 600 880	1 600 880	1 600 880
Cumulated revenues	320 160	960 480	1 921 040	3 201 680	4 802 560	6 403 440	8 004 320	9 605 200	11 206 080	12 806 960

Assumptions:

- Cost of a 1KW unit = 1500 US$ - 1335 €. Annual production 1600 KWh / installed KW
- Assumptions: KWh purchased at 0,58 ILS / Change ILS to € at 0,23 / Change € to US$ at 0,89

Other options could be proposed to exploit this PV potential:

- **Negotiate a 1 Million € loan** to install 900 KW in 2 years. The production of year 1 and 2 will be then invested to install another 70 KW/year capacity. After 10 years the Municipality will save 296K€ per year from reduction in electricity import, and will be able either to reimburse the initial investment or to launch a new program to deploy more PV units.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Capacity installed each year KW	300	600	70	70	70	70	70	70	70	70
Total capacity installed KW	300	900	970	1 040	1 110	1 180	1 250	1 320	1 390	1 460
Investment in €	400 500	801 000	93 450	93 450	93 450	93 450	93 450	93 450	93 450	93 450
Initial subsidy	*400 000*	*600 000*								
Production in KWh		480 000	1 440 000	1 552 000	1 664 000	1 776 000	1 888 000	2 000 000	2 112 000	2 224 000
Production in €		64 032	192 096	207 037	221 978	236 918	251 859	266 800	281 741	296 682
Net income in €		64 032	-38 822	113 587	128 528	143 468	158 409	173 350	188 291	203 232
Cumulated net income		64 032	25 210	138 797	267 324	410 793	569 202	742 552	930 843	1 134 074

Pass a deal with a private company that will invest and pay a rent to the municipality for using the roofs. The Municipality will buy the electricity produced reducing its dependency on IEC. This model is probably easier to manage for the municipality but it will not provide as much resources on the long run than the previous one.

- **Negotiate a 1 Million € subsidy** to install 900 KW in 2 years. The production of year n-1 will be then invested to install as much capacity as possible, growing from 70 KW in year 3, and up to 350 KW in year 10. In this process, after 10 years the Municipality will save 467 K€ (in year 10) from reduction in electricity import, and will be able to continue developing solar PV

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Capacity installed / year	300	600	70	140	160	190	220	265	300	350
Total capacity in KW	300	900	970	1 110	1 270	1 460	1 680	1 945	2 245	2 595
Investment in €	400 500	801 000	93 450	186 900	213 600	253 650	293 700	353 775	400 500	467 250
Initial subsidy	*400 000*	*600 000*								
Production in KWh		480 000	1 440 000	1 552 000	1 776 000	2 032 000	2 336 000	2 688 000	3 112 000	3 592 000
Production in €		64 032	192 096	207 037	236 918	271 069	311 622	358 579	415 141	479 173
Net income in €		64 032	-38 822	20 137	23 318	17 419	17 922	4 804	14 641	11 923
Cumulated net income	0	64 032	25 210	45 347	68 665	86 084	104 006	108 811	123 451	135 374

3. **Organization and procedures**	
Formal approval	Staff allocated to prepare, implement, monitor action
Municipality council needs to decide on different options	Nader Betar – Hebron Counsellor
Staff training needs	Role of Partners

The team which will be assigned to the unit need to receive a proper training on two subjects: • Technical questions related PV development • Project management	Technical partners (HEPCO, local companies dealing with PV installation and electric equipment maintenance) will be engaged in the programme in order to ensure that a proper network of services can follow on PV development and maintenance.

4. Summary of related Awareness Raising (AR) actions

Adequate awareness raising actions will be necessary to help people understand the value of electricity production through PV and the benefit both for individual producers and for the entire city of such a move. Awareness should also insist on the fact that Solar PV development doesn't mean that electricity will become abundant. On the contrary such awareness campaign should highlight that combining electricity conservation and efficiency with PV production will allow Palestinian cities to become independent form Israeli sources for their electricity consumption.

5. Assumptions and risks (3)

The key challenge will be to organize a proper maintenance system in order to ensure adequate production yields securing interesting enough R.o.I.

