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● Palestine Municipality of Nablus Sustainable energy action plan (SEAP)



بلدية نابلس
Nablus Municipality



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Sustainable energy action plan (SEAP)

**Municipality of Nablus
- Palestine –**

**Integral document of the sustainable
energy action plan**

(4 January 2016)

CES-MED



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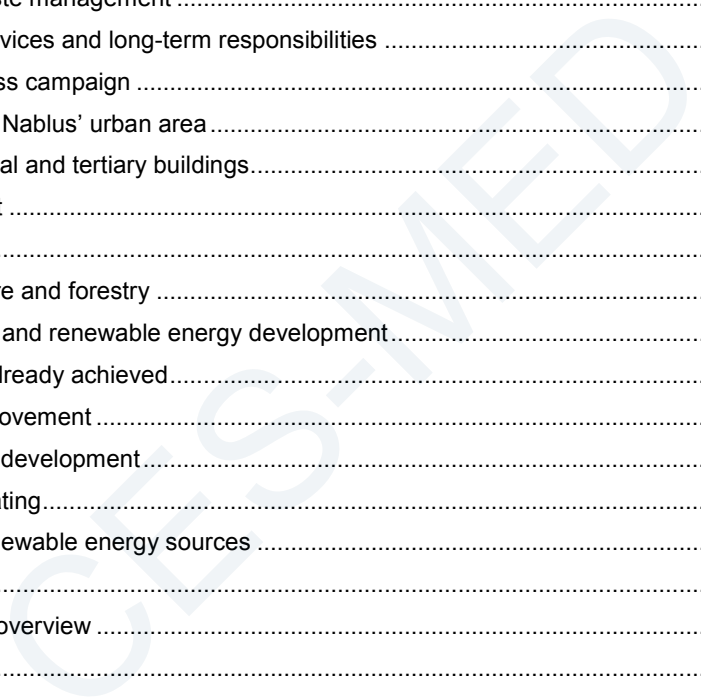
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Section I: SEAP summary

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 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:

- 1) Reduce energy consumption in all sectors through energy conservation and efficiency, in order to provide better services while reducing costs and impacts.
- 2) 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 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).

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. Mobilisation 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:

- Reinforce and promote energy efficiency in municipal property, public infrastructure and other local activities.
- Promote the integration of energy efficiency and renewables into public and private housing construction projects in the municipality.
- 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.).
- Implicate all of the territorial actors in the promotion of energy efficiency and the development of renewables,
- Develop a sustainable energy action plan (SEAP) in the city.
- Develop partnerships with all of the providers that are favourable to the implementation of the SEAP.
- Reduce energy consumption and GHG emissions by 20% in the Municipality by 2020.
- Inform the public about the true cost of energy and make known the incentives and initiatives that encourage energy conservation and efficiency.
- 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.

- Reduce energy needs during peak periods by managing electricity demand and by changing energy and gas consumption behaviours and habits.
- 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 34%, respectively, of consumption in energy Nablus.
- **Emissions:** Transport, residential and tertiary buildings are the largest emitters of greenhouse gases and account for 63% of Nablus' emissions.
- **Emissions from municipal property:** Water management is the main source of emissions from municipal assets and accounts for approximately 5% 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 16 buildings in different location representing 90,000 square meters of offices (23,172 roof surface). There various other warehouse and technical facilities representing another 15,500 sqm (roof surface).

Municipality buildings consume 11,096 MWh of electricity per year (2014 reference), representing an average consumption of 153 KWh/square meter, and a cost of 1,6 M€/year.

Electricity consumption in municipal buildings is coming from lighting (20%), cooling and heating (75%), office equipment (computer, copiers, etc.), elevator, etc.

Short-term actions

Various actions have already been planned and implemented by NEDCO acting as the “Municipality energy service” since its entry in function in 2010:

- Replacement of old cooling and heating systems by more energy efficient equipment;
- Installation of voltage optimization modules;
- Replacement of all old lighting equipment by LED technology in some parts of the commercial center (to be implemented before end of 2015).

These projects were designed in 2010, to reach significant cut in electricity consumption in the municipality. However, figures show that this consumption has increased over the last years. It will be necessary to monitor more tightly consumption per building to assess where efforts were efficient and where they need to be reinforced.

Additional effort should be done on **lighting inside buildings**. Lighting represents **around 20%** of electricity consumption in municipality buildings. To help reducing energy consumption at the municipality building, beyond effort done to switch lamps to more efficient devices, it would be good to install motion sensors in all offices to turn the lights off during the un-occupied periods. This will reduce the lighting consumption by around 20% to 80% based on the occupancy type of these areas. Various studies demonstrate that a 30% cut could be achieved pretty easily installing “motion sensors” in key areas, with an overall cost of less than 20,000 NIS (4,400€) per 1000sqm and a return on investment in 2 years or less, as cost saving could reach 10,000 NIS/y (2,200€).

More efforts should be done in **raising staff awareness** on simple change of behaviour to develop energy conservation without significant financial investment:

- Opening curtains and window shutters during daytime to avoid artificial lighting.
- Imposing mini/maxi temperature levels in offices: 22°C max in winter 24°C min in summer. Such a rule, when enforced everywhere will result in 20 to 30% cut in electricity from cooling and heating (75% of electricity consumption in office buildings). Additionally, this rule is healthier (as it reduces the gap of temperature between inside and outside) and preserves a good enough comfort in working environment all the year along.
- Avoiding elevator and choosing stairs when going up or down one or two floors.
- Shutting down all electric equipment at end of working time or when such equipment is not actually used.

Long-term actions

In addition, carbon-saving technologies are to be implemented across all municipality buildings, mostly through the use of more energy efficient equipment to be chosen when old ones are replaced.

When old buildings go through a retrofitting program it will be essential to add to the “normal renovation plans” components to improve the overall energy efficiency: insulation to protect inside spaces from cold and heat outside, switching to double-glazing windows or low emitting glass, improving electrical network and promoting centrally controlled temperature, etc.

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 Nablus consumes 6.784 MWh of electricity per year (2014 reference), which represents an overall annual cost of 3.9 Million NSI (Equivalent 865,000 €).

Almost 95% of the urban territory is covered with public lighting system mainly equipped with HPS lamps (250 and 150 watt). The system is controlled with circuit breakers protection, and photocell or timers to manage operating time. Electrical meters are set to register consumption in KWh. The entire system is managed by NEDCO. The company charges a specific fee for this service.

Short-term actions

In 2014, NEDCO already started to replace some of the old high pressure sodium and mercury lamps with LED systems, far more efficient but more expensive to purchase. In total 426 lamps have been replaced allowing a 60% cut in electricity consumption for this road section.

Another project run with the PNA will result in changing another 200 lamps in Haifa street.

It would be good to monitor as precisely as possible reductions in energy consumption due the new devices used. This will help informing the design of the expansion of street lighting upgrading.

Long-term actions

Revolving fund to replace HPS lamps / PRIORITY ACTION #1

Informed by the first experiments performed in Nablus, replacement of old lamps by modern technologies (LED), appears to be very cost effective.

Even if LED lamps cost far more (highest prices reach 400€ per unit) than HPS one, the fact that they result in more than 50% consumption reduction and they last 15 years (when HPS have to be replaced every 3 years) make this technology very cost efficient beyond offering a very good quality of light and being also good for the environment.

The Municipality looks for an initial financial support to feed in a revolving fund dedicated to old lamps replacement. NEDCo managing street lighting, should set up a specific budget monitoring mechanism and put aside financial resources preserved due to more efficient lamps replacing old devices. Resources saved will be invested again in lamp replacement. This set up could ensure full replacement over time (between 4 and 8 years depending on the initial level of investment) offering replenishment of the initial investment fund and additional budget availability due to cuts in the energy bill related to street lighting.

The detailed process for this fund will be established as part of the priority action development.

Street lighting strategic plan

Based on the Master plan produced in 2012 with the support of the EU, it now should be 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 moving 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 a tighter management of public demand, should lead to designing a lighting system combining qualitative lighting and reduced energy consumption. This evolution will require a combination of technical solutions (moving 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.).

2.3. Water delivery

Nablus is suffering from persistent water restriction. Six wells are providing 80 % of the water distributed in Nablus municipality, some springs providing the remaining 20%.

Municipality Water Service ensures delivery of 80 litres / capita / day even if the system doesn't ensure 24/7 supply. Parts of the city only receive water twice a week. The water service pumps water up to the roofs of residential building in reservoirs where water get stored. Such reservoirs, when properly managed, allow people to get permanent availability of potable water.

Due to these constraints, the system consumes a lot of electricity: 27 GWh / year of which, 20 for pumping water from the underground (wells pumps) and 7 are used for the distribution process. All this represents a very high budget for the Municipality: close to 15 Million NIS / year (3,2 M€/year).

The Municipality already engaged in rehabilitating the water networks to reduce water leakage and, as a consequence, save energy (KWF project 20M€).

Short-term actions

With the support of KFW, Nablus already implemented a big project (20M€) to set up a "system pressure zone" allowing significant energy saving from 0,9 to 0,6 KWh/cubic meter.

The Municipality service also promoted new engines for pumps with higher efficiency, variable speed optimization and a SCADA (Supervisory Control And Data Acquisition) system for monitoring and control. In the near future, this system will provide exact figures of energy consumed per year for water delivery.

Ideally, the pumping station could also be equipped with solar PV, covering its electricity consumption. Solar PV would be an adequate solution for the "new model" proposed, as big reservoirs could be easily filled in, during daytime.

Long-term actions

The only significant change that would both improve the quality of delivery and reduce energy consumption could come from a different structure of the water delivery system. This new model would be based on larger tanks placed on the heights of the city, using gravity to distribute water in all buildings. Energy consumption would be then reduced to pumping water up to these tanks.

The main challenge of this option would be the investment cost as the system will require building a big reservoir and installing a new pipes network from existing water sources to the reservoir and from the reservoir to the distribution network. Considering the annual budget consumed by the water distribution system, it is worth looking carefully at the design of the system that could offer a short to mid term pay back.

2.4. Waste water treatment

Sewage treatment consumes also a lot of electricity 2,3 GWh, representing an annual cost of around 1,2 Million NIS (equivalent to 273K€). The sewage system covers 97% of buildings in Nablus, with an overall efficiency of 70 %. The Master plan prepared in year 2006 aims at increasing coverage and efficiency up to 100%, mainly by rehabilitating the existing system.

Wastewater from West Nablus goes to the Western wastewater treatment plant (WWTP) located near Beit Lead junction (12 km out of city boundaries). The plant processes around 9000 cbm/day. After processing the wastewater goes to the green line through Wadi Zeimer.

There is no treatment plant for Nablus East. So far the wastewater goes to Jordan Valley through Wadi Sajour without any treatment. Nablus Municipality signed an agreement with KFW and the EU to establish the Nablus Eastern Waste Water Treatment Plant. The fund (39 million Euro) has been allocated to build a unit similar to the Western one. Expected flow will be 10,000 m3/day.

Action in progress

The construction of a sludge digester unit is on its way at the WWTP (KFW project 2M€). This unit will produce methane and be coupled with an electricity generating plant (0,5M€ investment plan). Generated electricity will cover part of the needs of the wastewater treatment plan. This digester could provide enough biogas to produce 17,880 KWh/day.

Solar PV will also be installed to cover another part of these energy needs. It would be good to have an overall analysis of energy produced from this equipment and assess what will be left for the

Municipality to cover from NEDCO or other sources. According to initial plans, 60% of the WWTP energy needs will be covered from PV and the remaining will come from other sources

Long-term plans

If the Eastern wastewater treatment plant gets equipped with the same type of digester to produce electricity, backed with solar PV, the energy generation from wastewater treatment could be covering all needs of the same service. For this EWWTP the best option would be to set up a digester that could manage both sludge and bio-waste collected in the city area. The amount of gas produced will be more important and could be used for other consumption in the city.

The existing Master plan for rainwater collection system is still waiting for funding. The Water department already started a pilot project by implementing 1000 mm diameter pipes (half a km) in West of Nablus. Even if such a projects doesn't fit in the "energy plan", it is important to keep in mind that the overall performance of the sewage system has a significant impact on the energy consumed and/or produced by the waste water treatment plant.

Additionally, if the Municipality would develop a specific system for rainwater, this network could be equipped with micro turbine to produce electricity from the water flow. At least, this option should be explored.

2.5. Solid waste management

The Nablus municipality solid waste department is responsible for solid waste collection in the city. The UNRWA relief and works agency is responsible for collection of solid waste within the borders of the Refugee camps: Askar old and new camps, Blata camp, AL Ein camp (representing all together a total population of 35.000 people). The JSC (Joint service council) is responsible for collecting the solid waste within the borders of the villages. The total population served by JSC is 35.700, which represent 18% of the total served population.

All in all, the Municipality service collects 200 tons per day (around 1 kg per capita / per day / in the main city). Waste is transferred to landfill. The municipality manages around 15 vehicles for this service: 8 compactors (8 tons) + 7 containers + small trucks for the old city + 1 medical waste transport unit + 1 green waste transport unit + 1 big truck for transfer. All trucks are very old and would need to be replaced by more efficient vehicles.

Short-term actions

Strengthen **public awareness** to reduce waste generation, promote recycling and separation (specific project to be developed in schools). The idea would be to develop a pilot with families starting to sorting waste and demonstrating the overall benefit for the entire city. The production of compost from bio waste could then be used in neighboring farms, generating revenues for families engaged in bio waste collection and compost production.

Long-term actions

Develop **separate collection of bio waste** to produce biogas. The high proportion of bio-waste represents a resource to be used for energy production. Separating bio-waste will have a double impact: biogas generation and reduction of treatment cost for the remaining part of waste. A sophisticated sorting system could also result in separating three streams:

- Bio waste
- Recyclable materials: paper and cardboards; glass; steel; plastics (PET, PVC) ...
- Non-recyclable material to be used as fuel in specific furnace or to be sent to landfill.

The development of bio waste separate collection should be connected to the bio-digester project to be implemented as part of the Eastern Waste Water Treatment Plant.

Organic waste processing in a bio-digester

A project is currently under design to set up a bio-digester. This unit would process part of the organic fraction of Municipal solid waste (4800 t/year) and vegetal residues to be collected in the city (130t/y) added with digested liquid fraction coming from the waste water treatment plant. This unit would be able to offer a net electricity production reaching 805MWh/y and a net heat production reaching 740 MWh/y. This unit would also produce 7,7 t/day of compost and 9,1 t/day of liquid fertilizer, both very useful to support agriculture in the suburbs.

2.6. Other services and long-term responsibilities

Municipal fleet

The Municipality run its own fleet of vehicles, which are also generating GHG emission.

To reduce these emissions and save energy few options can be develop:

- Tighter monitoring of the fleet in used
 - o To ensure that actual use is in line with the purpose of the Municipal fleet
 - o To optimize this use based on accumulated experience
- Drivers training to adopt eco-efficient driving behaviour (improving ones driving patterns might result in 10 to 20% consumption cut)

In the longer term, old vehicles should be progressively replaced by low emitting ones (either gas powered vehicles or electric ones when electricity can be provided by renewable sources).

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.

The Nablus Municipality through few tenders (e.g. for water pumps) already considered criteria regarding energy savings allowed, as the main issue for awarding the purchased equipment.

Sustainable urban planning

The Municipal Council, by defining how urban development will shape, has a very important role to play on long term climate and energy performance of the entire city.

A dense city, where services are easily reachable; and where people can live close to where they work will result in decreasing mobility demand, meaning less cars, less traffic congestion, less GHG emissions... On the contrary linear extension along the entry roads will impose long commuting distance between living places and working places or services...

Nablus already adopted a strategic development plan. It would be good to check how this plan will help reducing energy consumption or not.

So far it appears that the main center is pretty dense, but that other parts of the city shows many empty space that could be used for new buildings, instead of expanding construction far away from the center. The lack of density is even more problematic as Nablus is surrounded by high hills, which make any travel in the city more complicated.

This 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, which will be organized to cope as closely as possible 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 knowledge in terms of technical expertise (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.

In Nablus, the establishment of NEDCO was a good incentive to develop skills among staff as the technical requirements and functions were pretty new. However, there is room for improvement to allow more senior staff (from NEDCO or from the Municipality) to provide support to their colleagues and to stakeholders in the city area, in order to promote a work culture focusing on efficiency in resources usage and considering energy as a strategic resource to be preserved and produced locally from available renewable sources.

2.7. Awareness campaign

It is not only good to raise awareness among Municipality staff for them to make necessary efforts to promote energy conservation in their daily work, it would be also good to develop the Municipality capacity to promote awareness among stakeholders in Nablus.

Already in 2008, Nablus municipality through the technical team in electricity department started programs for public awareness, targeting school students in the age of 10 to 14, and charity women institutions. Since 2010, the same type of programme continues through NEDCO with different methods depending on learning tools (story, puzzle, gifts, etc.) to spread energy conservation and energy efficiency methods and recommendations.

However, the Municipality staff considers it is now necessary to duplicate efforts towards raising awareness of all stakeholders in the city.

Action

Setting up a public awareness unit/ PRIORITY ACTION# 2

In order to develop more initiatives to raise public awareness and promote behavioural changes from all stakeholders, the Municipality plans to set up a specific “public awareness unit” dedicated to energy and climate.

This unit will be located in the Public relation department of the Municipality and will gather staff from other units and from NEDCo, under the leadership of engineer Amal Hudhud currently in charge of urban planning and environmental service at Nablus Municipality.

This unit will develop its activities, elaborating from past experiences of NEDCo or the Water department of the Municipality.

The unit will mobilize local NGOs, women’ groups, religious leaders, schools, and opinion leaders to spread the words towards a larger audience.

The unit plans to start developing awareness among local authority staff (in Municipality and NEDCo) as it is essential that these public services would be the first groups to change their behaviour and be examples for change in front of the public at large.

One of the first tasks of the unit, will be to establish a strategic road map to raise awareness among all stakeholders in Nablus. Without anticipating on what will be this road map, some options can be mentioned as first ideas to be explored to start developing awareness:

- Spreading **training material** (posters, brochures, stickers, etc.) to remind everyone of the importance of energy saving
- Develop an annual “**Energy festival**” 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
 - o Developing a network of “**Positive energy schools**” that would be produce more energy than they actual consume, though a combination of energy conservation / energy efficiency measure and the development of Solar PV on schools roofs to generate electricity. Teachers should be engaged in such programmes to use all the potential of the technical develop as support for training of students.
This also could be developed in the University engaging students to drive the programme and use it as research and development exercise that would also help them developing specific skills.
 - o 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 Nablus’ urban area

3.1. Residential and tertiary buildings

The residential and tertiary building sector is the first one in terms of energy consumption (47% with 329 GWh/year) and GHG emission (39% with 154 ktCO₂eq/year). It is though an important subject of concern for the Municipality council.

About 70 to 80% of the existing houses and apartment are dependent on electricity as the source for heating and cooling. The electricity used is purchased from the IEC, which offers rather poor performance regarding CO₂ content per kWh. During winter, electricity consumption goes up by 20 to 25%, due to increasing demand for heating, imposing additional imports from Israel. The same situation occurs at peak of heat in summer time, like the one the city experienced in August 2015.

Note that electricity demand is growing very fast (10% in 2013 compared to 2012), a much higher rate than what can be observed in stable industrialised countries.

Solar heating (for water) is widely spread in Nablus: around 90% of dwellers are equipped with such devices (compare to 64% in West Bank).

About 39% households are using diesel or kerosene for heating, liquid gas been mainly used for cooking. Poor families representing 7% are using firewood, peat and charcoal for heating.

