Solar Energy Implementation At Household: Gaza Strip Case Study

Hala J. El-Khozondar (hkhozondar@iugaza.edu)
Islamic University of Gaza https://orcid.org/0000-0003-4384-1208
Fady El-batta
Palestinian Ministry of Health

Original article

Keywords: Solar energy, fostering solar system, Energy cost, Energy marketing, Environmental effect

Posted Date: June 30th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-632080/v1

Abstract

Background: Gaza Strip in Palestine is facing a major power deficiency problem due to local political situation. Thus, powering Gaza Strip without blockage whole day is a challenging task for decision maker. Lack of electrical power required inhabitants of Gaza Strip to implement solar energy systems to power their homes to replace or to complement the traditional sources of energy. To understand the success of solar system adoption at household in Gaza, authors built an electronic questionnaire. The dependent variable is chosen to be the adoption of energy and independent variables are environmental benefit, the cost of adoption of solar energy, and the market value of solar energy measured. The electronic questionnaire consists of two parts: part one consists of personal questions; second part is 22 items on a five- point Likert scale. The study sample consists of the 10% of the study population which are Al-Shifa Medical Complex employees (1819 employees). The electronic questionnaires are electronically circulated to the study sample. Then data is collected and analyzed using SPSS program.

Results: The authors found that only 19.5% of the sample install solar energy systems on their houses. The results show that some factor including governorate in which employees are living, house ownership, total cost of energy/month, space to install the space to install the solar panels, and the desire to share the cost with neighbor unaffected the decision to use solar energy. Contrary, the type of house, knowledge of renewable energy impacted the decision.

Conclusion: The adoption of solar energy in Gaza is limited. Type of house and knowledge of renewable energy are important to spread using of solar energy at houses in Gaza. Therefore, it is important to spread the knowledge of solar energy through universities by giving classes to all university students or by giving general lecture. To overcome the other two factors, the government should adopt the system and support the local inhabitants.

Introduction

Renewable energy is an attractive source of energy that provide clean and sustainable source of energy. One of the most common sources of renewable energy is solar energy which is capable to meet most the challenges that fronting the world. It provides people with safe and environmentally friendly energy.

Photovoltaic, PV, is the basic element in the solar power system. It harvests solar irradiance to produce clean electrical energy. It decreases the green house emission and the dependency on traditional fossil fuel. Solar energy system is the full system that capture the light, converted to electrical energy, and distributed to the user. It consists of solar panels (PV connected in parallel and series), inverter, battery pack, and charge controller[1]. Other secondary equipment is solar array mounting racks, array DC disconnect, power meter, utility meter, kilowatt meter and backup generator. There exist in the marker various types of solar systems for residential use depending on various features including grid connection, type of material and battery. The solar system might be connected to the grid, stand alone or hybrid system [2].

The energy sector has a vital input in development of the economy in many societies [3]. Especially in Gaza Strip which about 75% of its energy needs are imported, i.e., 66.6% from Israel and 8.5% from Egypt. While the

remining 25% off energy are generated locally by the unique Palestinian power plant. Table 1 summarizes the quantity of imported energy and its average consumer prices in Gaza Strip according to the type of energy [4]. Gaza Strip receive 120 MW from Israel, 37MW if all lines worked from Egypt and approximately 80 MW (which is usually less than its full capacity of 120 MW) from the local power plant [5]. However, local power plant currently and Israeli line can provide Gaza by only 54MW and 70MW respectively out of their full capacity due to the political situation in Gaza Strip. Additionally, the electricity demands depend on the season, e.g., in summer and winter seasons the energy consumption reaches 440 MW and decreases to 380 MW for the rest of the year. By simple math, it is easy to notice that most of the year electricity deficit varies between 220 to 280 MW through the year [5] .

Table 1
Quantity and consumer prices of imported energy in Gaza Strip.

