

## ***SUSTAINABLE ENERGY ACTION PLAN : THE CASE OF NABLUS CITY, PALESTINE***

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### **ABSTRACT**

Nablus City and the Municipality Council want to seriously address climate change, which became a global issue in recent years. Nablus aims to lead the way of design and apply new models in energy generation and consumption. Nablus Municipality vision will be achieved by working towards five strategic objectives: 1) Improving and promoting energy efficiency, 2) Increasing the amount of energy produced from sustainable and renewable sources, 3) Promoting sustainable construction and projects, 4) Engaging and inspiring the community to meet the challenges of climate change; 5) and managing and adapting to the effects of climate change; 6) Reducing the emissions of green house gas (GHG) mainly CO<sub>2</sub>. After signing the "Covenant of Mayor" in May 2015. The main aim of this paper is to address the Energy Strategic Action plan that was prepared by Nablus Municipality with the support of European Union. 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. The city conduct an inventory to understand which actors and sectors consume energy and contribute to GHG emissions , in order to describe precisely themes the municipality can act on and where can the municipality efficiently reduce emissions. The result of this inventory shows that 40% of CO<sub>2</sub> emissions is coming from transportation sectors. while 34% coming from residential building. 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 mobilisation of all stakeholders, inviting them to reduce their energy consumption and contribute to the development of renewable energy capacities. The short term, medium and long actions will be emphasis more in detail together with the priorities actions in this paper. It is worth to mention that some of these short term actions are currently under implementation. If Nablus municipality implemented the above energy action plans, 22% saving in energy consumption will be gained in providing the services by Nablus municipality. and 12% in services outside municipality

**Keywords:** climate change, actions plan, GHG emissions, energy saving, energy consumption. renewable energy, engaging community.

## **1 INTRODUCTION**

### **1.1 General background about Nablus city :**

Geographically, Nablus extends on Mount Ebal and Mount Gerizim. The city is known by its delicious sweet (kenafa) and it has many industries such as soap industry and stone industry, the served Population is about 200,000 inhabitants.

### 1.2 Nablus Municipality

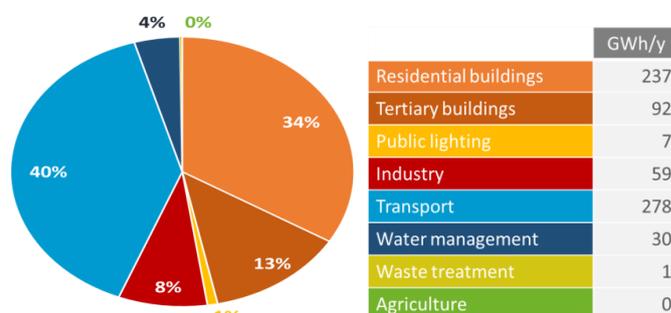
Nablus municipality is a semi- governmental foundation and it considered as one of the oldest municipalities in the level of Palestine and the Arab world . It established in 1869 . Currently NM is one of the biggest Palestinian foundations . The most important services provided by the municipality: water, electricity and solid waste collecting, permits buildings licenses, and paving the streets and its sidewalks. Nablus Municipality vision includes :Improving energy and water efficiency, Promoting sustainable development in all services provided, engaging and inspiring the community and Adapting and managing the effects of climate change and disaster risks. In the city , We face many challenges such as : Israeli control of water resources , financial deficit , lack of water sources , lack of awareness , electricity supply is from Israel company which is not reliable. The following table (Table 1) shows some facts about the city:

**Table 1: Facts about the city**

Item	value
Water supply coverage	100%
Wastewater coverage	97%
Water consumption per capita per day	80 L
Cost of 1 m <sup>3</sup> of water	1.6 US\$
Average tariff	1.65 US\$/ m3
Electricity coverage	95 %
Average Electricity tariff	0.2 0 US\$/ kwh
Purchase Electricity cost	0.11 US\$/ kwh
Annual consumption of different energy sources	705 GW (35% electricity source)
Palestine GHG emissions per capita	1,0 t CO <sub>2</sub> eq /year

### 1.2 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 (table 2) and pie chart shows its distribution among branches



**Table 2: Energy Consumptions in 2014**

Municipal buildings consumptions are here included under tertiary buildings. If we look more precisely and analyse consumption per energy and sectors, we realise 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.