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.

On electricity NEDCO already made significant progress in promoting prepaid meter that significantly reduce electricity smuggling and set the ground for prospective approach to promote energy conservation and efficiency. Obviously when people don't pay electricity they get no incentive to reduce their consumption. As they start paying the "real price" they get a growing motivation to reduce their 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. This awareness campaign will be the key task of the Awareness unit to be set up at Nablus Municipality.

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 electricity 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 tacking into account the higher level of energy consumption, which results in a higher "global cost" over a certain period of time.

Long-term actions

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

A revitalization plan of the old city already exists. About 100 houses in a cluster were restored funded by a welfare association. It would be good to understand what was the energy saving allowed by this programme, in order to learn all lessons possible.

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 though detailed mapping of housing registering average consumption, date of construction, location...
- Train small local companies, which will have the flexibility to work in different type of condition while performing adequate refurbishment 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 refurbishment programme).
- Promote refurbishment programme to selected target offering the best potential in return on investment and, elaborating on these showcases further deploy the plan.

The Municipality should work on promoting **energy high-performance rules** for any new building to be constructed.

3.2. Transport

Transport is one of the key concerns to be addressed, as this sector is both a significant domain of energy consumption and the second GHG emitter (24% with 94.600 tons CO2 equivalent / year).

Public modes of transport	30 %	Public Buses	126 units
		Public Cars	2,500
Private modes of transport	70 %	Private Buses	101
		Private cars	17,996
		Motor bikes	39
		More or less every family has a car.	

Actions already planned

The Municipality already designed a “Strategic plan for transportation” taking into account the public demand for mobility, the geographical constraints (hills around the city, Israeli check points). This plan identified equipment to be developed, on top of building the two new terminals. Some infrastructures are to be built by the Municipality, but other still wait for funding:

- Traffic bridge in Faisal Street
- Pedestrian Bridge near Al-Watani Hospital
- Intelligent Traffic System (ITS) to improve traffic management. This project is a vital project for reducing energy consumption from traffic. Funds are still required for it.
- Traffic tunnel near the main intersection at the border of the CBD to enhance the capacity of the main street (Haifa street) that connects to Faisal street (funds still required).

Urban mobility master plan/ PRIORITY ACTION #3

Ideally a city committed to reduced energy consumption and GHG emission would design and implement a Sustainable Urban Mobility Plan (SUMP). Such a comprehensive plan would require a strong leadership from the Municipality Council. As Nablus Municipality is highly committed to improve traffic in the city to reduce GHG emissions and air pollution while improving traffic and quality of life, the authority decided to run a comprehensive study on mobility as one of its priorities.

This study would elaborate from the existing “Strategic plan for transportation” and could entail the following components:

- Integrating transport and city planning policies, while prioritizing public transportation and active modes of mobility for people, and 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 and around the city. In the case of Palestine, this would mean a closer collaboration between the Municipality council and the Ministry of Transport.
- Supporting the development and improvement of integrated public transport systems to make them more attractive to local inhabitants.
- Developing incentives as well as regulation measures in order to control the use of private motor vehicles and to make other modes a more attractive choice.
- Promoting active modes of transport, especially walking and cycling, in particular by providing safer conditions for the users.
- Implementing a common methodology to measure GHG emissions, report on them and monitor all other benefits deriving from the development of sustainable urban mobility.
- Promoting cooperation among local governments, creating partnerships to share experiences and good practices and to organize technical cooperation on sustainable urban mobility policies.

The study should result in a comprehensive road map to drive investment and priorities in infrastructures, in awareness initiatives and cross sectorial activities to reduce the demand for transports – both for people and goods - and to improve the overall quality of transport services.

3.3. Industry

There are only few industries in Nablus and most of this industrial activity is coming from small businesses, shops and warehouse (carpenters, furniture production, tile production, stone quarrying,

textile, leather tanning, and traditional sweets). None of these industries can be define as energy intensive or high emitters. However most of these production units are located, close to or embedded inside residential areas, generating nuisances for neighbors

The industry is a rather “small” contributor in energy consumption (with 8% or 59 GWh/year) and in GHG emissions (with 8% and 32 ktCO₂eq/year).

The business sector is not really concerned with any energy saving strategy and it is not easy for the Municipality services to engage with this sector.

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 Nablus, in order to build an action plan on a robust analysis of the sector.
- Raise **awareness** among business owner 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.

Long-term actions

The municipality in its strategic plan for 2017 defined as a priority the East Industrial Zone establishment, allocating an area of 1.5 square km, which represents 5% of Nablus total area.

The Master plan (awaiting for funds) has been designed to move the scattered industries to this new East industrial zone and invite new ones to come. This move also includes all stone quarries to be transferred from West to the new East zone. The site is expected to start working in 2016.

This move should help defining synergies that could help **reducing energy consumption** through **mutualisation of equipment and services**:

- Organization of joint transportation of raw material
- Common management of heavy equipment using energy (and investing in more efficient solutions)

Mutualisation of services could extend also to waste management.

- Setting a platform for industrial waste sorting and recycling all recyclable material.
- Organizing proper management of toxic wastes and wastewater from leather tanning and stonecutters.

It is important while setting up this new industrial area to **define** what would be the **energy needs** and how a part of it (or all of it) could be **supplied from renewable sources**. For example, the development of the site could come with the deployment of large solar PV production all around the area to demonstrate the technical and economical viability of such solutions.

3.4. Agriculture and forestry

In low range, there are still few green areas populated with are old pine trees (26,000m²). However most of this urban forest vanished during the last years. Nowadays, forest is strictly protected and cutting any tree is forbidden.

Agricultural land represents 31.5% of the total Nablus area, from which 8.4% is irrigated land. Agriculture is in area B. Surfaces are very small (around 300 m² / capita).

Main productions are the following:

- Olive 1485 acres with a total of 37125 olive trees
- Almond 86 acres – about 3440 trees
- Figs 22 acres – about 440 trees
- Grips 37 acres – about 2590 trees

Energy consumption from the agriculture is due to pumping water for irrigation (20,000 m³/ year) and fuel for agriculture equipment.

Agricultural produces around 100 tons of green waste per year. So far, green waste isn't used, neither for energy, nor for compost.

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 transfer it to the bio-digester that could be developed in the Eastern Wastewater Treatment Plant.

4. Results of actions 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 detailed, the implementation of the action plan will enable the municipality 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 493,814 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.

CES-MED



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 Conservation 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 PNA.

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 Conservation 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 CO₂ 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.

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.
- 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 N° 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, N° 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 Licenced 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.

One of the issues 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 from 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 sectors 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 taking place to provide technical support and training. For example, the AFD mobilized expertise from INES – National Institute on Solar Energy in France – to provide technical guidance and training to Municipalities and companies willing to develop solar energy.

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.

1. 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.
2. Include energy consumption reduction and renewable energy development in the city's development vision.
3. Utilize energy cost-benefit analyses in on-going and future projects.
4. 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.
5. Partnerships: encourage individual, private sector, NGO participation in the development and management of energy resources and renewables in the municipality,
6. 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. Mobilisation 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 behaviours 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 to:

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 create a sustainable energy activity unit. The unit will be in charge of all municipal energy related questions. This unit is directly connected 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 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 für 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 World 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 World Bank's recently created Trust Fund programme, a funding assistance mechanism for the Palestinian Territories. The European Union, along with the World 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 of 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 gauge 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

1.1. 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 tCO₂eq/year
- Palestine GHG emissions in 2010: 4,15 million tCO₂eq/year
- Palestine GHG emissions per capita: **1,0 tCO₂eq/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 tCO₂eq/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 tCO₂eq/capita/year, we observe that emissions of Palestinian citizens are already far lower than the target (3.5 tCO₂eq/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.

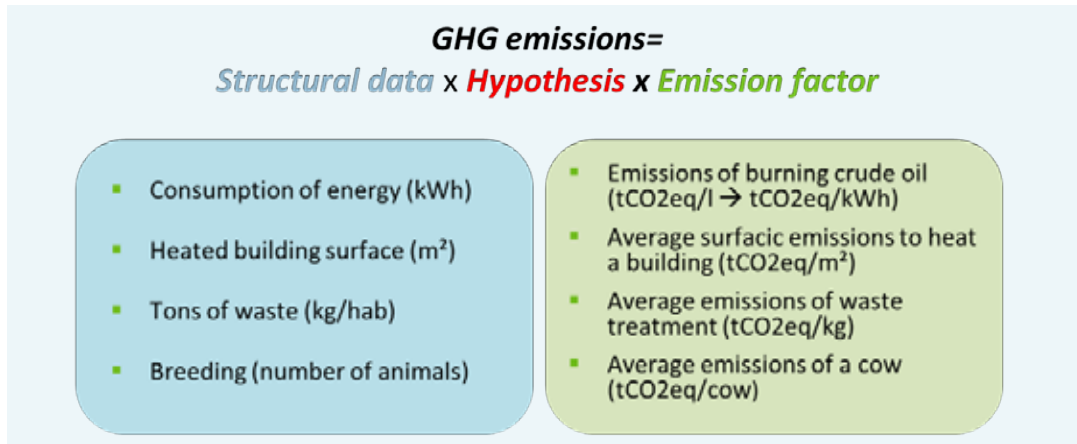
1.2. Methodological principles of the inventory

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.

1.3. 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).



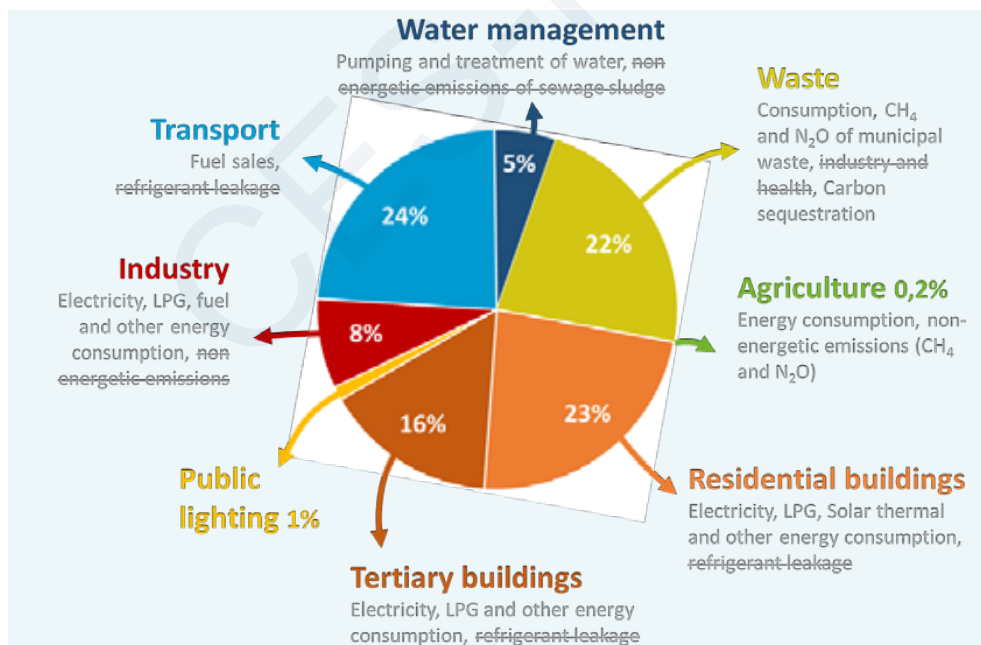
Calculation principle of the inventory

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

1.4. 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:



Considered themes in BEI (%tCO₂eq/an) – Nablus city 2014

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 Nablus, according to what has been described in the last chapter. This part explains details on the methodology used to build the first Nablus 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-Nablus-v10* is the best way to understand very precisely the methodology and sources used.

2.1 Common data sets

2.1.1. Population statistics

Population statistics have been downloaded directly from PCBS website for the city¹ and Palestine². PCBS estimation are based on the 2007 national census using an annual growth index. In Nablus, the municipality wished to correct this value for 2014 using their own estimation. 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
<i>Nablus city and camp</i>								
PCBS Estimation	124 780	127 699	130 676	133 715	136 823	140 009	143 235	146 493
Municipality data	124 780	-	-	-	-	-	-	192 000
Nablus Governorate	317 391	324 816	332 389	340 117	348 023	356 129	364 333	372 620
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 localities governed by Nablus municipality services is **192 000 inhabitants**. The only value that can be compared to governorate data is the PCBS estimation, thus we will consider that about 39.3% of the governorate population lives in Nablus city and camps.

2.1.2. 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.

¹ Localities in Nablus Governorate by Type of Locality and Population Estimates 2007-2016, PCBS, 2007

² Estimated Population in the Palestinian Territory Mid-Year by Governorate 1997-2016, PCBS, 2007

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 Statistical Yearbooks³. 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 and quarrying	Manufacturing	Construction	Total
Nablus (2009)	City	nd	nd	nd	25 327
	Governorate	321	9 393	808	38 524
Palestine (2007)		1 851	62 832	4 557	296 965
Palestine (2012)		1 796	74 667	5 530	384 778

2.1.3. Energy demand in Palestine per sector and type of energy

One of the key reports used for producing these BEI is the Energy Balance report published by the PCBS for 2008⁴. 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 Nablus, we built such a ratio using the following formula:

$$\text{Ratio} = \text{LPG Pal 2008} / \text{Pop Pal 2008} = 28.5 \text{ kg/capita/year}$$

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

³ Nablus Governorate Statistical Yearbook n°3, PCBS, August 2011

⁴ Energy Balance in the Palestinian Territory 2008, PCBS, December 2009

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

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

2.1.4. Emissions factors of energy consumption (IPCC, UNFCCC)

Emission factor for energy combustion used in the BEI to convert consumption in GHG emission come from IPCC Guidelines 2006⁵, 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 CO₂ (Carbon dioxide), N₂O (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 publication⁶.

For electricity, the emission factor is the one provided by the GHG Protocol, via a tool to calculate GHG emissions of purchased electricity⁷. 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 gCO ₂ eq/kWh	Upstream gCO ₂ eq/kWh	Global gCO ₂ eq/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

1. 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 Nablus.

For all energies, the municipality has provided yearly energy consumption. Some values seemed consistent compared to household energy surveys conducted by PCBS, some were 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	100,4 GWh/y	Consistent value	100,4 GWh/y
Liquid gas	10 000 t/y	Not consistent, estimated using national ratio	69 GWh/y
Diesel and gasoline	53 million litres/y		2,1 GWh/y
Solar energy	62%	Average consumption per household	65 GWh/y

Solar thermal energy consumption has been estimated using the percentage of households using a solar heater (provided by municipality), multiplied by the population in Nablus in 2014, which is then multiplied by an average energy consumption ratio per capita using a solar heater (built from PCBS

⁵ IPCC 2006 Guidelines for National Greenhouse Gas Inventories (Chapter 2-3), IPCC, 2006

⁶ Methodological tool "Upstream leakage emissions associated with fossil fuel use" version 1, UNFCCC, 2006

⁷ GHG emissions from purchased electricity calculation tool, Greenhouse Gas Protocol, December 2014

report on Energy Demand and the percentage of households using a solar heater in Palestine in 2008).

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

2. 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.

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

	Consumption
All municipality buildings (in schools, mosqs)	11 096 MWh/year
Street lighting	6 784 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	69 950 MWh/y	Consistent, kept	69 950 MWh/y
Liquid gas	Not provided	National ratio per capita	9 300 MWh/y
Diesel and gasoline	Not provided		1 400 MWh/y
Other	Not provided		350 MWh/y

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

3. Industry

Except for electricity, which consumption was directly provided, an estimation was made.

	Value provided	Method	Final value
Electricity	32 000 GWh/y	Consistent	32 000 MWh/y
Liquid gas	Not provided	National Ratio per capita	7 500 MWh/y
Diesel and gasoline	Not provided		18 700 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** using PCBS report on Energy Demand 2008 for each energy (electricity, LPG, Diesel, gasoline, wood and charcoal, kerosene) and each sector (mining and quarrying, manufacturing industries, construction). After that, a percentage of that district consumption is charged to the city using the percentage of total employed of the governorate that are in the city.

Energy consumption for manufacturing industries is 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.

4. Transport

Municipal fleet fuel consumption (diesel, gasoline) was given by the municipality and are all judged consistent, although high compared to Hebron (twice more for smaller population) and Tulkarem.

	Volume	Consumption
Gasoline	8 000 litres/year	70 MWh/year
Diesel	425 000 litres/year	4 000 MWh/year

The Ministry of Finance of Palestine has given information on fuel sales at district scale in 2014. Since Nablus city and camps contains 39.3% of the governorate population (cf. *Population statistics*) the same ratio is applied to fuel consumption for transport.

	District consumption	City estimation
Gasoline	25 540 000 litres/y	189 200 MWh/y
Diesel	58 680 000 litres/y	89 100 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.

5. Waste management

Diesel consumption for waste treatment and transport has been provided and judged consistent. Municipality services provided the amount of waste collected: 185 tons/day, about 65 500 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 report⁸.

	% 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 landfilled⁸, but in Nablus, 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 RECORD⁹ Institute, and selected in the Bilan Carbone method.

	CH ₄ leakage kg eqC/t	CO ₂ Sequestration 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 in the BEI, since they appear in rural areas.

6. Water management

Electricity consumption for water management is provided by the dedicated municipality service and is very high compared to other cities: 30.2 GWh/y in 2014, which is about 5 kWh/m³. It comprises pumping, production and wastewater treatment. This astonishing value is caused by an increased need to pump water higher in the city, and was confirmed by multiple sources.

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.

⁸ Country report on the solid waste management in Occupied Palestinian Territories, SWEEPNET, 2014

⁹ Application de la méthode « bilan carbone[®] » aux activités de gestion des déchets, RECORD, 2008

7. Agriculture

From the Agricultural Census 2010 at city 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:

- 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 that is applied per ha of crops.
- For non-energetic CH₄ emissions: Emission factors are directly taken from the national inventory of emissions¹⁰ or estimated from it, and applied to local number of animals.

	Number of animals	<i>in kgCH₄/animal/y</i>	
		Manure management	Enteric fermentation
Other cattle	312	1	31
Sheep	1 769	0	5
Goats	1 132	0	5
Camels	22	2	46
Horses	29	2	18
Mules and Asses	28	1	10
Poultry	2 643	0	0

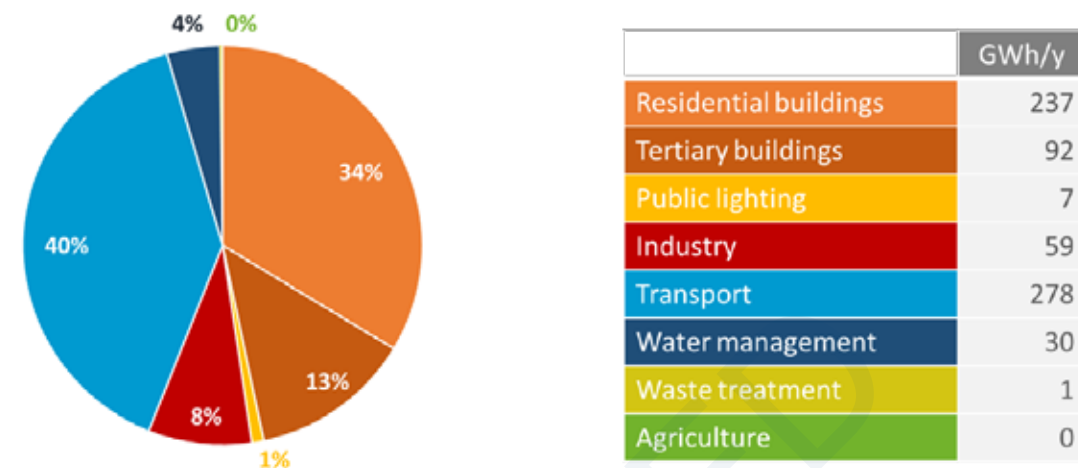
- For non-energetic N₂O emissions: A ratio of N₂O emissions per dunum of crops is built from the national inventory of emissions¹⁰ to estimate N₂O due to artificial fertilization, crop residues and pasture. It is applied to the **2 140 dunums** of crops in Nablus, around 214 ha.