	Electricity	**Gasoline**	**Diesel**	**Kerosene**	**LPG**	**Bitumen**	**Oils and lubricants**	**Wood and Charcoal**
Quantity	1,024,120 MWh	53,999 m^3	239,707 m^3	150 m^3	59,915 ton	748 ton	25 ton	427 ton
Price[4]	0.56 NIS/kWh	5.75 NIS/L	5.09 NIS/L	5.79 NIS/L	61.0 NIS/kg	1.8 NIS/kg	10.0 NIS/kg	1.0 NIS/kg

In a recent report by Palestinian investment promotion agency (PIPA) , the prices of electricity for different customers in Gaza Strip is given in Table 2. Table 2 show that the price of energy is a Parden for any investment.

Table 2
Average Electricity Prices in Gaza Governorate ($)

	Household	**Commercial**	**Industry**	**Agricultural**
Fixed Fee	2.9	5.8	5.8	5.8
Price per kilowatt	0.14	0.17	0.17	0.17

Palestine is located in a strategic place crossing the road to three continents, Africa, Asia and Europe. Gaza Strip lays on the southeast cost of Mediterranean Sea for around 41 km long in the south of Palestine (Fig. 1). Its width varies from 6 km to around 12 km and its total area is 365 km^2. It lies on Longitude 34°26' east and Latitude 31° 10' north of the equator. Gaza Strip is highly populated area. By end of 2020, 2.1 million persons live in Gaza as issued by Palestinian Central Bureau of Statistics (PCBS) with annual growth rate of 2.7% making it one of the highest populated density in the world. Gaza Strip has Mediterranean climate of hot summers with 300 sunshine days, and cool rainy short winters. It has annual global horizontal irradiance (GHI) above 2000 kWh/m^2 as in Fig. 1. The continuous increase of population with low water and fossil fuel resources make Gaza Strip a harsh environment to live in. The electricity crises started in 2006 when the local power plant has been destroyed by Israeli attack causing a 61% electricity deficiency. As a result, two million inhabitants live as little as 3 to 4 hours/day of electricity, forcing locals to search for alternatives including electric generators and solar energy in particular to power houses, hospitals and schools [5]. The problem is increased due to the tension between local political parties in Palestine over custom tax revenue.

Accordingly, the electricity deficiency in Gaza Strip is consider a major problem that affects badly the local economy, social welfare and consequently the living level of Gazans. Gazans are desperate to adopt different energy sources because of the situation in which they live. Thus, it is important to make a thorough study of the benefit use of this system and its applicability in peoples' lives.

The main sources of renewable energy are solar energy, wind, biomass and geothermal. Solar energy is considered the most important of all system and highly applicable in Gaza Strip. In 2019, Nassara, Y. F., Alsadib, S. Y. present a study on implantation of solar energy in Gaza strip as replacement of fossil fuel [4]. They studied the possibility of using Photovoltaic (PV) and concentrating (CS) solar systems in Gaza Strip. They analyzing solar radiation data for five major cities in Gaza that has been collected for 15 years from 2000 to 2015 using System Advisor Model. They end up with strong recommendation to use solar energy to power Gaza Strip [4].

Wind energy is considered the second source of renewable energy that has high potential in Gaza Strip. Nassara, Y. F., Alsadib, S. Y. in 2018 [6] assessed using wind energy in three different places in Gaza Strip. They analyzed data collected for wind speed and its direction in 16 years (2000–2015). The result of their analysis unveiled that the best place for wind farm in Palestine is Rafah city in the southern part of Palestine on the border with Egypt. They explained that Rafah city has the highest wind energy and being at the border with Egypt smoothing the process of getting the needed equipment and experts with low cost of transportation and communications. Moreover, the low population density in Rafah City upsurges the economic viability of exploiting wind energy. It has been estimated that each wind turbine will produced 15,952 MWh; therefore, it requires 110 wind turbines to cover the shortage of 200 MW[6].