Main risk remains the potential difficulty in importing equipment as all of these will come through Israel.

Last but not least, as renewable electricity production will grow, the grid should be maintained and upgraded to support integration of local production in varying intensity and quantity. Grid upgrade and proper network management will become more and more important.

6. Key success factors (3)

- High cost of energy means that any saving will be a significant incentive
- A lot of efforts can be made without heavy investment
- Municipality determination to act in a comprehensive way on the issue

7. Cost estimates

Initial and start-up expenses: technical training for Municipality staff	5,000 €
Approximate operational Costs (Setting up a Solar PV maintenance unit)	20,000€/y
Revolving fund (possibly loan to be reimbursed after 10 years)	10 million €
Approximate annual income for energy producing projects	296 k€ after 10 year
Draft calculation of the NPV and return of Investment (IRR).	10 years (see table page 2)

8. Available and foreseen sources of funding

Local authority's own resources Staff form the municipality and from HEPCo	National Funds and Programs
International Financial Institutions Both the **EU** and the **AFD** are allocating funds to support renewable energy production development	EU Funds & Programs and other external funds According to some of the funders, the loan released could be also supported by a grant covering loan interests, which then are not to be covered by the municipality.
Public-Private-Partnerships (available or to raise)	Lined up private investments

Loans and potential borrower AFD	Expected annual cost savings to the City budget 296 k€ after 10 years	
Other		
9. Projected Energy Estimates in 2020 (or other set target year)		
Energy savings MWh/y		
Renewable energy production MWh/y		12,000 MW/y
CO_2 reduction t CO2/a		
- Reference Year		2014
- Target Year		2020
- Percentage of net reduction on the territory		3,3 %
- Reduction as related to BAU scenario		8,724 tCO_2 equivalent
- Per capita calculated reduction		0,02 tCO_2 equivalent

ANNEX II – CITIZENS AWARENESS PROMOTION PLAN

Hebron
A Participative and Economically Performing City

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 its 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 behavioral 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 behavioral 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 in 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 Hebron

Aim

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

The exercise of filling the templates has identified and assessed the conditions in the municipalities prior to preparing a CAPP and to answer a number of questions, including:

1) Who are the target audience of a CAPP?
2) What are the priority issues to be addressed by the CAPP (that also could be identified by the SEAP as priority actions)?
3) What is the level of awareness of key energy problems? And what are the first issues to raise awareness about?
4) What are previous awareness raising actions, so that the CAPP can build on them?
5) What is the situation as related to public consultation, based on which a public consultation is to be designed?

The exercise of filling the template helped pointing out how raising awareness can be utilized as a tool for improved energy policy to facilitate implementation of its actions; it has 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 on 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 for help in filling in the answers.

(ii) The filled templates were discussed in the "CES-MED Communication Workshops", which were led by the 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.

I. Identification of the target audience and the importance they give to Sustainable Energy (audience targeted by the awareness raising campaigns and actions)			
Women/ Men Age group	Very important	Important	Not important
Youth	X		
Middle Age	X		
Seniors		X	
Other: school kids under 18	X		

II. 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		
Other			

III. 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 reduce energy consumption	X		
Existence of renewable energy		X	

IV. Previous awareness actions conducted by the city/municipality or by other actors	
Has the city or local authority done previous actions	The municipality did not go through any procedures but carried out certain activities
If yes, who conducted the actions (the city/municipality, NGO, national authority…)	Hebron Municipality
If yes, describe the action	The municipality has repeatedly sent messages via radio stations and Internet sites related to the citizens concerning actions and directives preceding the weather depression or heat waves
If yes, what was the budget and how did you fund it	The funding was very modest
If yes, outcome, impact and feedback	Outcome was positive and the impact was a real-time effect on consumer energy consumption during cold or heat waves

V. Public consultation	
Does the city practice public consultation?	Yes, to a certain extent
Has the city done public consultations for SEAP?	No
Is it part of the legislative process?	
Foreseen consultation(s)	There were community consultation sessions regarding the strategic plan involving various city institutions
Does the city liaise with national institutions, stakeholders?	Yes it does

Situation analysis

From this study concerning the target profile, it appears that the groups that are aware and informed about energy challenges are the middle age and young population and the ones open to any information and behaving accordingly are the children. It would be recommended to carry out the communication with them and get easily their involvement as they could function as opinion sharing people to disseminate ideas and new behavior.