¹⁰ Green House Gas Emissions 2010 (Methodological Report), PCBS, August 2012

3. Results

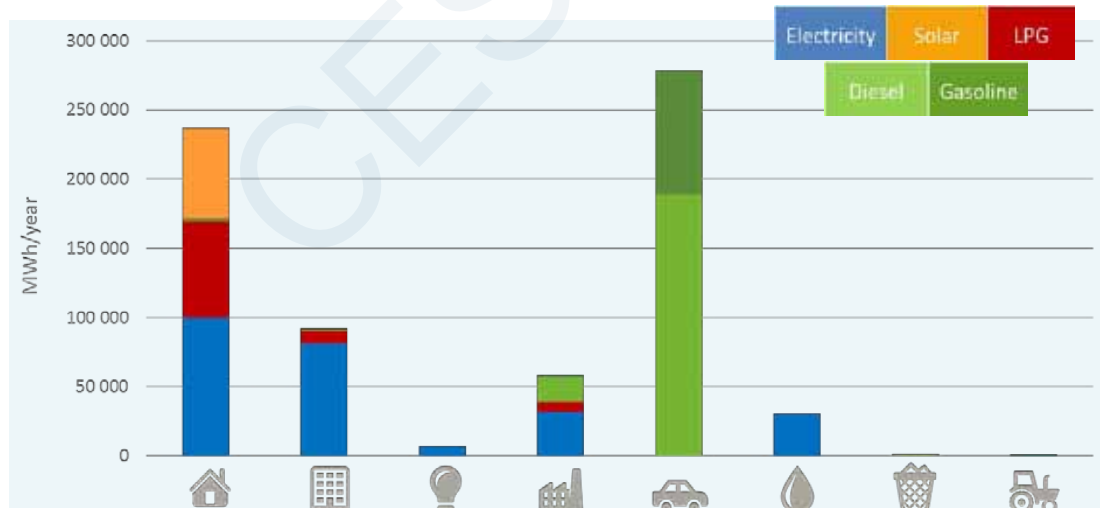
3.1. Energy consumption

The total energy consumption on Nablus city perimeter is estimated to be **705 GWh FE/year** in 2014, which corresponds to about **3.67 MWh/person/year** (equivalent to 2.3 barrel of oil per year per person). The following table and pie chart shows its distribution among branches:



Energy consumption in Nablus (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 two third of the household's electricity consumption. If all water were heated with 65 GWh of electricity instead of solar energy, it would increase residential GHG emissions by 52%.



Energy consumption per sector and energy in Nablus (2014)

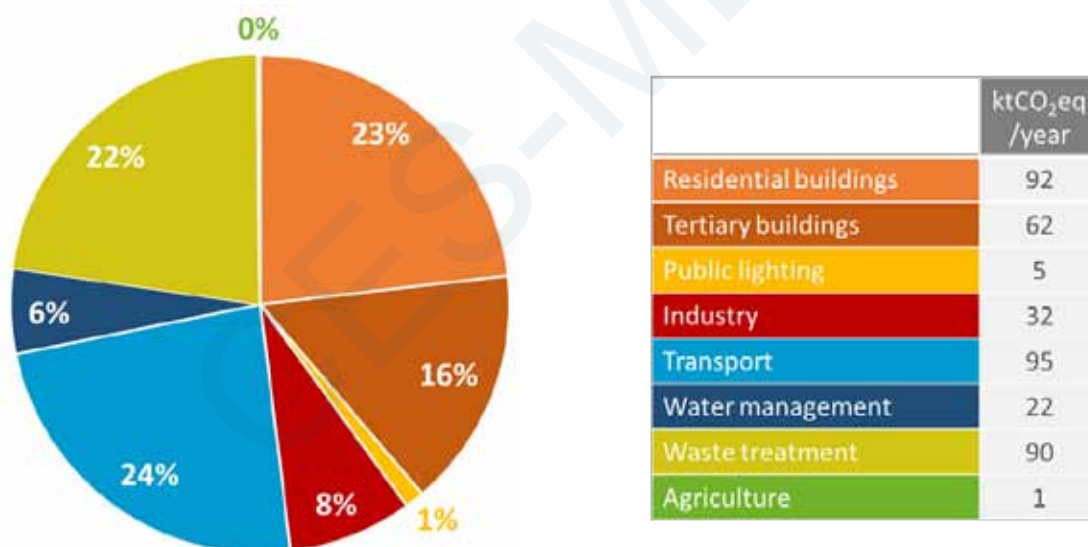
Residential buildings	100,4	65,4	69,4	2,1	0,0	237,2
Tertiary buildings	81,1	0,0	9,3	1,4	0,3	92,2
Public lighting	6,8	0,0	0,0	0,0	0,0	6,8
Industry	32,0	0,0	7,5	18,7	0,9	59,1
Transport	0,0	0,0	0,0	278,3	0,0	278,3
Water management	30,2	0,0	0,0	0,0	0,0	30,2
Waste	0,0	0,0	0,0	1,4	0,0	1,4
Agriculture	0,1	0,0	0,0	0,1	0,0	0,1
Total	250,5	65,4	86,2	302,1	1,2	705,4

Table of energy consumption per sector and per energy in Nablus (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).

3.2. GHG emissions

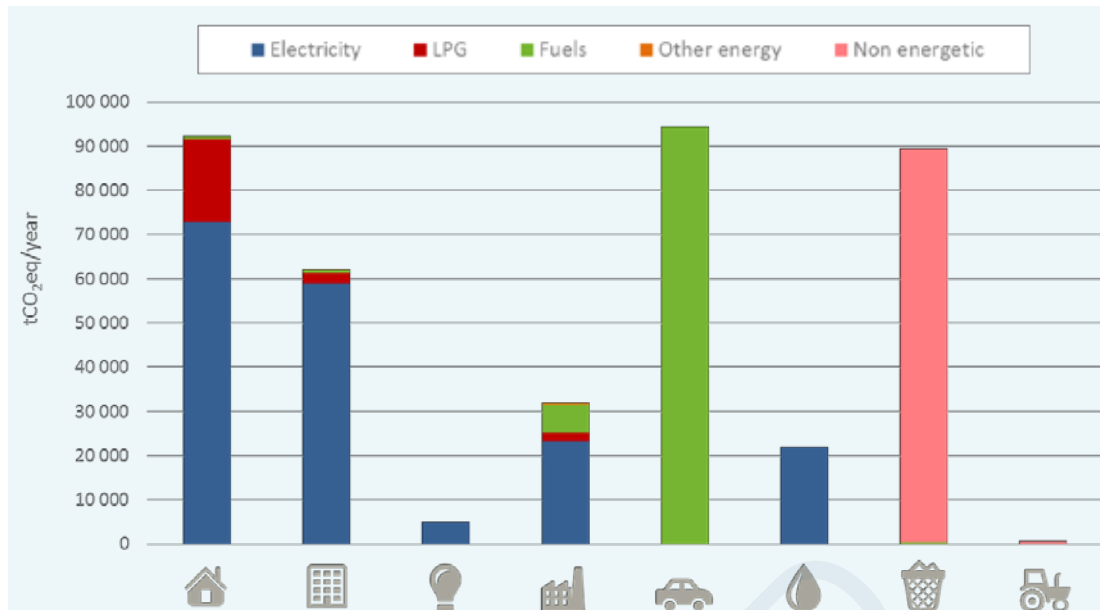
Global GHG emissions of Nablus city are estimated to be **398 ktCO₂eq/year** in 2014, which corresponds to about **2.07 tCO₂eq/person/year** (equivalent to 10000 km drive by car). This is significantly higher than average emissions per person in Palestine (1.0 tCO₂eq/person/year), which is due to two 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).



GHG emissions in Nablus (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 gCO₂eq/kWh (GHG Protocol).



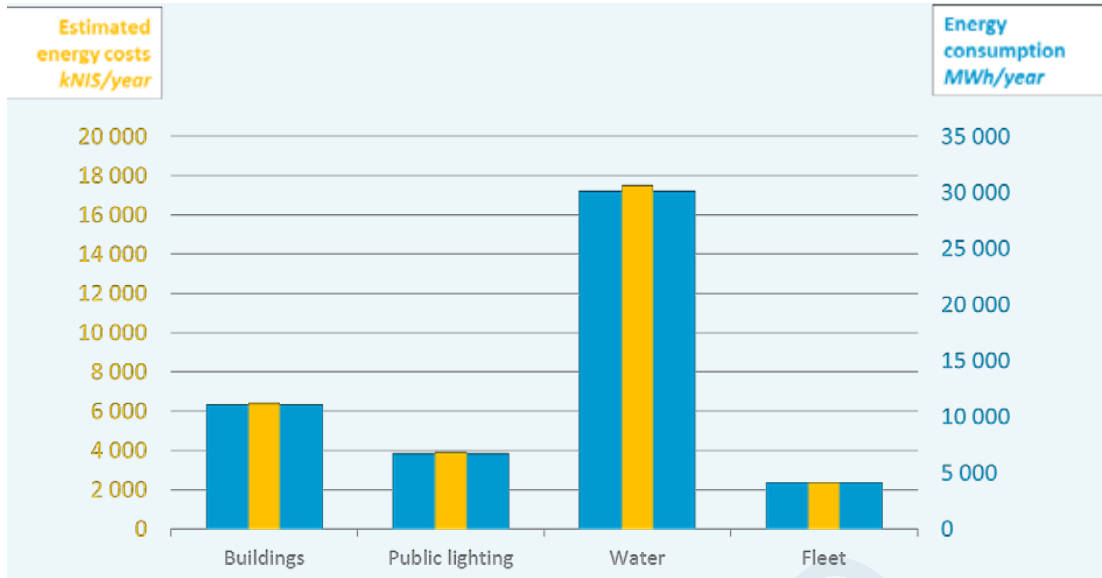
GHG emissions per sector and per energy in Nablus (2014)

ktCO2eq/year	Electricity	LPG	Fuels	Other energies	Non energetic	Total
Residential buildings	73,0	18,7	0,7	0,0	0,0	92,3
Tertiary buildings	58,9	2,5	0,5	0,1	0,0	62,1
Public lighting	4,9	0,0	0,0	0,0	0,0	4,9
Industry	23,3	2,0	6,4	0,3	0,0	32,0
Transport	0,0	0,0	94,6	0,0	0,0	94,6
Water management	22,0	0,0	0,0	0,0	0,0	22,0
Waste	0,0	0,0	0,5	0,0	89,1	89,6
Agriculture	0,1	0,0	0,0	0,0	0,7	0,8
Total	182,1	23,2	102,7	0,5	89,8	398,2

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

3.3. Zoom on municipal assets

The energy consumption of Nablus municipality belongings (buildings, public lighting, water management and fleet) is **52 GWh FE/year**, about 7% of the total consumption of the city. This is much higher than other cities (between 1 and 2% of the city consumption) and can be explained by a very high electricity need for pumping water. 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).

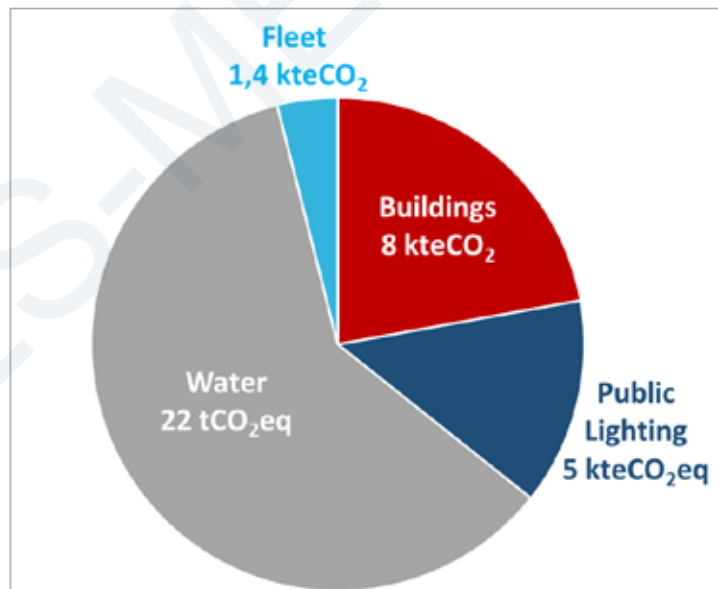


Energy consumption of municipal assets in Nablus (2014)

Total GHG emissions (without waste treatment) are **36.4 ktCO₂eq/year**, about 9% of all city emissions.

Water management is the main source of emissions of the municipality assets, but also in terms of energy costs and consumption, about 5% of the global city emissions. This can be explained by an important need for pumping water to consumers.

Distribution of GHG emissions of Nablus municipality services (2014)



	Consumption MWh/year	Costs kNIS/year	GHG emissions tCO ₂ eq/year
Municipal buildings	11 100	6 400	8 070
Public lighting	6 800	3 900	4 930
Water management	30 200	17 500	21 970
Municipal fleet	4 100	2 350	1 440

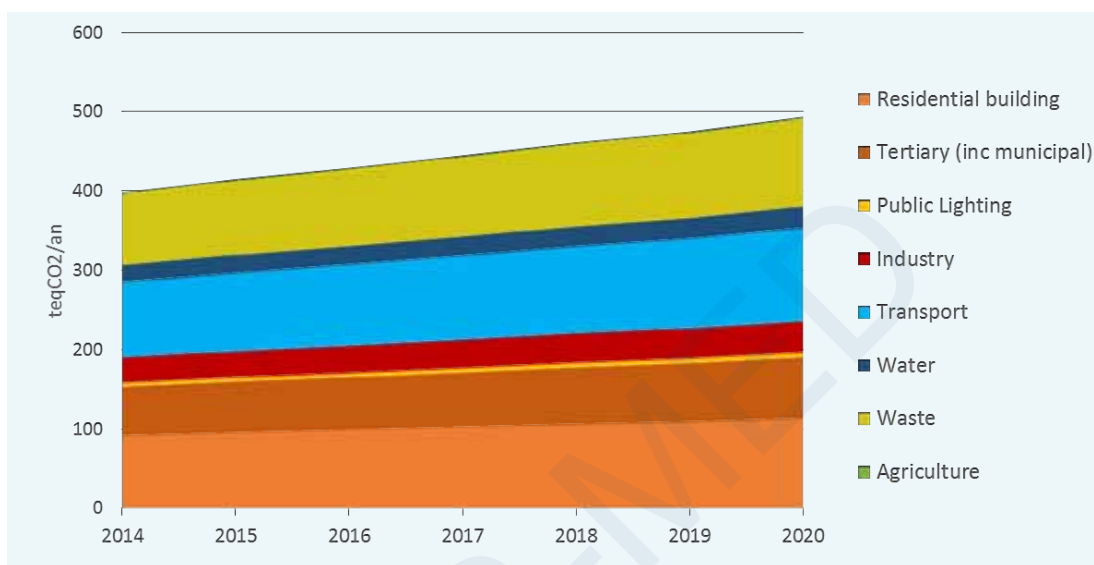
Consumption, costs and GHG emissions of municipal assets in Nablus (2014)

3.4. Business-as-usual scenario

Information isn't consistent enough in Palestine to create a BAU¹¹ 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 Nablus.

	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



BAU trend scenario for Nablus GHG emissions 2014-2020

¹¹ 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	Tertiary buildings	69 967	9 312	1 169	264	178	171		81 061
	Residential buildings	100 365	69 397	806	1 300			65 375	237 243
	Industry	32 015	7 481	16 943	1 771	288	586		59 084
	Agriculture	69	6	59	2	7	2		145
	Transport			185 173	89 047				274 219
	Total	202 416	86 196	204 149	92 384	473	759	65 375	651 753
Municipal assets	Municipal buildings	11 096							11 096
	Public lighting	6 784							6 784
	Waste			1 430					1 430
	Water	30 223							30 223
	Municipal Fleet			4 053	72				4 125
	Total	48 103	0	5 483	72	0	0	0	53 658
Total	250 519	86 196	209 632	92 456	473	759	65 375	705 411	

GHG emissions in tCO₂eq/year in 2014

		Electricity	Liquid gas	Diesel	Gasoline	Coal	Other fossil fuel	Non energetic	Total
Non municipal	Tertiary buildings	50 866	2 503	406	83	79	58		53 995
	Residential buildings	72 965	18 651	280	409				92 305
	Industry	23 275	2 007	5 877	556	129	197		32 041
	Agriculture	50	2	20	1	7	2	713	794
	Transport			64 902	28 222				93 124
	Total	147 156	23 163	71 486	29 271	215	256	713	272 259
Municipal assets	Municipal buildings	8 067							8 067
	Public lighting	4 932							4 932
	Waste			497				89 066	89 563
	Water	21 972							21 972
	Municipal Fleet			1 420	23				1 443
	Total	34 971	0	1 917	23	0	0	89 066	125 977
Total	182 127	23 163	73 403	29 294	215	256	89 779	398 237	

Section IV: Sustainable energy action plan (planned actions)

The document is structured in four parts

- **Background information** – Very brief overview of basic information of Nablus city
- **Municipality building and services** – Presentation of activities that fall under the direct responsibility of the Municipal council (the buildings it manages and the services it implements as part of its core competencies)
- **Action plan on Nablus area** – Presentation of activities that can be run by stakeholders independently from the Municipality, but that need a to be stimulated and steered by Municipal 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 develop renewable energy production

1. Background information

Overall population	190,000 (2012)		
Municipality area	29 km ²		
Electricity consumption	250 GWh / year	Electricity per capita	1,302 KWh / year
Energy consumption	705 GWh / year	Energy per capita	3,672 KWh / year
GHG emission	398 KTon eqCO ₂ /y	GHG per capita	2,07 Ton eqCO ₂ /y

Mayor: Samee R.A. Tuballa

The history and culture of Nablus are characterized by continuity, diversity, and uniqueness. The city benefits from a 2,000-year history during the course of which it earned its title the “Uncrowned Queen of Palestine”, which refers to its strategic geographical location and the beautiful nature of its surroundings. Nablus was and continues to be one of the most important economic centers in Palestine. With regard to the local economy, agriculture was the major component. Yet, in Nablus there are still unique traditional industries that continue to operate, including the production of soap, olive oil, and handicrafts. Other industries include furniture production, tile production, stone quarrying, textile manufacturing and leather tanning.

2. Municipal vision

The Municipality of Nablus developed a strategic road map for 2012-2015 based on the inspiring vision of a city described as a, “*capital of economy, incubator of education, symbol of steadfastness, and address of authenticity*”.

The strategic plan points to some issues concerning the energy sector, such as the “inadequacy of transportation and road safety infrastructure” and the necessary improvement of water management. However, energy consumption and supply are not directly addressed in the strategic plan, which makes the Sustainable Energy Action Plan to be developed under CES-MED an even more important piece to strengthen the urban strategy.

Currently, Nablus City and the Municipal Council want to seriously address climate change, which has become a global issue in recent years. Nablus aims to lead the way in designing and applying new energy generation and consumption models.