A specific project is done by instilling 5KW wind turbine on the top of residential buildings. At height of 10, wind turbine will annually produce 2695 KWh. This amount can be posted by going to higher building up to 120% at 70m. The electric energy obtained via wind system presents up to 84% of the annual output of an equivalent power rating photovoltaic energy system [7].

In addition to solar energy and wind energy, biomass plays an important source of energy as it may be found anywhere. It has major contribution to protect environment from hazardous exhaust gases when it is particularly used as fuel for vehicles. Biomass energy could be used for cooking, heating, electricity production, steam and liquid biofuels. Biomass energy shar of about 9–13% of the global energy source and around 8% of Palestinian energy source [8] .

Geothermal energy is the least explored energy in Palestine. In a study by Nabil Beithou N., Abu Al-Ganam Z. [9], the accessibility of geothermal energy as a source of energy and electricity in Palestine is discussed. Their results indicated that Gaza Strip and north Palestine southern of Tabariya Lake are high sources for geothermal energy. Moreover, the produced geothermal energy can be independently used to produce electrical power.

Implantation of renewable energy in particular solar energy in Gaza Strip started since 2012 when Ministry of Health used solar energy to power several clinics and hospitals, e.g., department of care cardiac surgery in Al-Shifa medical complex [10]. Ministry of Education and Higher Education followed same strategy and used solar energy to power schools and some administrative offices. The Ministry of equip and Higher Education

and the Palestine Investment Fund (PIF) in Palestine have a treaty to equip 500 public schools with solar energy system [11]. Ministry of Agriculture and the Ministry of the Interior also started to adopt solar system for their departments. Other local institutes, e.g. municipalities, universities, and houses are also started using solar energy system. Gaza Electricity Distribution Corporation (GEDCO) encouraged people to use solar system to power their homes by selling their customers with installment systems [12].

In the last years, several researchers conducted several studies to handle the issue of applying solar energy systems in Palestine and in Gaza Strip in particular. Nassar, Y. F. and Alsadi, S. Y. studied and assisted the energy situation in Gaza Strip and accordingly they suggested four solutions for the electricity crisis in Gaza [4]. In their study they perform an economical and environmental assessment to the four solutions to realize the one which attains the highest revenue. Later the same authors gave an assessment of the potential of solar energy in Gaza Strip in order to finish the suffering of Gazans due to lack of electricity [13]. They present an urgent solution by building PV systems on the roof of local houses that can produce 555 MW. Though the solution will cost more than the existing utility company feeding line, solar energy will minimize unemployment by providing new jobs and independency to Gazans on using imported fuel. The Gaza Electricity Distribution Company (GEDCO) The full capacity of energy to supply Gaza Strip as stated by the Gaza Electricity Distribution Company (GEDCO), is 550 MW of electricity.

Ismail et al. presented a survey of several installed projects or running for different types of renewable energy. Authors studied the visibility of these systems and their potential in providing stable energy for Palestine [14]. In a study performed in 2011, Aydi used a data from solar radiation survey for years (1989–2002) at the cost to investigate the possibility to adopt solar energy in Gaza Strip. His result show that it could be possible to locate possible places for solar power plant. However, for economic benefits more data is need to be able to do the simulation [15].

Hamed et al. (2013) revealed the types of renewable energy that can be implemented in Palestine which are solar, wind, biogas and geothermal. The study estimated that 36% of energy demand can be generated from wind and solar energy [16]. For study of renewable energy in Gaza Strip, Juaidi [17] gave a review of potential renewable energy and assures that main sources are wind and energy. That is a combination of wind and energy will help Gazans to get stable amount of energy and decrease its dependency on fossil fuel [7].