The oldest respondents, probably taken by other top social concerns, are the group that needs more persuasion means to address those barriers as their environmental deeds are deeply rooted in cultural norms and habits.

The template shows that the important leverages that we can use and base our communication upon are: The price of energy, the cleanliness of the environment and the waste management issues. The ambiguity lays in the fact that the citizens of Hebron in general are aware about some energy issues such as the waste energy and the availability of energy efficient products but do not feel convinced about their link to cost of energy and the impact that overconsumption may have on the environment. Evenly, they don't seem to be aware of the climate change issue.

Nevertheless, the municipality of Hebron has conducted awareness raising actions and campaigns that are related to sustainable energy towards the civil society, punctually, before the heat wave. Despite the modest funding of these actions, it was able to assess their positive and immediate impact on alerting the population about energy consumption and the importance of energy saving.

The means of communication, and the tools that were used were messages via radio stations and Internet sites related to the citizens.

Finally, regarding public consultations, the municipality does liaise with the citizens to a certain extent; there has been a community consultation session conducted regarding the strategic plan with the city institutions.

Template 2.1

Proposed Communication or Awareness Raising Action related to Specific/Pilot Project: Empowering the students

1. **Title of the Pilot Project**

   Raising awareness among students on topics related to energy and environment.

2. **Title of the Communication Action related to the pilot project**
   National Awareness Campaign on Environment and Energy Issues

   Location

   Intermediate Schools and High schools of the city

3. **Summary of the Communication Action**

   General Objective:

   Raising awareness among the youth on Environment and Energy Issues

   Key message:

   We are part of this world;

   Every individual behavior or action is important, whether it is positive or negative.

   Theme:

   Global Change and our individual responsibility towards it

   Target group: Students in the city

   Tools and channels:

   Posters, municipality's website, field trips to schools.

4. **Organization**

   Roles and responsibilities:

   Municipality employees and university students for part time jobs

   Project lifetime:

   A whole year from 01/01/2016 to 30/12/2016

   Link to other opportunities and/or events: NA

   Principal partners and stakeholders and their roles: NA

   Staff training needs:

   Sessions and workshops about the topic as it is new, and the preparation of a booklet or brochure on the topics related to energy and environment.

   Technical assistance and expert needs:

   Providing written material related to the rationalization of the use of energy and the conservation of the environment.

5. **Cost estimate**

   Estimated implementation cost:

The estimated implementation cost is around 20,000 to 30,000 Euros

Funding source:

Mainly the municipality's treasury

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

6. **Next steps:**

Establishing the Environmental Awareness Unit at the Municipality

7. **Follow-up, evaluation and impact assessment:** NA

Template 3.1

Identification of CAPP CAMPAIGN TOPIC related to sustainable energy challenges

Once the Sustainable Energy challenges and priorities, general awareness raising priorities, and specific awareness raising needs related to SEAP actions have been 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
Increase in the Energy Consumption	Limit domestic and commercial use of energy. Keep on providing energy to those who need it. Reduce the impact of greenhouse gas emissions.	**Topic**: **Simple energy saving procedures in the household and commercial sectors, that most of the citizens can apply.** **Activities**: Raise awareness by spreading the culture of the rationalization of energy and start to implement the procedures by giving practical advice to help saving energy in houses, centers and shops. Launch exhibitions of solar houses, architectonical scale models, trade fairs for the general public and technical conferences for professionals of the building sector and city councils.
Production of large amounts of waste and unsustainable management of the solid waste.	Increase the efficacy of waste collection operations. Implement the principles of the comprehensive and sustainable waste management (in order to improve the quality of life and reduce the cost of waste management).	**Topic**: **Making the city clean and benefiting from recycled waste**. **Activities**: Explain the negative effects of waste accumulation and its health impact on the citizens (spread of insects, rodents and bad smells) and on the beauty of the city in general. Provide practical advice on waste sorting and on how to reuse it and recycle it.
Lack in water provision.	Practicing responsible and rationalized use of water.	**Topic:** **Preserving water as a collective wealth and improving the water consumption behaviors.** **Activities:** Explain the facts related to water rarity, the effects resulting from the excessive use of water, and the right of everyone to have water, despite of its scarcity.