The Municipal vision will be achieved by working towards five strategic objectives:

- Improving and promoting energy efficiency,
- Increasing the amount of energy produced from sustainable and renewable sources,
- Promoting sustainable construction and projects,
- Engaging and inspiring the community to meet the challenges of climate change; and
- Adapting to and managing the effects of climate change.

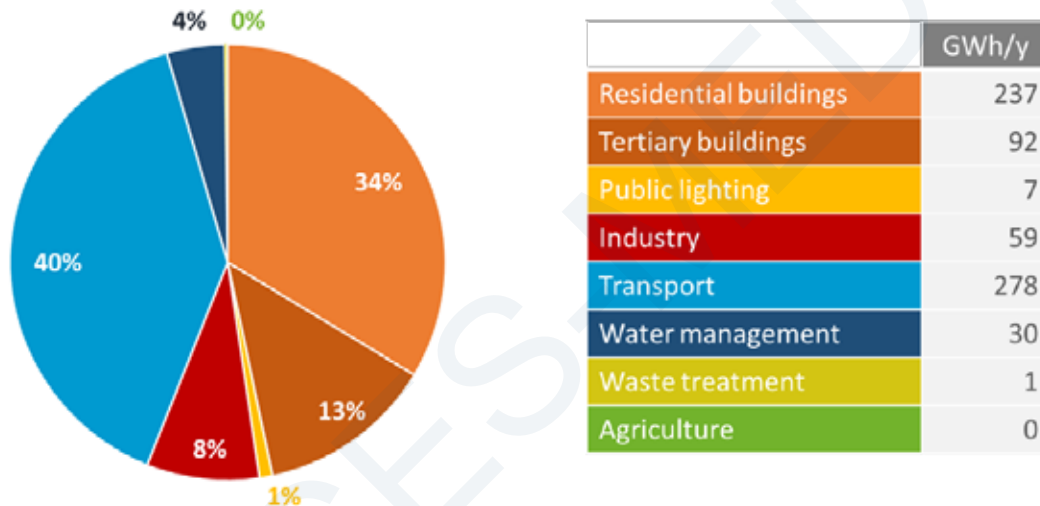
Nablus Municipality plans to work on two different scopes:

- Municipality buildings and services, directly controlled by the Municipality Council
- All activities in Nablus area, engaging will all stakeholders to support them in their efforts to reduce energy consumption and renewable energy production.

3. Summary of the Baseline emissions inventory

3.1. Energy consumption

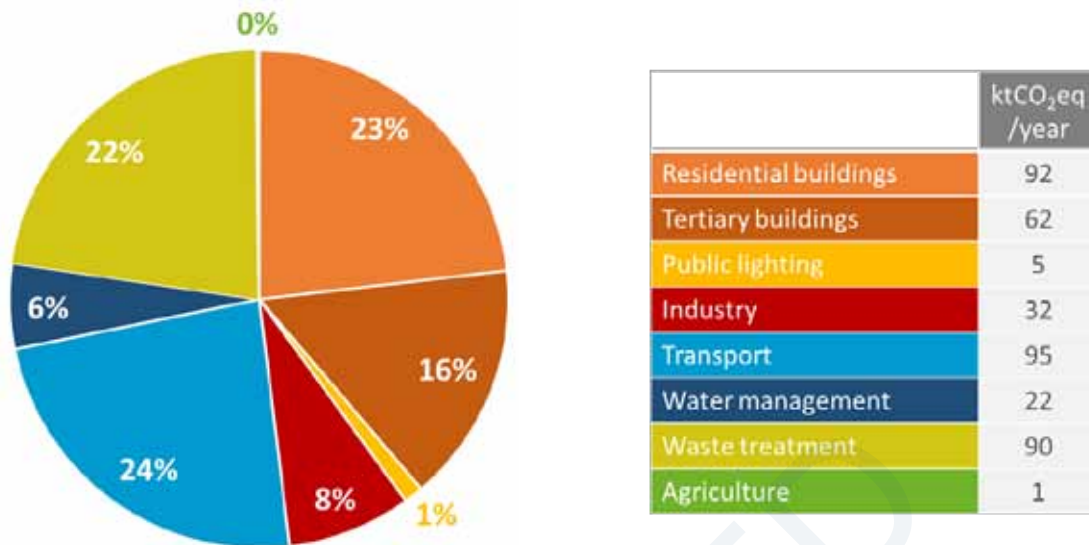
The total energy consumption on Nablus city perimeter is estimated to be **705 GWh/year** in 2014 (final energy), which corresponds to about **3.67 MWh/person/year** (equivalent to 2.3 barrel of oil per year per person). Distribution among sectors is as follows.



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

GHG emissions in Nablus city are estimated to be **398 KtCO₂eq/year** in 2014, which corresponds to about **2.07 tCO₂eq/person/year** (equivalent to 10,000 km drive by car).



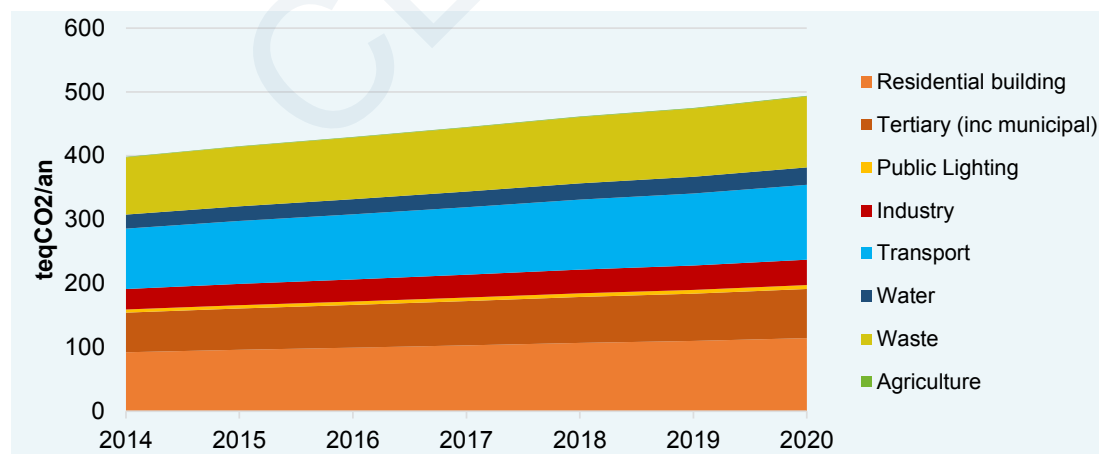
This amount of GHG per capita is pretty low compare to other countries in the region: 2,5 in Jordan; 2,4 in Egypt; 4,6 in Algeria, 9,4 in Israel. However, this shouldn't refrain Nablus to develop all efforts to contain these emissions while the city will continue to expand.

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 Nablus will then reach a total of about **494 KteqCO₂/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 local groups that will have to act to promote the local energy transition.

4.1. Municipal buildings

4.1.1. Current status

The municipality owns 16 buildings in different location representing 90,000 square meters of offices (23,172 roof surface). There various other warehouse and technical facilities representing another 15,500 sqm (roof surface).

Municipality buildings consume 11,096 MWh of electricity per year (2014 reference), representing an average consumption of 153 KWh/square meter, and a cost of 1,6 M€/year.

Electricity consumption in municipal buildings is coming from lighting (20%), cooling and heating (75%), office equipment (computer, copiers, etc.), elevator, etc.

Lighting: Some efforts were made to switch to efficient bulbs, however there is still no tight control of lighting and no automatic device to shut it down after a certain time or when there's nobody in a room or a building.

Cooling and heating: All offices are equipped with split units for cooling and heating. There are no specific rules regarding temperature in offices, which doesn't allow for any tight control on energy consumption generated by cooling and heating.

Electric equipment: So far electric equipment is basic. Reduction in consumption could come from switching to more energy efficient device.

Renewable energy: In 2013, a 20 KW pilot solar PV project, installed on the Hamdi Manko Cultural Centre, gets funded from the World Bank through the Municipal Development and Lending Fund (MDLF). The cost of the project was around 3,000€ per installed KW, which appears to be very expensive compare to current prices (around 1200€/KW). This equipment is now connected to the grid. The production started in June 2015 reaching 3,200 KWh from the first month growing to 3,400 KWh in July 2015. The expected annual production could reach 38,000 KWh representing 70% of the energy consumption of the building (1,355 square meter). It is important to mention that the current energy consumption of the building (58,000 KWh/year) could be easily reduced through basic management measures (temperature control, moving sensors, tight control of lighting, etc.) With such measures the Solar PV can cover 100 % of the energy need of the center.

4.1.2. Energy saving/short-term actions

Various actions have already been planned and implemented by NEDCO acting as the "Municipality energy service" since its entry in function in 2010:

- Replacement of old cooling and heating systems by more energy efficient equipment;
- Installation of voltage optimization modules;
- Replacement of all old lighting equipment by LED technology in some parts of the commercial center (to be implemented before end of 2015).

These projects were designed in 2010, to reach significant cut in electricity consumption in the municipality. However, figures show that this consumption has increased over the last years. It will be necessary to monitor more tightly consumption per building to assess where efforts were efficient and where they need to be reinforced.

Additional effort should be done on **lighting inside buildings**. Lighting represents **around 20%** of electricity consumption in municipality buildings. To help reducing energy consumption at the municipality building, beyond effort done to switch lamps to more efficient devices, it would be good to install motion sensors in all offices to turn the lights off during the un-occupied periods. This will reduce the lighting consumption by around 20% to 80% based on the occupancy type of these areas. Various studies demonstrate that a 30% cut could be achieved pretty easily installing “motion sensors” in key areas, with an overall cost of less than 20,000 NIS (4,400€) per 1000sqm and a return on investment in 2 years or less, as cost saving could reach 10,000 NIS/y (2,200€).

More efforts should be done in **raising staff awareness** on simple change of behaviour to develop energy conservation without significant financial investment:

- Opening curtains and window shutters during daytime to avoid artificial lighting.
- Imposing mini/maxi temperature levels in offices: 22°C max in winter 24°C min in summer. Such a rule, when enforced everywhere will result in 20 to 30% cut in electricity from cooling and heating (75% of electricity consumption in office buildings). Additionally, this rule is healthier (as it reduces the gap of temperature between inside and outside) and preserves a good enough comfort in working environment all the year along.
- Avoiding elevator and choosing stairs when going up or down one or two floors.
- Shutting down all electric equipment at end of working time or when such equipment is 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 gift.

4.1.3. Energy saving/long-term actions

In addition, carbon-saving technologies are to be implemented across all municipality buildings, mostly through the use of more energy efficient equipment to be chosen when old ones are replaced.

When old buildings go through a retrofitting program it will be essential to add to the “normal renovation plans” components to improve the overall energy efficiency: insulation to protect inside spaces from cold and heat outside, switching to double-glazing windows or low emitting glass, improving electrical network and promoting centrally controlled temperature, etc.

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

4.1.4. Renewable energy production

There are many buildings directly or indirectly controlled by the Municipality that could be used to develop Solar PV. Considering only municipal buildings’ roofs surface (total 38,000 sqm), the equipment of 50% of this surface would produce at least 3,000,000 KWh per year already representing 22% of the needs of the buildings.

It is thus necessary to draw a comprehensive inventory of all roofs available for Solar PV equipment to set up the most appropriate renewable electricity production model for the Municipality. This option is developed in section 5.2, page 18 of this document.

4.1.5. Expected results

Energy in MWh/year GHG in tCO ₂ eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
All municipality buildings	11,096	8,067	- 2,551	-1,854	10,003	18,5 %
Staff awareness campaign			- 2,219	- 1,613		16,1 %
Switch to LED lighting and sensor systems in buildings			- 332	- 241		2,4 %

4.2. Street lighting

4.2.1. Current status

Street lighting in Nablus consumes 6.784 MWh of electricity per year (2014 reference), which represents an overall annual cost of 3.9 Million NSI (Equivalent 865,000 €).

Almost 95% of the urban territory is covered with public lighting system mainly equipped with HPS lamps (250 and 150 watt). The system is controlled with circuit breakers protection, and photocell or timers to manage operating time. Electrical meters are set to register consumption in KWh.

The entire system is managed by NEDCO. The company charges a specific fee for this service.

4.2.2. Short-term actions

In 2014, NEDCO already started to replace some of the old high pressure sodium and mercury lamps with LED systems, far more efficient but more expensive to purchase. In total 426 lamps have been replaced allowing a 60% cut in electricity consumption for this road section.

Another project run with the PNA will result in changing another 200 lamps in Haifa street.

It would be good to monitor as precisely as possible reductions in energy consumption due the new devices used. This will help informing the design of the expansion of street lighting upgrading.

4.2.3. Long-term actions

Revolving fund to replace HPS lamps / PRIORITY ACTION #1

Informed by the first experiments performed in Nablus, replacement of old lamps by modern technologies (LED), appears to be very cost effective.

Even if LED lamps cost far more (highest prices reach 400€ per unit) than HPS one, the fact that they result in more than 50% consumption reduction and they last 15 years (when HPS have to be replaced every 3 years) make this technology very cost efficient beyond offering a very good quality of light and being also good for the environment.

The Municipality looks for an initial financial support to feed in a revolving fund dedicated to old lamps replacement. NEDCo managing street lighting, should set up a specific budget monitoring mechanism and put aside financial resources preserved due to more efficient lamps replacing old devices. Resources saved will be invested again in lamp replacement. This set up could ensure full replacement over time (between 4 and 8 years depending on the initial level of investment) offering replenishment of the initial investment fund and additional budget availability due to cuts in the energy bill related to street lighting.

The detailed process for this fund will be established as part of the priority action development.

Street lighting strategic plan

Based on the Master plan produced in 2012 with the support of the EU, it now should be 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 moving 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 a tighter management of public demand, should lead to designing a lighting system combining qualitative lighting and reduced energy consumption. This evolution will require a combination of technical solutions (moving 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:

- Based on the existing Master plan and elaborating on the first return on experiments of the different tests performed, identify 3 or 4 types of streets and areas according to their specific lighting needs.
- Organize public consultation to ensure proper acceptance of the new lighting system propose and collect ideas to continue improving the plan.
- 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).
- 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.

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	6,784	4,932	- 4,070	- 2,958	6,116	48,4 %
Expand LED deployment (priority 1)			- 3,392	- 2,465		40,3 %
Street lighting strategic plan			- 678	- 493		8,1 %

4.3. Water delivery

4.3.1. Current status

Nablus is suffering from persistent water restriction. Six wells are providing 80 % of the water distributed in Nablus municipality, some springs providing the remaining 20%.

Municipality Water Service ensures delivery of 80 litres / capita / day even if the system doesn't ensure 24/7 supply. Parts of the city only receive water twice a week. The water service pumps water up to the roofs of residential building in reservoirs where water get stored. Such reservoirs, when properly managed, allow people to get permanent availability of potable water.

Due to these constraints, the system consumes a lot of electricity: 27 GWh / year of which, 20 for pumping water from the underground (wells pumps) and 7 are used for the distribution process. All this represents a very high budget for the Municipality: close to 15 Million NIS / year (3,2 M€/year).

The Municipality already engaged in rehabilitating the water networks to reduce water leakage and, as a consequence, save energy (KWF project 20M€).

4.3.2. Short-term actions

With the support of KFW, Nablus already implemented a big project (20M€) to set up a “system pressure zone” allowing significant energy saving from 0,9 to 0,6 KWh/cubic meter.

The Municipality service also promoted new engines for pumps with higher efficiency, variable speed optimization and a SCADA (Supervisory Control And Data Acquisition) system for monitoring and control. In the near future, this system will provide exact figures of energy consumed per year for water delivery.

Ideally, the pumping station could also be equipped with solar PV, covering its electricity consumption. Solar PV would be an adequate solution for the “new model” proposed, as big reservoirs could be easily filled in, during daytime.

4.3.3. Long-term actions

The only significant change that would both improve the quality of delivery and reduce energy consumption could come from a different structure of the water delivery system. This new model would be based on larger tanks placed on the heights of the city, using gravity to distribute water in all buildings. Energy consumption would be then reduced to pumping water up to these tanks.

The main challenge of this option would be the investment cost as the system will require building a big reservoir and installing a new pipes network from existing water sources to the reservoir and from the reservoir to the distribution network. Considering the annual budget consumed by the water distribution system, it is worth looking carefully at the design of the system that could offer a short to mid term pay back.

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	27,923	20,300	- 2,100	- 1,527	25,172	6,1 %
Water distribution improvement (Short term and simple actions)			- 2,100	-1,527		6,1 %

4.4. Waste water treatment

4.4.1. Current status

Sewage treatment consumes also a lot of electricity 2,3 GWh, representing an annual cost of around 1,2 Million NIS (equivalent to 273K€). The sewage system covers 97% of buildings in Nablus, with an overall efficiency of 70 %. The Master plan prepared in year 2006 aims at increasing coverage and efficiency up to 100%, mainly by rehabilitating the existing system.

Wastewater from West Nablus goes to the Western wastewater treatment plant (WWTP) located near Beit Lead junction (12 km out of city boundaries). The plant processes around 9000 cbm/day. After processing the wastewater goes to the green line through Wadi Zeimer.

There is no treatment plant for Nablus East. So far the wastewater goes to Jordan Valley through Wadi Sajour without any treatment. Nablus Municipality signed an agreement with KFW and the EU to establish the Nablus Eastern Waste Water Treatment Plant. The fund (39 million Euro) has been allocated to build a unit similar to the Western one. Expected flow will be 10,000 m3/day.

Regarding rain water: In old Nablus, which is an ancient roman city, there were separate systems for sewage and rainwater but these systems were overtime demolished due to road works and lack of appropriate maintenance. In the more recent part of the city, there is no separate rainwater system, meaning that during rainy days, all water goes down the sewage system creating various problems.

4.4.2. Action in progress

The construction of a sludge digester unit is on its way at the WWTP (KFW project 2M€). This unit will produce methane and be coupled with an electricity generating plant (0,5M€ investment plan). Generated electricity will cover part of the needs of the wastewater treatment plan. This digester could provide enough

biogas to produce 17,880 KWh/day.

Solar PV will also be installed to cover another part of these energy needs. It would be good to have an overall analysis of energy produced from this equipment and assess what will be left for the Municipality to cover from NEDCO or other sources. According to initial plans, 60% of the WWTP energy needs will be covered from PV and the remaining will come from other sources.

4.4.3. Long-term plans

If the Eastern wastewater treatment plant gets equipped with the same type of digester to produce electricity, backed with solar PV, the energy generation from wastewater treatment could be covering all needs of the same service. For this EWWTP the best option would be to set up a digester that could manage both sludge and bio-waste collected in the city area. The amount of gas produced will be more important and could be used for other consumption in the city.

The existing Master plan for rainwater collection system is still waiting for funding. The Water department already started a pilot project by implementing 1000 mm diameter pipes (half a km) in West of Nablus. Even if such a projects doesn't fit in the "energy plan", it is important to keep in mind that the overall performance of the sewage system has a significant impact on the energy consumed and/or produced by the waste water treatment plant.

Additionally, if the Municipality would develop a specific system for rainwater, this network could be equipped with micro turbine to produce electricity from the water flow. At least, this option should be explored.

4.4.4. Expected results

	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Waste water management	2,300	1,672	+ 6,000	- 4,362	2,073	Not relevant
Bio digester on the Western WWTP			+ 6,000	- 4,362		

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.