Some researchers [7, 15, 17–21] studied issues related to renewable energy in Palestine in general and in the Gaza Strip in particular. They studied the needs of the Gaza Strip of electricity and they recommend to use new sources of energy, i.e., solar, wind and sea wave energy. Other researchers (e.g. [22]) present new plans to construct solar power plants in the Gaza Strip. In 2014, PalThink for Strategic Studies published case study report titled “Renewable Energy in the Gaza Strip: Short, Mid, and Long Term concepts”. This report presented obstacles, challenges and recommendations provided by key participants of six workshops and round table discussions organized by PalThink and Friedrich-Ebert-Stiftung for the project titled “Renewable Energy as a Sustainable Solution to the Electricity Crisis in Gaza Strip”[23]. Recommendations and approaches have been divided to short-term, medium and long-term concepts for their appropriate adoption by individuals at different levels of the decision-making process [23]. In 2016, researchers examined energy sector in Palestine and emphasized the use of renewable energy as promising replacement for fossil energy. The possible RE technologies are solar energy, wind energy, geothermal and/or biomass. Solar energy is already extensively

utilized inside Gaza Strip for domestic water heating; however, it is not as widely used for electricity production[17].

The environmental impact of energy is an important factor to decide switching to renewable energy. It is found the cost of traditional distillated oil fuel to produce 110 MW power/ year is 735,475,000 [ILS/year] in Gaza Strip and the environmental damage cost is 445,069,320 [ILs/year]. However, using renewable energy will increase the quality of the environment, reducing the amount of CO_2 emitted to the atmosphere by 484,250 kg/day [13]. Thus, involving the environmental damage cost into the economic calculations will increase the chances of competition in the energy market in favor of solar energy in Gaza-Strip [13].

In a recent work, the motivation for the local institutions to install solar energy is studied [24]. The authors presented three reasons for adopted solar energy system, which are the environmental factor, marketing value and solar system price. The institutions in the sample do not use solar energy as a full replacement. The main results of their study show that the local institutions used solar energy system to complement the current power system considering environmental value regardless to its cost. In addition, the attributes of the institutions have not affected the decision on adoption of solar system. Thus, authors recommend solar energy system to be used as a source of energy [24]. However, authors in their study did not consider other sectors in the local society, e.g., household, small shops, and hotels.

Table 3 present current type of solar energy systems used in different sectors. It can be seen that most domestic user use off-grid system. While industry use the solar system to lower cost of Fuel.

Table 3
Type and cost of solar energy systems used in all sectors

sectors	domestic	industrial	commercial	service	education
Type	Hybrid – Off grid system	Fuel Save Controller system	Fuel Save Controller system	Hybrid – On grid with Backup system	Hybrid – On grid with Backup system
Cost (USD $ /KWp)	2200	600	600	2500	2500
1 USD $=23.5 NIS [Source: https://www.xe.com/currencyconverter/convert at 28 May 2021]. [Source: author collection at May 2021].					

In [25], authors expand their work to include households. They used the employees for local hospital in Gaza as their population sample. This is due to the fact authors could not find a good reference to the list of people who installed solar system at their houses or they could have direct contact with owners of houses who installed solar system. They included the sample gender, job title and income to find the most effective attributes on the decision to adopt solar energy system among household owners. Results show that gender and job titles have no effect of the decision of adopting solar energy systems. However, income has a direct effect on the decision of adopting solar energy systems. Due to the important results presented in work [25]. Author extended their research work to including additional attributes; i.e. geographic region, type of house, and house ownership, which very important to investigate further the reasons behind installing the solar system in local Gazans' houses. The results will help decision maker to spot the degree of acceptance among

Gazans to install solar systems at their houses. Moreover, results will help policy makers to make major steps in energy market and in creating new power station to power Gaza Strip using solar energy.

[1] Source: Palestinian Central Bureau of Statistics, 2017, Ramallah.

[2] 1 USD = 3.588 NIS [Source: https://m.sa.investing.com/currencies/usd-ils at 27/04/2018].

[3] Source: Palestinian investment promotion agency, https://bit.ly/3u0znxO

[4] Source: Palestinian Central Bureau of Statistics, 2020, Ramallah https://rb.gy/nsmlfk

[5] https://rb.gy/nsmlfk

Research's Questions And Hypothesis

This work tries to give an answer to the following main question: "Can solar energy be an alternative to conventional energy for domestic use in Gaza Strip?" In this study, significance level is measured at $\alpha \leq 0.05$.