## **2 SUSTAINBLE ENERGY ACTION PLAN**

### **2.1 Actions for municipal buildings and services**

The municipality owns 16 buildings (40,000 sq roof surface. Municipality buildings consume 11,096 MWh of electricity per year. In the short-term actions, more energy efficient equipment and raising staff awareness is needed. in long term carbon-saving technologies are to be implemented across all municipality buildings

#### **2.2 Street lighting**

Street lighting in Nablus consumes 6.784 MWh of electricity per year. In the short and long action, it is necessary to replace some of the old high pressure sodium and mercury lamps with light emitting diode (LED) systems.

#### **2.3 Water Delivery**

The system consumes a lot of electricity about 27 GWh /year. In the short term action, NM carried out the water loss reduction project which save a lot of energy. In the long term, the pumping station could also be equipped with solar PV and Big water storage reservoir is recommended

#### **2.4 Waste water treatment**

Sewage treatment consumes also a lot of electricity 2,3 GWh , which cost NM around one million dollar every year. In the short term action, a sludge digester produce methane and be coupled with an electricity generating plant will be installed very soon in the WWTP. In additional to install solar panel to produce electricity to cover needs of WWTP from energy. On the long term the digester to produce electricity, backed with solar PV for WWTP will be installed.

#### **2.5 Solid Waste Management**

The Municipality service collects 200 tons per day (50-60% organic compounds). In the short term, conduct public awareness to reduce waste generation, promote recycling and separation. In the long term action, separate collection of bio waste to produce biogas and electricity will be developed.

### **2.6 Actions on the territory of the municipality**

#### **2.6.1 Residential and Tertiary Buildings**

The residential and tertiary buildings are in terms of energy consumption 47% from total energy consumption of the city (with 329 GWh/year) and GHG emission 39% with 154 ktCO<sub>2</sub>eq/year. About 70 to 80% of the existing houses and apartment are dependent on electricity as the source for heating and cooling. In the short-term actions , there is a lot to do to raise public awareness on energy issues, and as long term action developing a renovation programme is recommended.

#### **2.6.2 Transport**

Significant domain of energy consumption and the second GHG emitter (24% with 94.600 tons CO<sub>2</sub> equivalent / year). short term action is to prepare strategic plan for transportation and urban

mobility master plan.

### 2.6.3 Industry

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 and reducing energy consumption through mutualisation of equipment and services is recommended

### 2.6.4 Agriculture

Raising awareness among farmers to promote behavioural changes that would help reducing energy consumption. Promotion of sophisticated irrigation system. Develop a comprehensive plan to collect green waste and transfer it to the bio-digester

## 2.7 Energy supply and renewable energy development

1. Actions already achieved are : 1) Installing high voltage capacitors (indoor and outdoor), 2) Upgrading of old grid reducing technical losses from 12% to 5% on medium voltage grid (since 2010), 3) Implementing prepaid meters
2. Grid improvement
3. Solar PV development through: 1) Solar PV on all public buildings and available public spaces and 2) Solar PV for residents and private owners
4. Solar heating

## 3 CONCLUSIONS

From the above actions proposed and after conducting several meeting with experts and stakeholders the priorities Actions from SEAP are:

1. Using Renewable Energy
  - ✓ PV system above Nablus Municipality Buildings
  - ✓ PV at wastewater treatment plant
  - ✓ Using bio-waste to produce electricity
  - ✓ Enhancing the citizens to install PV
2. Establish Public awareness unit
3. Changing the street lighting lamp with LED

The results expected from implementing the actions plan are represented in table 3 below. 22% saving in energy consumption will be gained in providing the services by Nablus municipality. and 12% in services outside municipality.

table 3: Results expected SEAP

<b>Item</b>	<b>MWH</b>	<b>Item</b>	<b>MWH</b>
NM services		Outside NM services	
Municipal Building	<b>11,096</b>	buildings	388,271

Street lightening	<b>6,784</b>	transportation	274,219
Water supply	<b>27,923</b>	industry	59,084
Waste water system	<b>2,300</b>	agriculture	145
Solid waste disposal	<b>1,430</b>		
Municipal feet	<b>4,125</b>		
Total	<b>53,658</b>	Total	651,753
	<b>%22</b>	saving	<b>%12</b>

## REFERENCE

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