The Nablus municipality solid waste department is responsible for solid waste collection in the city. The UNRWA relief and works agency is responsible for collection of solid waste within the borders of the Refugee camps: Askar old and new camps, Blata camp, AL Ein camp (representing all together a total population of 35.000 people). The JSC (Joint service council) is responsible for collecting the solid waste within the borders of the villages. The total population served by JSC is 35.700, which represent 18% of the total served population.

All in all, the Municipality service collects 200 tons per day (around 1 kg per capita / per day / in the main city). Waste is transferred to landfill. The municipality manages around 15 vehicles for this service: 8 compactors (8 tons) + 7 containers + small trucks for the old city + 1 medical waste transport unit + 1 green waste transport unit + 1 big truck for transfer. All trucks are very old and would need to be replaced by more efficient vehicles.

Waste composition shows a significant proportion of bio waste (54% bio waste – 12% carton and plastic – 2 % glass – rest mix). Selective collection is about to start for paper and cardboard. Investigation is to be developed to promote bio waste separate collection (to produce biogas).

There is no formal system organized for sorting waste. The private sector has the opportunity to collect paper and cardboard from stores, as well as steel and iron. These materials are sent to recycling factories in Israel. This only concerns a small proportion of what could be recycled.

There is a project to build a sorting facility at Nablus East boundary near Surafee transfer station, but this equipment still needs funding and formal permission from resident.

Waste is transferred to the dumpsite at Zahrit al Fenjan near Jenin.

4.5.2. Short-term actions

Strengthen **public awareness** to reduce waste generation, promote recycling and separation (specific project to be developed in schools). The idea would be to develop a pilot with families starting to sorting waste and demonstrating the overall benefit for the entire city. The production of compost from bio waste could then be used in neighboring farms, generating revenues for families engaged in bio waste collection and compost production.

4.5.3. Long-term actions

Develop **separate collection of bio waste** to produce biogas. The high proportion of bio-waste represents a resource to be used for energy production. Separating bio-waste will have a double impact: biogas generation and reduction of treatment cost for the remaining part of waste. A sophisticated sorting system could also result in separating three streams:

- Bio waste
- Recyclable materials: paper and cardboards; glass; steel; plastics (PET, PVC) ...
- Non-recyclable material to be used as fuel in specific furnace or to be sent to landfill.

The development of bio waste separate collection should be connected to the bio-digester project to be implemented as part of the Eastern Waste Water Treatment Plant.

Organic waste processing in a bio-digester

A project is currently under design to set up a bio-digester. This unit would process part of the organic fraction of Municipal solid waste (4800 t/year) and vegetal residues to be collected in the city (130t/y) added with digested liquid fraction coming from the waste water treatment plant. This unit would be able to offer a net electricity production reaching 805MWh/y and a net heat production reaching 740 MWh/y. This unit would also produce 7,7 t/day of compost and 9,1 t/day of liquid fertilizer, both very useful to support agriculture in the suburbs.

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	1,430	89,563	+ 1,259	- 27,941	111,058	25,2 %
Improve waste management through better monitoring of waste collection	1,430	497	- 286	- 99		
Waste separation reducing bio-waste going to landfill by 25%				- 22,266		20,0 %
Bio-digester using 5% of bio-waste to produce heat and electricity			+ 1,545	- 5,576*		5,2 %

*The 5,576 tCO2eq gain in GHG is due to 1,123 tCO2eq from renewable energy substitution to imported electricity and from 4,453 tCO2eq of non energetic emissions gain from diverting waste from landfill.

4.6. Other services and long-term responsibilities

4.6.1. Municipal fleet

The Municipality run its own fleet of vehicles, which are also generating GHG emission.

To reduce these emissions and save energy few options can be develop:

Tighter monitoring of the fleet in used

- To ensure that actual use is in line with the purpose of the Municipal fleet
- To optimize this use based on accumulated experience

Drivers training to adopt eco-efficient driving behaviour (improving ones driving patterns might result in 10 to 20% consumption cut)

In the longer term, old vehicles should be progressively replaced by low emitting ones (either gas powered vehicles or electric ones when electricity can be provided by renewable sources).

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
Municipal fleet	4,125	1,443	- 618	- 171	1,789	9,6 %
Improve fleet management			- 309	- 86		4,8 %
Develop eco-friendly driving practices			- 309	- 86		4,8 %

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.

The Nablus Municipality through few tenders (e.g. for water pumps) already considered criteria regarding energy savings allowed, as the main issue for awarding the purchased equipment.

4.6.3. Sustainable urban planning

The Municipal Council, by defining how urban development will shape, has a very important role to play on long term climate and energy performance of the entire city.

A dense city, where services are easily reachable; and where people can live close to where they work will result in decreasing mobility demand, meaning less cars, less traffic congestion, less GHG emissions... On the contrary linear extension along the entry roads will impose long commuting distance between living places and working places or services...

Nablus already adopted a strategic development plan. It would be good to check how this plan will help reducing energy consumption or not.

So far it appears that the main center is pretty dense, but that other parts of the city shows many empty space that could be used for new buildings, instead of expanding construction far away from the center. The lack of density is even more problematic as Nablus is surrounded by high hills, which make any travel in the city more complicated.

This 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, which will 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 knowledge in terms of technical expertise (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.

In Nablus, the establishment of NEDCO was a good incentive to develop skills among staff as the technical requirements and functions were pretty new. However, there is room for improvement to allow more senior staff (from NEDCO or from the Municipality) to provide support to their colleagues and to stakeholders in the city area, in order to promote a work culture focusing on efficiency in resources usage and considering energy as a strategic resource to be preserved and produced locally from available renewable sources.

4.7. Awareness campaign

4.7.1. Current situation

It is not only good to raise awareness among Municipality staff for them to make necessary efforts to promote energy conservation in their daily work, it would be also good to develop the Municipality capacity to promote awareness among stakeholders in Nablus.

Already in 2008, Nablus municipality through the technical team in electricity department started programs for public awareness, targeting school students in the age of 10 to 14, and charity women institutions. Since 2010, the same type of programme continues through NEDCO with different methods depending on learning tools (story, puzzle, gifts, etc.) to spread energy conservation and energy efficiency methods and recommendations.

However, the Municipality staff considers it is now necessary to duplicate efforts towards raising awareness of all stakeholders in the city.

4.7.2. Setting up a public awareness unit/ *PRIORITY ACTION #2*

In order to develop more initiatives to raise public awareness and promote behavioural changes from all stakeholders, the Municipality plans to set up a specific “public awareness unit” dedicated to energy and climate.

This unit will be located in the Public relation department of the Municipality and will gather staff from other units and from NEDCo, under the leadership of engineer Amal Hudhud currently in charge of urban planning and environmental service at Nablus Municipality.

This unit will develop its activities, elaborating from past experiences of NEDCo or the Water department of the Municipality.

The unit will mobilize local NGOs, women’ groups, religious leaders, schools, and opinion leaders to spread the words towards a larger audience.

The unit plans to start developing awareness among local authority staff (in Municipality and NEDCo) as it is essential that these public services would be the first groups to change their behaviour and be examples for change in front of the public at large.

One of the first tasks of the unit, will be to establish a strategic road map to raise awareness among all stakeholders in Nablus. Without anticipating on what will be this road map, some options can be mentioned as first ideas to be explored to start developing awareness:

- Spreading **training material** (posters, brochures, stickers, etc.) to remind everyone of the importance of energy saving
- Develop an annual “**Energy festival**” 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
 - o Developing a network of “**Positive energy schools**” that would be produce more energy than they actual consume, though a combination of energy conservation / energy efficiency measure and the development of Solar PV on schools roofs to generate electricity. Teachers should be engaged in such programmes to use all the potential of the technical develop as support for training of students.
This also could be developed in the University engaging students to drive the programme and use it as research and development exercise that would also help them developing specific skills.
 - o 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, businessmen, communication experts, university researchers, local citizen groups, beyond Municipality and NEDCO staff to work together on a broad mobilization to reduce energy consumption and develop renewable energy production in all domains.

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 on Nablus’ 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 (47% with 329 GWh/year) and GHG emission (39% with 154 ktCO₂eq/year). It is though an important subject of concern for the Municipality council.

About 70 to 80% of the existing houses and apartment are dependent on electricity as the source for heating and cooling. The electricity used is purchased from the IEC, which offers rather poor performance regarding CO₂ content per KWh. During winter, electricity consumption goes up by 20 to 25%, due to increasing demand for heating, imposing additional imports from Israel. The same situation occurs at peak of heat in summer time, like the one the city experienced in August 2015.

Note that electricity demand is growing very fast (10% in 2013 compared to 2012), a much higher rate than what can be observed in stable industrialized countries.

Solar heating (for water) is widely spread in Nablus: around 90% of dwellers are equipped with such devices (compare to 64% in West Bank).

About 39% households are using diesel or kerosene for heating, liquid gas been mainly used for cooking. Poor families representing 7% are using firewood, peat and charcoal for heating.

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.

On electricity NEDCO already made significant progress in promoting prepaid meter that significantly reduce electricity smuggling and set the ground for prospective approach to promote energy conservation and efficiency. Obviously when people don't pay electricity they get no incentive to reduce their consumption. As they start paying the “real price” they get a growing motivation to reduce their 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. This awareness campaign will be the key task of the Awareness unit to be set up at Nablus Municipality.

1. Such awareness campaign to promote efficient behaviour should focus on few points:
2. 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 electricity consumption.
3. Promoting behavioural changes at home: turning off lights, proper management of refrigerator, replacing classical bulbs with efficient device...
4. Promoting energy efficient cooling/heating devices, as the one on the market are not good enough. People buy cheap equipment without tacking into account the higher level of energy consumption, which results in a higher “global cost” over a certain period of time.

Note: There is already a pilot project run by NEDCO, which offers customers a support to buy efficient light bulbs. The company sells efficient bulbs to customers, and then pay back the price through monthly reduction on electricity bills. This programme should be followed and expanded.

An important element of the campaign should be the link to be done between changes and their impact on the energy bill. It appears that citizens are not really sensitive to energy shortage, but will be more reactive to possible saving in their personal budget.

5.1.3. Long-term actions

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

A revitalization plan of the old city already exists. About 100 houses in a cluster were restored funded by a welfare association. It would be good to understand what was the energy saving allowed by this programme, in order to learn all lessons possible.

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

1. Assess the need though detailed mapping of housing registering average consumption, date of construction, location...
2. Train small local companies, which will have the flexibility to work in different type of condition while performing adequate refurbishment programmes that result in significant reduction of energy consumption.
3. 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 refurbishment programme).
4. Promote refurbishment programme to selected target offering the best potential in 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 retrofitting 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, (or NEDCO in the present case) offering the guarantee that refurbishment 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 work on promoting **energy high-performance rules** for any new building to be constructed.

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	388,271	146,300	- 69,014	- 26,004	181,142	14,3 %
Awareness to reduce consumption			- 58,240	- 21,944		12,1 %
Housing renovation plan			- 10,774	- 4,060		2,2 %

5.2. Transport

5.2.1. Current situation

Transport is one of the key concerns to be addressed, as this sector is both a significant domain of energy consumption and the second GHG emitter (24% with 94.600 tons CO2 equivalent / year).

Public modes of transport	30 %	Public Buses	126 units
		Public Cars	2,500
Private modes of transport	70 %	Private Buses	101
		Private cars	17,996
		Motor bikes	39
		More or less every family has a car.	

People transports' services are ensured by a mix of private companies. 2,500 shared taxis are ensuring transport within Nablus boundaries and with neighboring villages. There are only few buses in service. In fact, shared taxis are operating like small buses, ensuring a service, which results in too much energy consumption per travelers. The same service could be operated by small buses, charging up to 10 people instead 3 or 4 with almost the same energy consumption and less space occupied on the road.

Roads are in pretty good condition, but the topography of Nablus city, located between two mountains, makes it more complex to organized public transport and imposes increased energy consumption due to steep slopes.

The city faces significant traffic congestion at rush hours: 7 to 8 in the morning and 2 to 3 in the afternoon. The congestion is particularly noticeable and measured in main streets and intersections surrounding the CBD area and in the main corridor that passes adjacent to the CBD area. As for intersection congestion, most of the studies analyzing the level of service for the critical intersection are qualified as "F". Intersections control is operated by fixed signal timings for different times of the day, coordinated through traffic movements analysis (Synchro software).

The municipality owns bus and taxi terminals. The current location around the CBD is critical in terms of traffic congestion. So the Municipality is now building new terminals on the entrances of the city: one in East and another one in West of Nablus. These terminals will offer connection between the city center and the main areas of neighborhood to contain traffic congestion within the city. Nablus will be then the first city in the West Bank with such a sophisticated taxi traffic regulation system. These terminals will serve for interior and exterior public transportation.

The interior public transport system counts with a total of 700 shared taxis and around 50 buses. It serves most of the city neighborhoods and most of Nablus inhabitants could use them. Specific taxi and bus stops are specified in the main routes, to pick and drop passengers. There are still efforts needed to offer more stops, or other routes and to provide stops with proper equipment.

The exterior public transport system is controlled within the existing terminals and serves for all outside villages and cities with more than 900 small vehicles and 120 buses. The taxis and buses are controlled by scheduled routes and timing for each zone.

The municipality services consider that the fleet size is pretty adequate to the needs for the city and the surrounding villages. Options for allocating additional buses could be explored in parallel to the construction

of the new terminals.

Within the city center, the sidewalks available for pedestrians are fairly good in terms of width. Previous studies were done to close the main center to cars and reserve it only for pedestrians and public transportation. Such a solution can only work if combined with other systems to overcome the traffic congestion around the city center.

5.2.2. Actions already planned

The Municipality already designed a “Strategic plan for transportation” taking into account the public demand for mobility, the geographical constraints (hills around the city, Israeli check points). This plan identified equipment to be developed, on top of building the two new terminals. Some infrastructures are to be built by the Municipality, but other still wait for funding:

- Traffic bridge in Faisal Street
- Pedestrian Bridge near Al-Watani Hospital
- Intelligent Traffic System (ITS) to improve traffic management. This project is a vital project for reducing energy consumption from traffic. Funds are still required for it.
- Traffic tunnel near the main intersection at the border of the CBD to enhance the capacity of the main street (Haifa street) that connects to Faisal street (funds still required).

5.2.3. Urban mobility master plan/ PRIORITY ACTION #3

Ideally a city committed to reduced energy consumption and GHG emission would design and implement a Sustainable Urban Mobility Plan (SUMP). Such a comprehensive plan would require a strong leadership from the Municipality Council. As Nablus Municipality is highly committed to improve traffic in the city to reduce GHG emissions and air pollution while improving traffic and quality of life, the authority decided to run a comprehensive study on mobility as one of its priorities.

This study would elaborate from the existing “Strategic plan for transportation” and could entail the following components:

- Integrating transport and city planning policies, while prioritizing public transportation and active modes of mobility for people, and 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 and around the city. In the case of Palestine, this would mean a closer collaboration between the Municipality council and the Ministry of Transport.
- Supporting the development and improvement of integrated public transport systems to make them more attractive to local inhabitants.
- Developing incentives as well as regulation measures in order to control the use of private motor vehicles and to make other modes a more attractive choice.
- Promoting active modes of transport, especially walking and cycling, in particular by providing safer conditions for the users.
- Implementing a common methodology to measure GHG emissions, report on them and monitor all other benefits deriving from the development of sustainable urban mobility.
- Promoting cooperation among local governments, creating partnerships to share experiences and good practices and to organize technical cooperation on sustainable urban mobility policies.

The study should result in a comprehensive road map to drive investment and priorities in infrastructures, in awareness initiatives and cross sectorial activities to reduce the demand for transports – both for people and goods - and to improve the overall quality of transport services.

➔ **Short term**

So far, few options to reducing energy consumption (and thus reducing GHG emission) from traffic have been mentioned during the first working sessions for the SEAP design:

1. One option could be done at “low cost”, i.e. without structural investment: the promotion of a new **“timing of activities”** at city level to avoid having rush hours where every body move at the same time. This will take some time to invite stakeholders to think differently their work schedule, but such a schedule can help diffusing peaks of traffic. A specific attention should be paid to access to the University and its 23.000 students: organizing a larger time span for courses to start will help spreading transport needs on a larger period of time and diffuse congestion to reach the campus or to leave it.
2. Along side this new planning, promotion of **specific transport services** for the institutions and/or employers that attract more people (university, hospital, city hall, etc.) to promote collective solutions and avoid people tacking their own car. The initiative already taken by students to set up fix time buses to reach the university could be used as a good example.
3. **Reserved lanes** for public transport and taxis on the main roads and strategic axes: it should be possible to mark (with a physical barrier) a reserved lane for buses and taxis offering them a more fluid traffic and inviting people to choose for these collective solutions instead of being stuck in the traffic jam.
4. Negotiation with all public transport providers (public and private) to promote a common **charter for a global improvement of the transport service**: routes, stops, timing and avoid competition that hamper the development of an efficient system.
5. Pollution control for taxis and buses should be compulsory to get a license

➔ **Longer term**

Long-term transformation of the transport system will require the full enforcement of the Sustainable Urban Mobility Plan to be design, and will probably need additional investment:

- To implement a more efficient management of the overall traffic, while promoting more public transports versus private cars.
- To review streets design in order to impose a new hierarchy between public transport, active mobility and at last, private cars.
- To renew the public (and private) fleet and switch to more efficient vehicles.
- Etc.

5.2.4. Expected results

Energy in MWh/year GHG in tCO ₂ eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Transports	274,219	93,124	- 54,842	- 18,625	115,474	16,1 %
Public awareness campaign			- 13,710	- 4,656		4,0 %
Sustainable urban mobility plan			- 41,132	- 13,969		12,1 %

5.3. Industry

5.3.1. Current situation

There are only few industries in Nablus and most of this industrial activity is coming from small businesses, shops and warehouse (carpenters, furniture production, tile production, stone quarrying, textile, leather tanning, and traditional sweets). None of these industries can be define as energy intensive or high emitters. However most of these production units are located, close to or embedded inside residential areas, generating nuisances for neighbors.

The industry is a rather “small” contributor in energy consumption (with 8% or 59 GWh/year) and in GHG emissions (with 8% and 32 ktCO₂eq/year).

The business sector is not really concerned with any energy saving strategy and it is not easy for the Municipality services to engage with this sector.

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 Nablus, in order to build an action plan on a robust analysis of the sector.
- Raise **awareness** among business owner 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.

5.3.3. Long-term actions

The municipality in its strategic plan for 2017 defined as a priority the East Industrial Zone establishment, allocating an area of 1.5 square km, which represents 5% of Nablus total area. The Master plan (awaiting for funds) has been designed to move the scattered industries to this new East industrial zone and invite new ones to come. This move also includes all stone quarries to be transferred from West to the new East zone. The site is expected to start working in 2016.

This move should help defining synergies that could help **reducing energy consumption** through **mutualisation of equipment and services**:

- Organization of joint transportation of raw material
- Common management of heavy equipment using energy (and investing in more efficient solutions)

Mutualisation of services could extend also to waste management.

- Setting a platform for industrial waste sorting and recycling all recyclable material.
- Organizing proper management of toxic wastes and wastewater from leather tanning and stonecutters.

It is important while setting up this new industrial area to **define** what would be the **energy needs** and how a part of it (or all of it) could be **supplied from renewable sources**. For example, the development of the site could come with the deployment of large solar PV production all around the area to demonstrate the technical and economical viability of such solutions.