In the work, researchers chose the dependent variable "the usefulness of the implementation of solar energy in Gaza Strip private houses" and the independent variables are "environmental value of the system, solar energy price, and solar energy market values".

Thus, there are the following hypothesis that have been assumed in this research and derived from the main question.

There exit statistically significant differences in the employees' attitudes regarding successfully implementing solar energy technology (environmental benefit, solar energy price, market value) due to the following attributes:

1. the governorate, which they are living in.

2. house ownership.
3. the type of house, which they are living in.
4. the knowledge of renewable energy types.
5. the knowledge of the use of solar energy or solar panels.
6. the energy cost per month.
7. the availability of space for solar panels.
8. the willingness to share solar systems with neighbors.
9. possible sharing the cost of the solar systems with neighbors.
10. the fact the worker is already having the solar systems in his/her house.
11. the year that the worker insulated the solar systems in his/her house.
12.the percent of dependency on using solar systems in his/her house.

Research's Methodology

The authors chose the analytical descriptive approach in the study. They used electronic questionnaire that have been distributed to study sample. In choosing the study population, authors tried to get detailed information about local people who adopt solar system at their houses but there was not any available documentation about this. Thus, authors seek a highly populated community which in this case employees of Al-Shifa Medical Complex (1819 employees). The study sample is around 10% of the total population (200 employees).

The statistical analysis used in the study have been performed using SPSS program. The analysis included descriptive statistics, Pearson correlation coefficient, Cronbach's Alpha coefficient, Spearman Brown Split Half, and One Samples t test.

Results And Discussion

5.1 Description of the study sample

The sample (200 employees) are randomly chosen to fill the questionnaire. The geographical distribution of sample is 63.5% of the sample resides in Gaza governorate, 20% lives in Middle governorate, 11.5% lives in the north governorate, 2.5% lives in Khan Younis governorate and 2.5% lives in Rafah governorate. 66.5% of the sample lives in their owned houses, 20% of the sample lives with their parents' house, and 13.5% of the sample lives in rented houses. 67.5% of the sample lives in an apartment in a building, 29% of the sample lives in an independent house, and 3.5% of the sample lives in a farmhouse.

In terms of knowing the important types of renewable energy, 86% of the sample know the most important types of renewable energy, and 14% do not know the most important types of renewable energy. 77% of the sample had background on solar energy or using solar panels, and 23% of the sample had no background on solar energy or did not use solar panels. 49.5% of the sample has an average monthly energy bill between 150 NIS and 300 NIS, 41.5% of the sample has an average monthly energy bill less than 150 NIS and 9% of the sample has an average monthly energy bill more than 300 NIS. 62.5% of the study sample had enough space to install solar cells, 29% of the sample did not have enough space to install solar cells, and 8.5% of the sample are not sure that they have sufficient space to install solar cells. 50.5% of the sample refuse to share with neighbors' solar system, and 49.5% of the sample accept to share with the neighbors. 79% of the sample can invest less than 5000 NIS in constructing a solar system, 20.5% of the sample can invest between 5,000 NIS and 10,000 NIS in building a solar system, and 0.5% of the sample can invest more than 10,000 NIS in building a solar system. 80.5% of the sample do not use solar energy in their home, and 19.5% of the sample uses solar energy in their home. Among the one who has solar systems in their houses, 46.2% install the system before 2010, 33.3% install the system after 2014, and 20.5% install the systems in years between 2010 and 2014. 64.1% of the sample who use solar energy in their home are using solar system to cover between 20–50% of the total use of energy, and 30.8% uses solar energy to cover less than 20% of their energy needs, and 5.1% uses solar energy to cover more than 50% of their energy demands.