		Convey a message to the community stating that it is possible to overcome water rarity by taking collective measures and limiting the trespassing on the distribution networks. Provide practical advice on how to reduce water consumption. Adopt a fair approach in the water distribution.

Template 3.2

CAPP activities as related to SEAP Priority Actions of Hebron

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 and related to the priority actions identified in the SEAP.

SEAP Priority Actions	Related CAPP Activities:
Lighting the streets using energy saving units technique.	**Target Audience:** - Local community (every person concerned by public affairs) - Private and public operators **Key Message:** - Installing energy saving lighting would help the city on the economic and environmental levels and saves money in the Municipality lighting bill of its annual budget. **Objectives:** - Switching the general lighting system into a system that saves energy and reducing the annual municipal consumption bill. **Communication Tools:** Announcing, through the various available tools, the size of savings and reusing the money saved in social and public projects. Producing posters nailed on street lamps to alert citizens on municipality action Promoting the usage of efficient lighting through a promotional distribution of led lamps to households. Setting-up training to the students on using the energy correctly. Organizing interdepartmental competitions to encourage and reward creative suggestions for energy efficiency improvements.
Rebuilding the water distribution system in the city.	**Target Audience:** - Local community (every person concerned by public affairs and contributing to the water network) - Private and public operators **Key Message:** - Rebuilding the water distribution system by relying on the flow would help in saving the overall energy bill of the water distribution. **Objectives:** - Reducing the annual bill of the energy used in the water distribution. - Reducing the house bill that the citizens pay to pump the water up to the rooftops. - Improving the performance of the water distribution system by adding tanks on the mountain tops surrounding the city - Reducing the household demand on energy for purposes that can be dispensed (water pumps). - Improve health and living conditions. **Communication Tools:**

	Highlighting the problem through introductory brochures, regular coverage in local media and coordination meetings convened with local stakeholders that include a description of the problem and the contribution of the suggested solution in limiting its effects. Raising awareness through showing the direct effect on the citizen's money if the current distribution pattern is adopted (through seminars and public meetings). Using the Municipality website to introduce the problem and show the size of the benefits resulting from changing the water distribution system. Achieving capacity building through a mix of training, coaching and learning-by-doing to municipal water authority and staff while implementing water projects.
3- Establishing the awareness unit at the Municipality.	**Target Audience:** - All local stakeholders: Civil society, private and public operators - Government agencies and associations - Private and public touristic operators - Service providers in the private and public sectors - Professionals in energy sector **Key Message:** - Raising awareness among the citizens on the importance of the procedures related to saving the environment and energy and their impact on the international efforts deployed on this level. **Objectives:** - Appoint a dedicated team and establish a communication unit - Communicate with citizens, all stakeholders and other municipalities - Promoting the project and the strategic vision of the city at local, national and international level in the clean energy sector. - Connecting with concerned international actors and organizations (donors, professionals abroad…) **Communication Tools:** Holding workshops for the Municipality employees in the various sections with regards to this orientation and how to convey it to the public. Building a proper Web site of the city as well as connecting through social networks and promoting them. Linking to the associations and their social networks (if possible) Launching communication actions in the local media (radio, press) and producing posters on the positive effects of taking the individual measures related to the activities of preserving the environment. Raising awareness among the citizens on the necessity of daily individual actions in this domain and their resonance on their bills, the environment and, directly or indirectly, on the rest of this planet. Promoting new technologies in RE to convey the means of preserving the environment.