5.3.4. Expected results

Energy in MWh/year GHG in tCO ₂ eq/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Energy	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Industry	59,084	32,041	- 5,908	- 3,204	39,731	8,1 %
Awareness among business holders			-5,908	- 3,204		8,1 %

5.4. Agriculture and forestry

5.4.1. Current situation

In low range, there are still few green areas populated with are old pine trees (26,000m²). However most of this urban forest vanished during the last years. Nowadays, forest is strictly protected and cutting any tree is forbidden.

Agricultural land represents 31.5% of the total Nablus area, from which 8.4% is irrigated land. Agriculture is in area B. Surfaces are very small (around 300 m² / capita).

Main productions are the following:

- Olive 1485 acres with a total of 37125 olive trees
- Almond 86 acres – about 3440 trees
- Figs 22 acres – about 440 trees
- Grips 37 acres – about 2590 trees

Energy consumption from the agriculture is due to pumping water for irrigation (20,000 m³/ year) and fuel for agriculture equipment.

Agricultural produces around 100 tons of green waste per year. So far, green waste is used neither for energy nor for compost.

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 transfer it to the bio-digester that could be developed in the Eastern Wastewater Treatment Plant

5.4.3. Expected results

Impacts are to be considered as marginal.

6. Energy supply and renewable energy development

Nablus 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 addressed in Nablus.

Regarding electricity, Nablus municipality gained in 1983 the ability to generate electricity from its diesel generating station (15MVA capacity). However, over years, this station was forced to shut down, because maintenance was almost impossible, as importation of spare parts was facing persistent obstacles from the Israeli side.

Since then, the municipality network was connected to the only existing supply in the region, which is the Israeli Electricity Company (IEC). Nablus remains dependent on this Israeli source, which generates its electricity from non-renewable source (gas).

In 2010, Nablus Municipality established NEDCO, the Northern Electricity Distribution Company, which provides electricity for Nablus and most of Northern West Bank. NEDCO is formally controlled by Nablus

Municipality, which owns 60% of the capital. The board of directors is chaired by Nablus Mayor, and counts with 4 members from the city Council.

However, according to its current bylaws and Palestinian regulation, NEDCO can't enlarge its mandate to energy production. However, NEDCO can act as a consultant to Nablus Municipality, which is allowed, by law, to produce electricity and other energies.

One of the persistent problems that Nablus is facing is the possible shortage of electricity at peaks of consumption. IEC is not willing to offer additional power when Nablus requires it at critical periods and even can stop supply to put pressure on the Palestinian authority as it happened during the peak of extreme heat in August 2015.

Thus, Nablus should reduce its dependency on IEC, through better management of its electricity demand, and by developing its own electricity production capacities.

6.1. Actions already achieved

NEDCO already developed many projects to improve delivery and the economic performance of electricity distribution in Nablus governorate. The company is one of the most advanced in Palestine regarding efforts already achieved to reduce losses – both technical and commercial – through concrete actions:

- Installing high voltage capacitors (indoor and outdoor),
- Upgrading of old grid to comply with regional specifications, reducing technical losses from 12% to 5% on medium voltage grid (since 2010)
- Implementing prepaid meters, reaching 70% from the total number of installed meters, and leading to a reduction of energy losses from 22 to 18% between 2010 and 2014.

In addition to the above, NEDCO completed the upgrading of the network from 6.6 KV to 11 KV in Nablus region, directly contributing to energy losses reduction.

In 2013, the calculated energy loss in Nablus electrical network was 15%. The already scheduled modernization of the electrical networks is expected reduce this value to a target of 7% by 2020. Obviously, this will reduce the amount of electricity purchased and the carbon footprint linked to it.

NEDCO launched its “Energy Saving Department” to:

- Work with the municipality employees to improve their carbon performance and raise awareness on climate change issues.
- Implement projects to raise public awareness to develop energy efficiency actions among individuals and communities.
- Work with public sector organizations (schools, hospitals, mosques, university) to reduce electricity consumption and capitalize on opportunities to develop a low carbon economy.
- Work with Palestinian Energy Institutions to promote and develop environmentally friendly technologies, products and services to deliver carbon savings and economic benefits.

Nablus also works on solar PV development to align with the national strategy aiming at producing 20% of energy from renewable resources by 2020. Pilot projects, with an overall capacity of 140 KW, have been identified, but apart from the 20KV unit at Hamdi Manko Cultural Centre, none of the other options have been implemented.

In 2012, the Palestinian authority issued a license for a private generating station in Jenin (north of Nablus), with a 200 MW capacity. The overall strategy is to replace sourcing from Israel with this facility that is supposed to cover electricity needs of the northern part of West Bank.

6.2. Grid improvement

Even, if a lot of improvement have been already performed, it will still be necessary to continue strengthening the grid efficiency to minimize technical losses and, at the same time, chase commercial losses. Losses still amount to 45GWh/y. One important element regarding the grid improvement is to ensure it will support the connection of a growing number of solar PV units that could be spread on private buildings, small companies, parking places...

6.3. Solar PV development

Solar PV on all public buildings and available public spaces / **PRIORITY ACTION #4**

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

- Develop **solar PV units on all municipality buildings**: Potential of Solar PV equipment have been explored for various public buildings: Municipality offices, slaughter house, cultural centers, public library, bus stations, fire department, etc.
The total installed power could reach 200 KW for an estimated of around 550,000 Euro.
- Develop **specific projects for public buildings**: schools, mosques, university, hospitals, etc.
- Implement **solar “umbrella”** on parking lots, bus stations, etc.
- Develop **larger units** on free spaces, East Nablus industrial area, etc....

The plan is to develop solar PV units connected to the grid wherever possible and appropriate. A detailed inventory is still required to assess the total surface and types of areas that could be equipped with solar PV. This inventory should explore capacities in Municipality buildings, schools, university, hospital, marketplace, bus terminal, etc.

Various options could be proposed to exploit this PV potential:

- **Negotiate 10 Million € investment fund** to install 7.5 MW solar PV capacities. The pay back period will be 9 to 10 years depending on actual production. After 5 years, the system will produce between 12 GWh offering annual revenues of 1.3 m€.

	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

- **Negotiate a 1 Million € subsidy** to install 1,000 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 479K€ (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) Nablus will be able to produce up to 15GW 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 each year KW	300	450	70	140	160	190	220	265	300	350
Total capacity installed KW	300	750	820	960	1 120	1 310	1 530	1 795	2 095	2 445
Investment in €	400 500	600 750	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	1 200 000	1 312 000	1 536 000	1 792 000	2 096 000	2 448 000	2 872 000	3 352 000
Production in €		64 032	160 080	175 021	204 902	239 053	279 606	326 563	383 125	447 157
Net income in €		64 032	129 412	-11 879	-8 698	-14 597	-14 094	-27 212	-17 375	-20 093
Cumulated net income	0	64 032	193 444	181 565	172 867	158 270	144 176	116 965	99 589	79 496

- **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.

Solar PV for residents and private owners / **PRIORITY ACTION #5**

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.

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

		US \$	Euro	KWh/an	Income €	Income \$	ROI year
Cost	5kv	3 000 000	2 670 000				
Prod	5kV			3 200 000	426 880	479 640	6,3

Assumptions: KWh purchased at 0,58 ILS / Change ILS to € at 0,23 / Change € to US\$ at 0,89

The Municipality aims at developing a massive production to reduce its dependency from IEC and increase the amount of electricity distribute in Nablus (this will at least partly compensate the 20GWh gap which has been identified) this is needs a significant investment to launch the process at a significant scale.

Different options could be proposed:

- **The municipality proposes residents to 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 4 or 5 five 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 passes 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
Investment	250 000	250 000	250 000	250 000					
Installed capacity/year KW	188	188	188	188					
Total installed capacity KW	188	375	563	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
Revenues in €	34 509	69 017	103 526	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

If the investment gets split between the Municipality and residents the amount of units possibly installed every year would grow according to the share of investment covered by residents.

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.

6.4. Solar heating

Solar heating is widely used for covering households' needs. However, Solar heating could also be used in some industries that require hit 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 for industrial processes.
- Identify technical solutions to match these needs with solar heating devices.

- Develop pilot projects to promote these new usages

6.5. Other renewable energy sources

The programme should also explore other option to produce energy, among which one can mention the following:

- Shallow geothermal source, pumping heat from underground (to produce heat with a small addition of electricity)
- Micro-turbines on water pipes (solution to be explore along side the rainwater collection system and or the water reservoir development plans)

6.5.1. Expected results

Energy in MWh/year	Situation in 2014		Cut expected in 2020		Situation in 2020	
	Electricity*	GHG	Energy	GHG	GHG (BAU)	Cut / BAU
Electricity supply & renewable energy	250,519	182,127		- 11,671	225,837*	5,2 %
Grid efficiency improvement Base line losses in 2014: 45,093 MWh Gain in losses reduction 451 MWh/y (1%)			- 2,255	- 1,639		0,7 %
Solar PV in public buildings			+ 12,600	- 9,160		4,1 %
Solar PV for households & private buildings			+ 1,200	- 872		0,4 %

* 225,837 tCO₂ 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 21% reduction in GHG emission compare to the business as usual scenario, where emission would reach 493,814 tCO₂eq/year in 2020.

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

The following tables propose a synthesis of this action plan.

8. Nablus 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 tCO ₂ eq/year	Energy MWh/year	GHG emission tCO ₂ eq/year		Cost Investment	Return €/y	
	Municipal building	11,096	8,067	-2,551	-1,854	18,5 %			
1	Staff awareness campaign to reduce energy consumption (light, cooling/heating, equipment) <i>Assumption: 20% efficiency gain through appropriate behaviour promoted by awareness campaign</i>			-2,219	- 1,613	16,1 %	20K€/y	296 K€/y	Starts 2016
2	Switch to LED lighting and sensor systems in 50% of buildings (45unit x 1000sqm x 4400€)			- 332	- 241	2,4 %	198K€	44,000 ROI 4,5 y	Starts 2017
3	Energy rehabilitation programme Improved insulation and EE in heavy equipment			Still to be defined					
	Street lighting	6,784	4,932	- 4,070	- 2,958	48,4 %			
4	Expand LED deployment based on lessons learned from the pilot project <i>Assumption: All lamps replaced by LED in 4 years</i>	1		- 3,392	- 2,465	40,3 %	400K€	393K/y ROI 4,5 y	Starts 2016
5	Street lighting strategic plan <i>Assumption: additional gain of around 20%</i>	1		- 678	- 493	8,1 %	50K€	90K€/y	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	
Water delivery	27,923	20,300	- 2,100	- 1,527	6,1 %			
6 Water distribution system improvement <i>Assumption: Following the KFW system pressure zone project, expend to 100 % distribution network</i>			- 2,100	- 1,527	6,1 %	20M€	280K€/y	Starts 2015
7 Water reservoirs development -Initial study <i>Assumption: The reservoir system should reduce all pumping needs by 30% But no plan defined yet</i>						150K€	tbd	Starts 2016
Waste water management	2,300	1,672	+ 6,000	- 4,362	210 %			
8 Bio-digester on the Western WWTP <i>Assumption: bio-digester will generate 18MWh/d</i>			6,000 Added production	- 4362 Electricity substitution		2,5 m€	800K€/y ROI 3,2 y	Starts 2016
9 Bio-digester on the Eastern WWTP <i>Assumption: bio-digester could offer same performance linked to the eastern WWTP</i>			Potentially similar input, but no plant yet decided to set up the unit					
Solid waste management	1,430	89,563	+ 1,259	- 27,941	25,2 %			
10 Improve waste management through better monitoring of collect process (<i>Gain 20%</i>)	1,430	497	- 286	- 99		20K/y	30,000€/y	Starts 2016
11 Waste reduction from bio-waste separation to produce compost (<i>25% reduction in 2020</i>)				-22,266	20,0 %			
12 Bio-waste separation and bio-digester unit <i>Assumption: 7% of waste diverted to bio-digestion</i>			+ 1,545	- 7,358	5,2 %	tbd	206 K€/y	Starts 2018

	Title / Type of action /Content	Situation in 2014		Expected results in 2020		GHG cut in %	Economy		Time frame
		Energy MWh/year	GHG emissions tCO ₂ eq/year	Energy MWh/year	GHG emission tCO ₂ eq/year		Cost or Investment	Return €/y	
Municipality fleet		4,125	1,443	- 618	-171	%			
13	Short term: Improve fleet management and more eco friendly driving practices <i>Assumption: 15% gain in energy efficiency</i>			- 618	- 171	15%		49K/y	Starts 2016
14	Long term: Progressive fleet replacement <i>Lack of detailed information</i>								
Residential and tertiary buildings		388,271	146,300	- 69,014	- 26,004	14,3%			
15	Public awareness unit action to promote energy consumptions <i>Assumption: the unit will generate 15 % saving in electricity consumption in 50 % of private households and tertiary buildings.</i>	2		- 58,240	- 21,944	12,1%	Already mentioned in block 1		Starts 2016
16	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. <i>Assumption: this work will generate 30 % saving in energy consumption in 10 % of private households and tertiary buildings.</i>			- 10,774	- 4,060	2,2 %	12K€/ household	1,200€/y household ROI 10 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 tCO ₂ eq/year	Energy MWh/year	GHG emission tCO ₂ eq/year		Cost or Investment	Return €/y	
	Transport		274,219	93,124	- 44,842	- 18,625	16%			
17	Public awareness improvement <i>Assumption: Actions from the public awareness unit will result in 5% traffic reduction all over the city</i>				- 13,710	- 4,656	4 %			
18	Sustainable urban mobility plan <i>Assumption: The plan when actually implemented should result in 15% traffic reduction</i>	3			- 41,132	- 13,969	12%	200K for the study	3.8m€/y benefit for drivers + Indirect benefits for the city	Study in 2017
	Industry		59,084	32,041	- 5,908	- 3,204	8,1 %			
19	Raise awareness on energy efficiency <i>Assumption: this process will generate 10% energy efficiency gains</i>				-5,908	- 3,204	8,1 %			Starts 2017
20	Long term: Development of the Eastern industrial area focusing on energy efficiency				Further investigation required to assess what could be the costs and impacts on the long term					
	Agriculture and forestry		145	794						
21	Promote EE among farmers while demonstrating the benefit for their business Promote drip irrigation Organize green waste collection				Impact on the sector will remain marginal for the city.					Starts 2017

Note: 1MWh in transport generates on 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 tCO ₂ eq/year	Energy MWh/year	GHG emission tCO ₂ eq/year		Cost or Investment	Return €/y	
	Energy supply and renewable development	250,519	182,127		- 11,671	5,2 %			
22	Continue Grid efficiency improvement <i>Assumption: Improvement generates 1% per year losses on the grid over a period of 5 years</i>			- 2,255	- 1,639	0,7 %	200K€/y	300K€/y after year 5	Starts 2016
23	Develop Solar PV in public buildings, schools, mosques, parking place, markets... <i>Assumption: 10 Mw capacity installed over 5 years</i>	4		+ 12,600	- 9,160	4,1 %	10 m€	2m€/y ROI 5y	Starts 2016
24	Develop Solar PV for households & private <i>Assumption: 1 Mw capacity installed over 5 years</i>	5		+ 1,200	- 872	0,4 %	1m€	160K€/y ROI 6,2 y	Starts 2016

NABLUS SEAP Overview

		Situation in 2014		Expected results in 2020			
Title / Type of action /Content		Energy MWh/year	GHG emission tCO ₂ eq/year	Reduction energy consumption MWh/y	Additional energy production MWh/y	Reduction in GHG emission tCO ₂ eq/year	
Non Municipal	Residential and tertiary buildings	388,271	146,300	- 69,014		- 26,004	
	Transport	274,219	93,124	- 54,842		- 18,625	
	Industry	59,084	32,041	- 5,908		- 3,204	
	Agriculture and forestry	145	794				
	Renewable energy development				+ 1,200	- 872	
		721,719	272,259	- 73,223	+ 1,280	- 48,705	14 %
Municipal assets	Municipal building	11,096	8,067	- 2,551		- 1,854	
	Street lighting	6,784	4,932	- 4,070		- 2,958	
	Water delivery	27,923	20,300	- 2,100		- 1,527	
	Waste water management	2,300	1,672		+ 6,000	- 4,362	
	Solid waste management	1,430	89,563	- 286	+ 1,545	- 27,941	
	Municipality fleet	4,125	1,443	- 618		-171	
	Grid efficiency improvement			- 2,255		- 1,639	
	Renewable energy development				+ 12,000	- 9,160	
	53,658	125,977	- 11,880	19,545	- 51,466	34 %	
TOTAL	705,411	398,237	- 85,103	26,325	- 100,171	20%	

The current work plan results in a 20% GHG emission cut compared to the BAU scenario where GHG emissions would reach 493,814 t CO₂eq/year

9. Monitoring

In order to ensure the longevity of the Sustainable energy action plan (SEAP), and to verify that Nablus 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 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		1.613 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Municipal building	Lighting	2017	Switch to LED lighting and sensor systems in 50% of buildings			LED lamps and sensors		241 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Municipal building	Equipment	TBD	Energy rehabilitation programme					TBD	0	0		0
Street lighting	Lighting	2016	Expand LED deployment			LED lamps		2.465 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Street lighting	Strategic plan	2016	Street lighting strategic plan			LED lamps and sensors		493 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Water delivery	Distribution system	2015	Water distribution system improvement			Loss of water	liters	1.527 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Water delivery	Reservoirs	2016	Water reservoirs development, initial study					TBD	0	0		0
Waste water management	Bio digestion	2016	Bio-digester on the Western WWTP					4.362 tCO ₂ eq/year	0	0	tCO ₂ eq/year	
Waste water management	Bio digestion	TBD	Bio-digester on the Eastern WWTP					TBD	0	0		0
Solid waste management	Waste management	2016	Improve waste management through better monitoring of collect process			tons	tons	99 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Solid waste management	Waste reduction	TBD	Waste reduction from bio-waste separation to produce compost			tons of compost	tons	22.266 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Solid waste management	Waste separation	2018	Bio-waste separation and bio-digester unit			tons	tons	7.358 tCO ₂ eq/year	0	0	tCO ₂ eq/year	
Municipality fleet	Fleet management	2016	Short term: Improve fleet management and more eco friendly driving practices			Persons reached		171 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Municipality fleet	Fleet replacement	TBD	Long term: Progressive fleet replacement			Vehicles		TBD	0	0		0
Residential and tertiary buildings	Public awareness	2016	Public awareness unit action to promote energy consumptions			Persons reached		21.944 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Residential and tertiary buildings	Housing renovation	2017	Housing renovation plan			Number of houses		4.060 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Transport	Awareness	TBD	Raise awareness on energy efficiency			Persons reached		4.656 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Transport	Mobility plan	2017	Sustainable urban mobility plan					13.969 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Industry	Awareness	2017	Raise awareness on energy efficiency			Persons reached		3.204 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Industry	Energy Efficiency	TBD	Long term: Development of the Eastern industrial area focusing on energy efficiency					TBD	0	0		
Agriculture and forestry	Awareness	2017	Promote EE among farmers while demonstrating the benefit for their business			Persons reached		Marginal impact	0	0		0
Energy supply and renewable dev	Grid efficiency	2016	Continue Grid efficiency improvement					1.639 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Energy supply and renewable dev	Solar PV	2016	Develop Solar PV in public buildings, schools, mosques, parking place, markets			PV panels	m ²	9.160 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0
Energy supply and renewable dev	Solar PV	2016	Develop Solar PV for households & private			PV panels	m ²	872 tCO ₂ eq/year	0	0	tCO ₂ eq/year	0

ANNEXES

CES-MED



ANNEX I – PROJECT FICHES

CES-MED



NABLUS – Priority action # 1 for SEAP		
1. General presentation		
STREET LIGHTING EFFICIENCY IMPROVEMENT	# 1	Area(s) of Intervention: A
Summary of the Action		Location: NABLUS
<p>Street lighting in Nablus consumes 6,784 MWh of electricity per year (2014 ref) representing a cost of around 780 K€ per year. The current system uses HPS lamps. In total the system should count with around 6,200 lamps.</p> <p>In 2014, NEDCO already started to replace some of the old high pressure sodium and mercury lamps with LED systems, far more efficient but more expensive to purchase. In total 426 lamps have been replaced allowing a 60% cut in electricity consumption for this road section. Another project run with the PNA will result in changing another 200 lamps in Haifa street.</p> <p>The priority action consists in contracting a loan to replace lamps, and continue the replacement process using savings from reduced consumption.</p>		Start date: 2016
		Project lifetime: 5 years
		End date: 2021
		Estimated cost €
		400K€ initial investment (to be reimbursed after 5 to 6 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 and reducing GHG emission.		<ul style="list-style-type: none"> ● New ● Planned ● Following previous action.
Principal partners and stakeholders		Contact person in the local authority
<ul style="list-style-type: none"> ● Nablus municipality ● NEDCo 		Amal Hudhud - Nablus Municipality
2. Technical description		
Link to municipal development plan		
<p>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 50% energy consumption reduction.</p>		
Implementation plan ½		
<p><u>Component 1:</u> 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 contribution of 400.000 € (as a loan) to change close to 50% of all lamps in year 1. The savings will be reinvested in new replacement. After year 5 the Municipality will be able to reimburse the initial loan.</p>		

	A1	A2	A3	A4	A5	Total 5Y
Investment	400 000 €	200 000 €	200 000 €	105 500 €		905 500 €
Lamps replaced	2 759	1 379	1 379	728	0	
New lamps	2 759	4 138	5 517	6 245	6 245	
Still to be replaced	3 481	2 102	723	0	0	
Cost without changing	780 000 €	780 000 €	780 000 €	780 000 €	780 000 €	4 680 000 €
Actual lighting cost	606 207 €	519 310 €	432 414 €	387 179 €	387 179 €	3 112 290 €
					Net saving	662 210 €

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: 62,5 €/y

Note: some figures have been rounded up between 2000 and 3000 €.