5.2 Statistical analysis results

In this part, the sample members are categorized according to their tendency to support adopt solar energy system to replace fossil fuel energy for domestic use in Gaza Strip according to environmental benefit, the

cost adoption of solar energy and market Value. To answer this question, arithmetic mean (A.M) and relative weight (R.W.) are calculated for each item of the questionnaire. The results are exhibited in Tables 1, 2 and 3.

Table (1) Respondents choose to adopt solar energy according to Environmental benefit

Item No.	Item	A.M.	Standard deviation	R. W. %	order
1	You have an initial knowledge of the environmental value of solar energy	3.370	1.273	67.40	7
2	You are very interested in environmental aspects	3.475	1.177	69.50	4
3	The environmental benefits of solar energy contribute to reducing the negative impact of high prices on traditional energy	3.635	2.347	72.70	2
4	The environmental cost of energy in your opinion is more important than the material cost	3.195	1.243	63.90	8
5	Environmental awareness campaigns are of great benefit at the level of increasing your environmental awareness	3.440	1.214	68.80	5
6	Awareness of environmental risks caused by the use of conventional energy sources	3.380	1.250	67.60	6
7	Traditional energy sources are polluting the environment and depleting natural resources from renewable sources of green energy	3.620	1.298	72.40	3
8	In case of equal cost of solar and conventional energy, you will choose solar energy	3.655	1.472	73.10	1
	General Average	3.471	1.409	69.43	

Table 1 shows the opinion of study sample member on adopting solar system according to Environmental benefit. The highest score goes to item 8, “the sample opinion goes to adopt solar energy system in case it has equal cost as conventional energy system”, which is ranked first with a R. W. of 73.10%. Item 4 "The environmental cost of energy in your opinion is more important than the material cost" is ranked the last with a R. W. of 63.90%. This means there is lack in awareness of protecting environment.

The total R.W. of awareness of the respondents to the environmental benefit of applying solar technology is 69.43% which is relatively low. Indicating the need to rise environmental awareness among locals of Gaza Strip.

Table (2) Respondents choose to adopt solar energy according to the solar system price

Item No.	Item	Mean	Standard deviation	Relative Weight %	order
9	Your input level affects your choice of the power source you are using	3.625	1.289	72.50	2
10	The increase in the price of solar energy contributes to traditional energy in not adopting it	3.500	1.276	70.00	3
11	Government subsidies, if any, for solar energy prices will push you towards adoption	3.710	1.230	74.20	1
12	Solar energy cost is less than traditional energy cost in the long term	3.350	1.363	67.00	7
13	The lack of conventional energy because of the political situation prompts you to adopt solar energy	3.135	1.231	62.70	8
14	Your dwelling in a remote location will push you to adopt solar energy	2.965	1.343	59.30	9
15	The availability of solar energy throughout the year prompts you to adopt solar energy	3.415	1.212	68.30	6
16	Knowing the details of the cost you pay for solar energy contributes to your dependence on it	3.425	1.175	68.50	5
17	Easy installation of solar panels and availability of spare parts and easy maintenance contributes to your adoption	3.445	1.202	68.90	4
	General Average	3.625	1.258	67.93	

Table 2 shows that item 11 "The government subsidy, if any, for the prices of solar energy that drives you to adopt it" is ranked the first with a R. W. of 74.20%. While item 14 "Your dwelling in a remote place that drives you to adopt solar energy" is ranked the last with a R. W. of 59.30%.

The total relative weight of awareness of the respondents to the adoption of solar energy technology according to the system price is 67.93%. This value is relatively low. Indicating the cost does not have high impact on respondent decision to adopt solar system.