Reuse the treated wastewater resulting from the infiltration station.	**Target Audience:** - Civic society in the city and especially the farmers and Stock breeder. - Agricultural Development, Environment and Land Use Planning, and Public Health administrations **Key Message:** - Reusing the treated wastewater in watering the plants; this would save the cost, especially if crops that are proper for the cows and sheep nutrition were planted. **Objectives:** - Providing a new water source amid the water scarcity and the reduction of water levels in the south of the western coast - Creating job opportunities for the unemployed **Communication Tools** Holding workshops to promote the project and its importance for all the residents of the city and its surroundings, as well as creating posters to prove the importance of the development of the rural areas. Conducting training and public awareness programs targeting students at schools, householders, and farmers to raise the knowledge about the treated wastewater uses. Disseminating the results from other experiences and using them to help change attitudes: press releases, media advisories, press conferences. Realizing public awareness efforts based solely on scientific data: short videos to highlight the impacts of wastewater on the ecosystem. Raising public awareness with regard to the safety and cleanliness of the treated wastewater.
Project of the transfer of waste to energy.	**Target Audience:** - The Civic Society and those concerned of the public affairs. - Schools and universities - Municipal staff for collecting garbage - Local authorities, in particular waste management officers **Key Message:** - Benefitting from the waste quantities produced by the city to produce electricity in a sustainable way. **Objectives:** - Increase the awareness for reducing the amount of waste not being recycled - Reduce the billing cost for waste collection and transportation - Practice responsible and integrated waste management within the city. - Increase sustainability **Communication Tools** Highlighting the problem of the waste, and specifically the random waste through introductory bulletins that include the problem and the suggested solution to limit the problem's impact. Raising awareness about the positive effect of producing

	electricity and the size of the savings on the Municipality's' general budget. Using the municipality's websites, producing posters and benefitting from the radio station programs to promote this project. Producing posters on pick-up trucks for high visibility Conducting environmental projects to give students the opportunity to learn and explore new technologies and concepts that could aid environmental sustainability. Provide practical tips to reduce solid waste at its source, to re-use and recycle: a small guidebook and calendar. Educational kits - with a view to teaching young people how to recycle and reuse waste.

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 Hebron specifically, the senior target group has very little interest in the topic and is very suspicious about the literacy around it. On the other hand, young people and students are highly dynamic and face changing situations; they are clearly educated to the energy issues and climate change. They will be 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 a behavior. 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.

In general, there is a gap between the citizens' general concern about climate change and their awareness of specific actions they can take (through buying certain products) to help address the problem. Awareness activities have to be persuasive and lead to taking action. Probably using their primary motivation –saving energy costs- will lead to environmental concerns, this will help bridge the gap.

Hebron municipality is a very determined force, trying hard to set innovative approaches and aiming at improving energy conservation and moving from energy consumer only to energy consumer and producers.
However it needs to assess the perception of options it offers to its 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 behavior, 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.

Moreover, the municipality will have to lead visibility from the top by indicating the importance of energy cost reduction to its employees and communicating the opportunity to do so. It needs to be an example of sound energy management in its direct scope of responsibility: municipal buildings, fleets and services, street lighting, waste and water management, etc.

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 (economically performing); Express a clear political commitment to involve individual target groups in future planning procedures to adapt/improve measures according to specific demands; 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.

Increase awareness of energy use and knowledge about specific energy saving opportunities to enable end-users to act more swiftly in their own financial interest. When the sticker price of energy saving is too high, that is a barrier, we need to raise awareness on the long term cost saving which is not understood and provide succinct information to customers on an informed purchase of an energy efficient product. Options as well include providing more information on utility bills or use of in-buildings displays, voluntary standards, audits and assessments and awareness campaigns.

On the other hand, marketers, retailers, utilities, local authorities and NGOs need to double efforts to educate consumers on the benefits and availability of energy efficient products (booklets on energy saving tips, audio messaging in retailer's shops, and guidance from salesmen).

One approach would be developing outreach partnerships, with NGOs, appliances companies, and other parties as a platform, in a joint program with the municipality to increase communication with the citizens and drive adoption.

And finally, establish an awareness unit at the Municipality and empower it, plan to set up its structure, strengthen its capabilities and its human resources. It will carry its actions at the level of the municipality, promote the project and the strategic vision of the city at local, national and international level and connect it with concerned international actors and organizations. It will build a sustainable awareness plan adapted to the project of the city and launch actions to connect with its citizens and implement the concept of eco-responsibility.

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