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.	Shadia Qamhay – NEDCo Strategic Planning Director Amal Hudhud - Nablus Municipality
Staff training needs	Role of Partners
The street lighting team need to receive a proper training on two subjects: <ul style="list-style-type: none"> • Technical maintenance of LED lamps • Understanding of strategic street lighting design and 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)	
<ul style="list-style-type: none"> • High cost of electricity means that any saving will be a significant incentive • The time length of LED lamps (3 to 4 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 6 years): NEDCo, 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 (4 to 8 years depending on technical choices) and ensures full replenishment of the initial investment fund.	400,000 €
Approximate annual cost saving (after initial investment reimbursement) <i>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 of time life.</i>	360,000 €/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 230,000 €
9. Projected Energy Estimates in 2020 (or other set target year)	
Energy savings MWh/y	4,070 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	0.74 %
- Reduction as related to BAU scenario	2,958 tCO2 eq/year
- Per capita calculated reduction	0.016 TCO ₂ equivalent

NABLUS – Priority action # 2 for SEAP		
1. General presentation		
ENVIRONMENTAL PUBLIC AWARENESS UNIT	# 2	Area(s) of Intervention: ABC
Summary of the Action		Location: NABLUS City
<p>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. Nablus 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.</p>		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:
<p>Focusing on 3 priority targets - Municipality staff / Children / Mothers:</p> <ul style="list-style-type: none"> • 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, including in minor energy saving projects that will be implemented, to help reduce energy consumption, and improve the urban environment (water, cleanliness). 		<ul style="list-style-type: none"> • New • Planned • Under implementation • Following previous action.
Principal partners and stakeholders		Contact person in the local authority
<ul style="list-style-type: none"> • Nablus: Public relation + Customer service / NEDCo Comm. dept. • Ministry of Education – Local teachers • Local NGOs – Women' groups • Local media: radio and social media 		Amal Hudhud- Nablus Municipality
2. Technical description		
Link to municipal development plan		
<p>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 SEAP.</p>		
Implementation plan 1/2		
<p>Phase 1: Setting up the unit – Allocating staff – Installing basic equipment</p> <p>Phase 2: Priority programme targeting municipality staff with basic information on climate change and energy</p> <ul style="list-style-type: none"> • 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... <p>Phase 3: Develop a specific programme “Positive energy schools”, mobilizing youth groups...</p> <ul style="list-style-type: none"> • 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. 		

<ul style="list-style-type: none"> • 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	
<p>Phase 4: Expand the programme to raise awareness among women / mothers:</p> <ul style="list-style-type: none"> • 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 households’ 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.	Shadia Qamhay – NEDCo Strategic Planning Director Amal Hudhud - Nablus Municipality
Staff training needs	Role of Partners
<p>The team which will be assigned to the unit need to receive a proper training on two subjects:</p> <ul style="list-style-type: none"> • Technical questions related to CC and energy • Pedagogy and communication to run efficient awareness programmes. 	<p>Stakeholders will be invited to contribute to the design of the action: Community and NGO’s, Ministries (Education, الأوقاف, Energy research Centre - MOE, University, Better trust) 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.</p>
4. Summary of related Awareness Raising (AR) actions	
<p>Some of the actions include:</p> <ul style="list-style-type: none"> • 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)	
<p>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.</p> <p>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.)</p>	
6. Key success factors (3)	
<ul style="list-style-type: none"> • 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 10% saving in electricity in municipal buildings only, it will avoid 160,000 € 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 <i>Potential: 15 % saving in electricity consumption in 50 % of all public buildings, private households and tertiary buildings.</i> <i>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, especially, the tertiary sector.</i>	58,240 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	5.5 %
- Reduction as related to BAU scenario	21.944 tCO ₂ equivalent
- Per capita calculated reduction	0.1 tCO ₂ equivalent

NABLUS – Priority action # 3 for SEAP		
1. General presentation		
URBAN MOBILITY MASTER PLAN	# 3	Area(s) of Intervention: B
Summary of the Action		Location: NABLUS
<p>Transport is one of the key concerns to be addressed, as this sector is both a significant domain of energy consumption and the second GHG emitter (24% with 93.124 tons CO2 equivalent / year).</p> <p>People transports' services are ensured by a mix of private companies. 2,500 shared taxis are ensuring transport within Nablus boundaries and with neighboring villages. There are only few buses in service.</p> <p>The Municipality already designed a "Strategic plan for transportation" taking into account the public demand for mobility, the geographical constraints (hills around the city, Israeli check points). This plan identified equipment to be developed, on top of building the two new terminals.</p> <p>Nablus Municipality now wants to move forward to continue promoting sustainable mobility and plans to develop a comprehensive "Urban mobility master plan"</p>		Start date: 2016
		Project lifetime: 5 years
		End year: 2021
		Estimated cost €
		300K€ initial investment
General Objectives of the project		Status of the Action:
The "Urban mobility master plan" will be Nablus' strategic road map to improve mobility while reducing energy consumption and GHG emissions from the transport sector.		<ul style="list-style-type: none"> ➤ New ➤ Planned ➤ Following previous action.
Principal partners and stakeholders		Contact person in the local authority
<ul style="list-style-type: none"> • Nablus municipality • Ministry of transport 		Amal Hudhud - Nablus Municipality
2. Technical description		
Link to municipal development plan		
<p>Mobility is a central point of concern for Nablus. Nablus urban area urgently needs a strategic approach to improve mobility in the city. The very specific shape of the city (a narrow valley between two mountains street) represents a strong geographical constraint the city has to live with. It is only through a comprehensive planning of infrastructure development and mobility services reshaping that Nablus will preserve its future development while improving quality of life in the urban area.</p>		
Implementation plan		
<p><u>Component 1:</u> Nablus first needs to get a more sophisticated understanding of mobility issues across the city:</p> <ul style="list-style-type: none"> • Traffic movements and intensity in different parts of the city • Mobility habits of residents • Needs for goods transport • Main issues to be solved • Etc. <p>The first of the Mobility master plan design will require a comprehensive investigation of mobility issues in Nablus</p> <p><u>Component 2:</u> From the detailed description of issues at stake, the study will draw strategic priorities with a double objective in mind – improve mobility services for people and goods while reducing the</p>		

environmental foot print of the transport sector. This includes:

- Designing a new organization of transport services to promote collective solutions instead of private / individual cars
- Review traffic management rules and circulation maps
- Propose organizational solutions that will help the transition towards a more sustainable mobility plan
- Defining infrastructures to be implemented
- Explore innovative solution that would significantly change the mobility paradigm in Nablus (cable car, bus in reserved lane, etc.)

Component 3 will articulate the different option in comprehensive scenarios taking into account all components of the evolution of mobility services and will assess the environmental impacts of the different proposed scenarios.

Component 4 will assess costs of the preferred scenario to help the Municipality council making the appropriate choice with the best return on investment.

Deliverables should be as follows:

1. Integrated Master Plan for a period of 20 years (the best mobility scenario for the city)
2. Strategic plans for implementing the different components the Master plan
3. Costing of these different components
4. Implementation road map, including priorities to be addressed on the short and medium terms
5. Environmental protection and adaption measures to reduce adverse impacts (locally and globally).

3. Organization and procedures

Formal approval	Staff allocated to prepare, implement, monitor action
City council needs to decide for the implementation of such an investigation.	Amal Hudhud - Nablus Municipality
Staff training needs	Role of Partners
Municipality staff connected to the issue need to receive a proper training on two subjects: <ul style="list-style-type: none"> • Strategic management of mobility issues • Technical and organizational solutions to be promoted. 	Stakeholders (taxi drivers, transport companies, police department, private users, big institutions generating a lot of transport needs – university, hospital, etc.) should be invited to specific workshop to design the strategic road map too improve urban mobility, to make this design process as inclusive as possible

4. Summary of related Awareness Raising (AR) actions

A communication plan needs to be developed to highlight the benefits of a new strategic mobility plan, for each and every individual and for the general interest of the city.

5. Assumptions and risks (3)

Mobility is a very complex issue and the potential impact (good or bad) of the different scenarios is very difficult to assess, which may lead to options hard to distinguish on their merits.

Beyond promoting new services and/or new infrastructures, reducing mobility needs and mobility demand is very dependent on public mobilization on the issue.

6. Key success factors (3)

- High cost of energy means that any reduction of mobility needs will be a significant incentive
- The many nuisances generated by poorly organized mobility services mean that people are willing to act, as soon as they see potential solution that answer their personal needs while

tacking into account the collective commitment the City made.	
<ul style="list-style-type: none"> Public participation can help designing ambitious solution Determination of the city Mayor (who is also Ministry of transportation) to seriously act on the issue is obviously an important element to consider. 	
7. Cost estimates	
Technical support for designing the master plan	300,000 €
Training for Municipality staff	10,000 €
Rolling fund (possibly loan to be reimbursed after 6 years)	
Approximate annual cost saving (after initial investment reimbursement)	Not relevant
Return on Investment (draft calculation)	Not relevant
8. Available and foreseen sources of funding	
Local authority's own resources:	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 <i>A reduction of 5% of mobility needs for people and goods will allow saving a lot of energy and as a consequence, a lot of GHG emission. Note: these savings are directed linked to the implementation of the actions foreseen under the master plan.</i>	41,132 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	3.51 %
- Reduction as related to BAU scenario	13,969 tCO ₂ eq/year
- Per capita calculated reduction	0.073 TCO ₂ equivalent

NABLUS – Priority action # 4 for SEAP

1. General presentation																																																																														
SOLAR PV DEVELOPMENT IN PUBLIC BUILDINGS	# 4																																																																													
Area(s) of Intervention: A																																																																														
Summary of the Action	Location: NABLUS																																																																													
Nablus Municipality wants to develop Solar PV in public buildings and public space wherever possible to produce electricity and thus reduce dependency from Israel and boost the development of this industry in Palestine.	Start date: 2016																																																																													
	Project lifetime: 10 years																																																																													
	End date: 2026																																																																													
	Estimated cost € 10 m€ investment																																																																													
General Objectives of the project	Status of the Action:																																																																													
<ul style="list-style-type: none"> • Develop renewable electricity production in order to reduce dependency on Israeli source and to improve energy sovereignty • Develop technical capacity locally to promote the technology and provide support to any investor willing to develop solar PV in Nablus • Contribute to build a sustainable energy strategy for the entire city 	<ul style="list-style-type: none"> • New • Planned • Under implementation • Following previous action. 																																																																													
Principal partners and stakeholders	Contact person in the local authority																																																																													
<ul style="list-style-type: none"> • Municipality services & NEDCo • Local business 	Amal Hudhud - Nablus Municipality																																																																													
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 as well as it will be promoted from the Municipality, any citizen could be energy producer beyond being energy consumers.																																																																														
Implementation plan 1/2																																																																														
The plan is to develop solar PV units connected to the grid wherever possible and appropriate. Various options could be proposed to exploit this PV potential: Basic assumptions: - Cost of a 1KW unit = 1500 US\$ or 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																																																																														
<p>1. Negotiate 10 Million € investment fund to install 7,5 MW solar PV capacities for example in the form of 2,000 units of 5 KW each. Whatever will be the initial investment the pay back period is 9 to 10 years. After 5 years, the system will produce between 12 GWh offering annual revenue of 1.3 m€.</p> <table border="1"> <thead> <tr> <th></th> <th>Year 1</th> <th>Year 2</th> <th>Year 3</th> <th>Year 4</th> <th>Year 5</th> <th>Year 6</th> <th>Year 7</th> <th>Year 8</th> <th>Year 9</th> <th>Year 10</th> </tr> </thead> <tbody> <tr> <td>Investment</td> <td>2 000 000</td> <td>2 000 000</td> <td>2 000 000</td> <td>2 000 000</td> <td>2 000 000</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Installed capacity/year KW</td> <td>1 500</td> <td>1 500</td> <td>1 500</td> <td>1 500</td> <td>1 500</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total installed capacity KW</td> <td>1 500</td> <td>3 000</td> <td>4 500</td> <td>6 000</td> <td>7 500</td> <td>7 500</td> <td>7 500</td> <td>7 500</td> <td>7 500</td> <td>7 500</td> </tr> <tr> <td>Production in KWh</td> <td>2 400 000</td> <td>4 800 000</td> <td>7 200 600</td> <td>9 600 000</td> <td>12 000 600</td> <td>12 000 600</td> <td>12 000 600</td> <td>12 000 600</td> <td>12 000 600</td> <td>12 000 600</td> </tr> <tr> <td>Revenues in €</td> <td>320 160</td> <td>640 320</td> <td>960 560</td> <td>1 280 640</td> <td>1 600 880</td> <td>1 600 880</td> <td>1 600 880</td> <td>1 600 880</td> <td>1 600 880</td> <td>1 600 880</td> </tr> <tr> <td>Cumulated revenues</td> <td>320 160</td> <td>960 480</td> <td>1 921 040</td> <td>3 201 680</td> <td>4 802 560</td> <td>6 403 440</td> <td>8 004 320</td> <td>9 605 200</td> <td>11 206 080</td> <td>12 806 960</td> </tr> </tbody> </table>			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
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Implementation plan																																																																														

Obviously, instead of 2,000 units of 5kV each, all combinations are possible, with for example larger units of 200kV or even more when surface available allows it. Such a plan will produce 15MWh/y covering 30% of the Municipality electricity needs from year 6 onwards, allowing significant economies in the energy budget on the long run.

2. **Or negotiate a 1 Million € subsidy** to install 1,000 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 479K€ (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) Nablus will be able to produce up to 15GW 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	180	190	220	285	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	188 900	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. **Or 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.

3. Organization and procedures

Formal approval	Staff allocated to prepare, implement, monitor action
Municipality council need to decide for the best option to replenish the fund.	Amal Hudhud - Nablus Municipality
Staff training needs	Role of Partners
The team which will be assigned to the unit need to receive a proper training on two subjects: <ul style="list-style-type: none"> • Technical questions related PV development • Project management 	Technical partners (new electricity company, 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 less dependent from Israeli sources for 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)	
<ul style="list-style-type: none"> • 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 €
Rolling fund (possibly loan to be reimbursed after 9 to 10 years)	10 million €
Approximate operational Costs (Setting up a Solar PV maintenance unit)	20,000€/y
Approximate annual income for energy producing projects	1,100 k€ after 4 years
<u>Return on investment:</u> Each investment could be reimbursed after 9 to 10 years thus a proper management of reimbursement would ensure full replenishment of the revolving fund.	
8. Available and foreseen sources of funding	
Local authority's own resources Staff from the municipality will be assigned to manage the fund	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
Public-Private-Partnerships (available or to raise)	Lined up private investments
Loans and potential borrower AFD provides loan without interest when RoI can be secured for a short period of time (5/6 years?)	Expected annual cost savings to the City budget Not relevant
Other	
9. Projected Energy Estimates in 2020 (or other set target year)	
Renewable energy production MWh/a	12,600MWh/y after 4 years
CO ₂ reduction t CO ₂ /a	
- Reference Year	2014
- Target Year	2020
- Percentage of net reduction on the territory	0.23%
- Reduction as related to BAU scenario	9,160 tCO ₂ equivalent
- Per capita calculated reduction	0.05 tCO ₂ equivalent

NABLUS – Priority action # 5 for SEAP																																																		
1. General presentation																																																		
SOLAR PV DEVELOPMENT REVOLVING FUND	# 6	Area(s) of Intervention: A																																																
Summary of the Action		Location: NABLUS																																																
Nablus Municipality will support the development of solar energy through setting up a revolving fund inviting private owners to install their own production units. The revolving fund will be replenished through valuing the electricity produced.		Start date: 2016																																																
		Project lifetime: 10 years																																																
		End date: 2026																																																
		Estimated cost € 1m€ revolving fund																																																
General Objectives of the project		Status of the Action:																																																
<ul style="list-style-type: none"> • Set up a rolling fund to support solar PV development by private owners. • Support local stakeholders to develop PV units 		<ul style="list-style-type: none"> • New • Planned • Under implementation • Following previous action. 																																																
Principal partners and stakeholders		Contact person in the local authority																																																
<ul style="list-style-type: none"> • Municipality services • Local business 		Amal Hudhud - Nablus Municipality																																																
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 as well as it will be promoted from the Municipality, any citizen could be energy producer beyond being energy consumers.																																																		
Implementation plan																																																		
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.																																																		
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th></th> <th>US \$</th> <th>Euro</th> <th>KWh/an</th> <th>Prod €</th> <th>Prod \$</th> <th>ROI</th> </tr> </thead> <tbody> <tr> <td>Cost</td> <td>5kv</td> <td>7 500</td> <td>6 675</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Prod</td> <td>5kv</td> <td></td> <td></td> <td>8 000</td> <td>1 067</td> <td>1 199</td> <td>6,3</td> </tr> </tbody> </table> <p>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</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th></th> <th>US \$</th> <th>Euro</th> <th>KWh/an</th> <th>Income €</th> <th>Income \$</th> <th>ROI year</th> </tr> </thead> <tbody> <tr> <td>Cost</td> <td>5kv</td> <td>3 000 000</td> <td>2 670 000</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Prod</td> <td>5kv</td> <td></td> <td></td> <td>3 200 000</td> <td>426 880</td> <td>479 640</td> <td>6,3</td> </tr> </tbody> </table>					US \$	Euro	KWh/an	Prod €	Prod \$	ROI	Cost	5kv	7 500	6 675					Prod	5kv			8 000	1 067	1 199	6,3			US \$	Euro	KWh/an	Income €	Income \$	ROI year	Cost	5kv	3 000 000	2 670 000					Prod	5kv			3 200 000	426 880	479 640	6,3
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Different options could be proposed to develop this process:																																																		
<ol style="list-style-type: none"> 1. 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.

Implementation plan

2. 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.
3. 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.

The Municipality can set up a 1 million € revolving fund to be engaged over a 4 year period of time. This will allow installing at least 50 units of 5KW each per year. If the investment gets split between the Municipality and residents the amount of units possibly installed every year would grow according to the share of investment covered by residents.

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.

The work process to implement the action will be the following:

- Set up the revolving fund and decide for the appropriate mechanism for reimbursement
- Ensure technical support can be provided by local entrepreneurs
- Import equipment
- Promote the use of the revolving fund to develop Solar PV units
- Assess performance and provide technical support when needed.

3. Organization and procedures

Formal approval	Staff allocated to prepare, implement, monitor action
Municipality council need to decide for the best option to replenish the fund.	Amal Hudhud - Nablus Municipality
Staff training needs	Role of Partners
The team which will be assigned to the unit need to receive a proper training on two subjects: <ul style="list-style-type: none"> • Technical questions related PV development • Project management 	Technical partners (new electricity company, 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. In addition, as the project targets residential PV development, it will be important to engage with residential associations.

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 less dependent from Israeli sources for electricity consumption. Some actions may include publicity campaigns (traditional media and online social networks) to spread awareness about the rolling fund, followed up with a town forum event to explain the project

<p>and answer questions that residents may have. It will also be important to educate women about the importance of energy conservation in the home so as to develop better consumption habits at the household level.</p>	
<p>5. Assumptions and risks (3)</p>	
<p>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.</p>	
<p>6. Key success factors (3)</p>	
<ul style="list-style-type: none"> • 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 	
<p>7. Cost estimates</p>	
Initial and start-up expenses: technical training for Municipality staff	5,000 €
Approximate operational Costs (Setting up a Solar PV maintenance unit)	
Rolling fund (possibly loan to be reimbursed after 5 years)	1 million €
Approximate annual income for energy producing projects	Not relevant
<p><u>Return on investment:</u> Each investment could be reimbursed after 5 years thus a proper management of reimbursement would ensure full replenishment of the revolving fund.</p>	
<p>8. Available and foreseen sources of funding</p>	
Local authority's own resources Staff from the municipality will be assigned to manage the fund	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
Public-Private-Partnerships (available or to raise)	Lined up private investments
Loans and potential borrower AFD provides loan without interest when RoI can be secured for a short period of time (5/6 years ?)	Expected annual cost savings to the City budget Not relevant
Other	

9. Projected Energy Estimates in 2020 (or other set target year)	
Renewable energy production MWh/a	1,200 MWh per year
CO ₂ reduction t CO ₂ /a	
- Reference Year	2014
- Target Year	2020
- Percentage of net reduction on the territory	0.22%
- Reduction as related to BAU scenario	872 tCO ₂ equivalent
- Per capita calculated reduction	0.005 tCO ₂ equivalent

CES-MED



ANNEX II – CITIZENS AWARENESS PROMOTION PLAN

CES-MED



Nablus

Inspiring the community towards improving energy efficiency

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 the 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;
 - o PPT Presentation of the CAPP Guidelines
 - o Presentation of “how to prepare and implement a communication and an awareness campaign” showing techniques, materials and models
 - o 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.
 - o 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.
 - o Table2: presents the content of a plan to implement a CAPP action related to a Pilot Project.
 - o Table 3 presents the proposed actions related to the general sustainable energy challenges and to the city.
 - o 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.

CES-MED

Preparation of COMMUNITY AWARENESS PROMOTIONAL PLAN (CAPP)

Template 1- Situation analysis of Nablus

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 in 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 (Children)		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		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	Yes, with the creation of many projects in renewable energy and through energy conservation projects in schools
If yes, who conducted the actions (the city/municipality, NGO, national authority...)	Sometimes NGOs, or the Municipality or the Electricity Distribution Company
If yes, describe the action	With schools, associations, universities, social networking
If yes, what was the budget and how did you fund it	NGO'S funded the actions
If yes, outcome, impact and feedback	Some of the actions got a positive feedback. Most of the time, unfortunately, the negative effects came from poor governmental response to the subject (stopping the implementation after installation of administrative procedures)

V. Public consultation	
Does the city practice public consultation?	No
Has the city done public consultations for SEAP?	No
Is it part of the legislative process?	No
Foreseen consultation(s)	Activate the actions through media and social networks. Awareness actions on "How to use the waste in the process of generating energy, using less expensive power tools and drag on energy".
Does the city liaise with national institutions, stakeholders?	No

Situation analysis

From this study concerning the target groups and profile, it seems that the young generation is aware and informed about energy challenges and children are a major target open to any information as they will behave accordingly. It would be recommended to carry out the communication with both audiences and rely on them as opinion sharing people to disseminate ideas and new behavior.

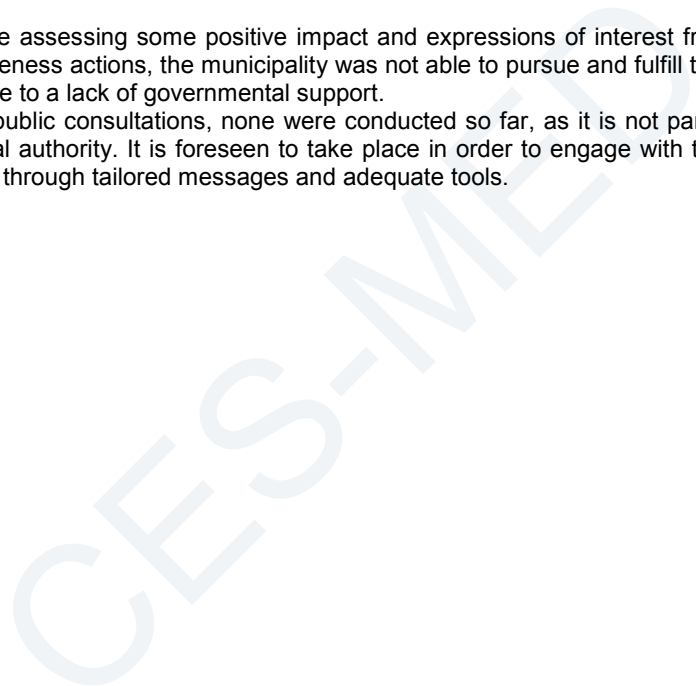
The older respondents are the group that needs more persuasion even though they are aware about certain issues, as their environmental deeds might be still rooted in cultural norms and long-standing practices.

The template shows that the citizens of Nablus are in general conscious about some energy issues and challenges but do not feel convinced about the level of importance they represent therefore the important leverages which we can use and base our communication upon are the ones related to household expenses and daily necessity such as the price and (non) availability of energy. The cleanliness of the environment and waste management are perceived as second important issues and availability of transportation not important at all.

On the other hand, the municipality of Hebron has conducted awareness raising actions and campaigns related to sustainable energy, targeting the civil society and more specifically its schools and university students, as well as associations and charity women institutions. It was able to collect funds from NGOs and applied different communication methods using mainly learning tools (story, puzzle, gifts, etc.).

Unfortunately, while assessing some positive impact and expressions of interest from the population regarding the awareness actions, the municipality was not able to pursue and fulfill the implementation of more of them due to a lack of governmental support.

Finally, regarding public consultations, none were conducted so far, as it is not part of the legislative process of the local authority. It is foreseen to take place in order to engage with the population and get its involvement through tailored messages and adequate tools.



Template 2.1

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

- **Title of the Pilot Project:**

Improving the efficiency of the public lighting in the city's streets

- **Title of the Communication Action related to the pilot project**

Pilot Project executed by the North Electricity Company through the municipality's website and the company's website.

- **Location:** Nablus City.

- **Summary of the Communication Action**

General objectives

- Improving the streets lighting.
- Reducing the operational costs and expenses incurred by the Municipality.
- Using the saved amounts of money to execute other similar projects or develop strategic projects.
- Inspiring the citizens by raising awareness on the importance of replacing the traditional lighting systems with other systems that save energy.
- Working with community to make it realize the importance of environment and saving resources.
- Replacing the old equipment with new eco-friendly equipment to ensure a better future for the coming generation.

Key Message

**Enhancing the path towards a green city
Saving the resources is a national objective.**

Theme

Replacing the old and traditional lighting systems with modern LED energy saving ones

Target group

All the categories of the civil society

Tools and channels

- Municipality's publicity boards fixed in the streets.
- Radio and local stations.
- Websites of the Municipality and of North Electricity Company.

- **Organization**

Roles and responsibilities

- The public relations division in the Municipality in cooperation with the public relations division at the North Electricity Company.
- Following up on the advertisements on the websites.
- Holding workshops with the local community.
- Working with the local management at the Municipality and the Company to display the results.
- Communicating with the Ministries, institutions and associations (Education and Teaching, Endowment, NGO's, Female Organizations).

Project lifetime

The project starts on 01/01/2016 and ends on 01/01/2017

Link to other opportunities and/or events

Linking the project to the awareness campaigns of the water and sewage system, as well as the activities of the civic associations and the activities of the energy authority.

Staff training needs

Training and Communication Skills

Technical assistance and expert needs

No need.

- **Cost estimate**

Estimated implementation cost:

Ten Thousand Euros – Constitutional Expenses

Funding source (available and foreseen)

Searching for GIZ funding and energy power

Initial and start-up expenses and approximate operational Costs

The operational costs on the Municipality are estimated at 2000 Shekel

- **Next steps**

- A survey on the level of current awareness.
- Undertaking an executive plan.
- Implementing the plan.

- **Follow-up, evaluation and impact assessment**

- A survey to be conducted after the campaign.
- Analyzing the electricity consumption prior to the project and after it.

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
<p>Waste water treatment and management for the remaining part of the city</p>	<p>Save underground water from waste water pollution and leakage of the waste water without treatment.</p>	<p>Topic: Reuse of recycled water, if properly managed, may alleviate pollution of water resources and sensitive receiving bodies.</p> <p>Activities: Raising Awareness of finite resources with a series of short videos to highlight the impacts of wastewater on the ecosystem and on the community, and the benefits of a better management for various audiences. Contribute to press releases, media advisories, press conferences and training. Raising public awareness with regard to the safety and cleanliness of the treated wastewater.</p>
<p>Expansions of existing main roads</p>	<p>Decrease CO2 emissions from automobiles Increase roads' capacity Reduce gas emissions and carbon footprint</p>	<p>Topic: The municipality is providing a high-level road network by reducing fuel consumptions and road congestion and increasing sustainability</p> <p>Activities: Awareness of the problems caused by car traffic: congestion, pollution... Design clear signage for speed limits, directions, etc. AR campaigns promoting network and traffic management and road safety for all users Launch effective communication for all responsible parties ensure the efficiency of the programme.</p>

Template 3.2

CAPP activities as related to SEAP Priority Actions of Nablus

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:
<p>1- Improving the street lighting in the city, by replacing the traditional lighting systems with modern energy efficient LED systems.</p>	<p><u>Target Audience:</u></p> <ul style="list-style-type: none"> - Local Community - Municipal Council and concerned divisions in the Municipality. - Local Traders and suppliers. <p><u>Key Message:</u></p> <ul style="list-style-type: none"> - By replacing the old equipment with a new eco-friendly one, Nablus will ensure a better future for the coming generation. - Reducing energy consumption will save resources and make our city a green environment. <p><u>Objectives:</u></p> <ul style="list-style-type: none"> - Reduce electricity consumption in order to save money from the monthly Municipality expenses. - Expand Led utilization in households and public buildings - Reduce electricity consumption and save electricity, which is a limited resource (as it is linked to the Israeli side). - Improve the levels of street lighting and unify it. - Limit the emissions of poisonous gas. <p><u>Communication Tools:</u></p> <p>Meet with the Local Council and the Municipality's Divisions to explain the project and its objectives.</p> <p>Meet with the suppliers to assess the energy saving products.</p> <p>Promote the installation of similar equipment in other urban common areas - both public and private – through a renewable energy equipment forum aimed at relevant stakeholders.</p> <p>Promoting the project in the media and through publicity and social media networks.</p> <p>Launch actions for children (solar drawing competitions and web games) for teenagers (debates, design and photo competitions) and for university students and the scientific community (debates and ideas competition).</p> <p>Set up visual information posters on the poles, on electricity exchange boxes, in the municipal and local media.</p> <p>Distributing fact sheets that will include data on the importance of the project, its target, the advantages of LED, savings expected in %.</p> <p>Create an info center to inform citizens about new technologies</p> <p>Launch a pioneer project held in a region of the city and make</p>

<p>2- Awareness campaigns</p>	<p>it open to the public: a prototypical house</p> <p>Target Audience:</p> <ul style="list-style-type: none"> - All local stakeholders: Civil society in general, private and public operators, schools, mosques, office employees... <p>Key Message:</p> <ul style="list-style-type: none"> - Energy efficiency is good for you, good for your city, for the nation and the world: change behaviors now! <p>Objectives:</p> <ul style="list-style-type: none"> - Adopt Eco responsible daily actions and change of behaviour - Increase sustainability. - Reduce energy billing cost for households and municipality <p>Communication Tools:</p> <p>Produce a slogan to express positive municipal action toward energy awareness, conservation, and efficiency.</p> <p>Awareness campaigns: production of promotional material (leaflets, brochures, posters, catalogues) and perhaps billboard advertisements on the vision of the city.</p> <p>Recruiting an “energy champion” in every area, enterprise, municipal building or residential building as a spokesperson to represent the program and who is recognized and publicly associated with energy initiatives in the organization and the community. Follow through when it comes to changing their behaviors.</p> <p>Adopt a liaison with the community through municipal newspaper, website and social media link, Info days for the citizens, dissemination of mayor messages through radio, newspapers and television, especially using local media.</p>
<p>3- Solar PV rolling fund</p>	<p>Target Audience:</p> <ul style="list-style-type: none"> - Civil society - Private and public operators - Energy experts, industries, utility companies - Investors - Financial and corporate communities <p>Key Message:</p> <ul style="list-style-type: none"> - You have the power to have free power - Access to solar power is critical for a just and equitable transition to 100% clean energy. <p>Objectives:</p> <ul style="list-style-type: none"> - Move quickly to a financially viable community enterprise - Present the different financing models for renewable energy projects and energy efficiency improvement projects. - Improve access of the city households and small enterprises to reliable and clean energy services and helping banking partners develop lending portfolios for financing the projects.

	<p><u>Communication Tools:</u></p> <p>Raising young people's awareness: Give a sense of a collective action on climate change</p> <p>Building a platform for public-private partnership involving banks, and sensitization of bankers.</p> <p>Reaching out to enterprises in an environmentally sustainable manner through organization of promotional forums and meetings between bank representatives and city councils.</p> <p>Launching of a campaign aimed at the general public to spread the good news about solar energy to communities across the city community members, along with high school and college students.</p> <p>Hosting solar education events sparking a coordinated national conversation about access to solar energy.</p> <p>Photovoltaic training day to citizens dedicated to issues on alternatives in the field of electricity (installation rates, prices of specific consumption, and other costs).</p>
<p>4- Mobility master plan</p>	<p><u>Target Audience:</u></p> <ul style="list-style-type: none"> - Civil society, specifically young people - Private and public touristic operators <p><u>Key Message:</u></p> <ul style="list-style-type: none"> - For a cleaner, safer and quieter city - If you care (about the environment), share (your car) <p><u>Objectives:</u></p> <ul style="list-style-type: none"> - Reduce the fuel consumptions and congestion - Increase sustainability - Create a balanced, multimodal transportation system to give people choices about how to get to their destinations. - Increase roads capacity and traffic optimization for a better quality of life and economic stability - Encourage car sharing, promoting active modes of transport, especially walking and cycling, and providing safer conditions for the users. <p><u>Communication Tools</u></p> <p>Launch awareness campaigns to young people (to whom mobility is important) on car sharing</p> <p>Produce programs that establish awareness of healthy transportation and environmental and energy use impacts of transportation choices and promote it.</p> <p>Launch programs that establish awareness of transportation safety and promote it.</p> <p>Introduce trainings for development professionals, teaching the principles and benefits of sustainable mobility.</p> <p>Communicate through social media to obtain people's opinions and promote a bicycle and pedestrian day.</p> <p>Use all media forms and produce imaginative posters, local TV and radio press articles about the above issues.</p> <p>Promote a car pooling scheme run on the Internet and co-financed by the municipality, at the disposal of all employees and city dwellers with practical advantages for car sharers (free and dedicated parking places, financial contribution from</p>

the company for petrol, free bicycles, access to the repair shop, etc.).
Promote energy-efficient transportation by rewarding departments that have the highest number of people who carpool or take public transit.

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 Nablus specifically, the senior target group has very little interest in the topic and doesn't regard it as being highly important. We need to find out what would be the best way to anticipate the barriers to proper environmental behaviors. The awareness actions will have to consider using credible messages and promoting proper insights, such as the cost of their energy bills and self-sufficiency/availability of energy in the first place: "what's in it for me?" This will lead afterwards to the broader concept of a clean environment and climate change.

To do so, it is vital to produce effective **targeted facts and figures that are specific to the city** and use them as directly relevant to energy consumption. Or, even better, use statistics that are directly relevant to energy consumption in each building.

On the other hand, young people and students are high dynamic and face changing situations; they are an important pillar to count on in order to influence and reshape 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, when targeted, educated and won over environmental issues and change of behavior, 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.

Nablus municipality is a very motivated force, and needs to assess the perception of options it offers to its citizens viable and sustainable alternatives that will benefit them;

Therefore, it is important to use the above mentioned leverages and base its communication upon, such as:

Establish a strong and dynamic communication methodology to facilitate the planning and implementation of SEAPs and stick to the vision slogan in every communication to highlight the goal aimed at (Inspiring the community); communicate and promote at the other municipalities level about actions and measures toward energy saving and energy efficiency that improves the quality of life in the city.

Start with raising the energy awareness of municipal staff and enable it to set and lead the example. To secure the appropriate level of stakeholders' mobilisation, the municipality must 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.

Solicit input from employees to develop program content via surveys, focus groups, and personal interviews; identify the desired behaviors/actions and consider how to motivate employees to take these actions, such as through incentives and awards; develop motivational themes, messages, and slogans; reward employees with improved benefits or awards for energy-efficient actions.

Determine the adequate medium to deliver the message and lead the citizens and other stakeholders in their choices towards a change in behavior, enabling individuals to make informed decisions (e.g., posters, video, newsletter, exhibits); select the activities/methods to distribute the messages/information. 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.

Examine existing links with institutional groups and others that can help promote the project, such as cooperation with the ministries of education as well as with organizations that already have established contacts with numerous schools.

And finally appoint a communication cell or team within the municipality; plan to set up its structure, its capabilities and its human resources. It can carry its actions at the level of the municipality, in order to build a sustainable awareness plan adapted to the project of the city and connect with its

citizens in order to implement the concept of eco-responsibility. Encourage expansion of technology infrastructure to serve and connect the community, increasing access to information and fostering better communication between residents, businesses, institutions, and local government. Being a “connected community” extends beyond the physical connections implied by our transportation system. It encompasses a community that is connected technologically and socially as well.

CES-MED



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

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

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

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