Table (3) Respondents choose to adopt solar energy according to Market Value

Item No.	Item	Mean	Standard deviation	Relative Weight %	order
18	solar energy future is to replace the traditional energy place	3.435	1.214	68.70	4
19	You prefer to use solar energy as a green renewable energy source	3.690	1.149	73.80	3
20	You see the need for government centers specialized in green renewable energy research	3.850	1.106	77.00	1
21	The use of green renewable energy in various sources is one of the accessories for you	3.220	1.161	64.40	5
22	You encourage another source of energy to create competition and lower prices	3.815	1.182	76.30	2
General Average		3.602	1.162	72.04	

Table 3 displays that item 20: "You see the need for specialized governmental centers to research renewable green energy" is ranked the first with a R.W. of 77% and item 21 "The use of green renewable energy in various sources of supplies for you" is ranked the last with a R. w. of 64.40%.

The total R.W. of awareness of the respondents to the adoption of solar energy technology according to the market value is 72.04%. This relatively high showing that the market value has important effect on deciding to adopt solar systems by respondents.

First hypothesis results

To authenticate the first hypothesis **"**There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to living governorate.**"** the One-Way ANOVA test "F test" was used to find the differences between the two variables as shown in table 4.

Table (4): Comparison between the study sample responses according to governorate at which they live

		Squares' sum	the degree of freedom	the average squares value	the "F" test	Significance level
Environmental benefit	Between groups	7.743	4	1.936	1.893	0.113//
	Within groups	199.404	195	1.023		
	The total	207.147	199			
Solar Energy Price	Between groups	8.439	4	2.110	2.463	0.047*
	Within groups	167.006	195	0.856		
	The total	175.445	199			
Market value	Between groups	8.599	4	2.150	2.581	0.039*
	Within groups	162.441	195	0.833		
	The total	171.039	199			
The total	Between groups	7.917	4	1.979	2.646	0.035*
	Within groups	145.833	195	0.748		
	The total	153.749	199			
**significant at 0.01 *significant at 0.05 // not significant						

As displayed in table 4, the results of the One-Way ANOVA test "F test" exhibits that there are no statistical significance differences in the success of the application of solar energy technology, environmental benefit, by sample members according to their living governorate. But there are significance statistical differences in the success of the application of solar technology (solar energy price, market value, total) by sample members due to the living governorate. To illustrate these differences, the Scheffe' Test are used to illustrate this and results are giving accordingly.

Comparison between sample members responses according to their governate in terms for their adoption to solar system regarding solar energy price, market value, and total are given in Tables 5, 6 and 7 respectively.

Table (5): Exhibits differences between the categories of the governorate in which the employee lives according to solar energy price

	North V = 2.932	Gaza V = 3.436	Central V = 3.458	Khanyounes V = 4.178	Rafah 3.267
North V = 2.932	-	0.503	0.526	0.526	0.526
Gaza V = 3.436	-0.503	-	0.023	0.023	0.023
Central V = 3.458	-0.526	-0.023	-	-	-
Khanyounes V = 4.178	-1.245	-0.742	-0.719	-0.719	-0.719
Rafah 3.267	-0.334	0.169	0.192	0.192	0.192

Table (6): Shows the differences between categories of the governorate in which employee lives according to market value

	North V = 3.096	Gaza V = 3.704	Central V = 3.545	Khanyounes V = 4.040	Rafah V = 3.360
North V = 3.096	-	0.608	0.449	0.944	0.264
Gaza V = 3.704	-0.608	-	-0.159	0.336	-0.344
Central V = 3.545	-0.449	0.159	-	0.495	-0.185
Khanyounes V = 4.040	-0.944	-0.336	-0.495	-	-0.680
Rafah V = 3.360	-0.264	0.344	0.185	0.680	-

Table (7): shows the total differences between the categories of the governorate in which employee lives according to environmental factor and market price

	North V = 3.024	Gaza V = 3.555	Central V = 3.494	Khanyounes V = 4.148	Rafah V = 3.360
North V = 3.024	-	0.608	0.449	0.944	0.264
Gaza V = 3.555	-0.608	-	-0.159	0.336	-0.344
Central V = 3.494	-0.449	0.159	-	0.495	-0.185
Khanyounes V = 4.148	-0.944	-0.336	-0.495	-	-0.680
Rafah V = 3.284	-0.264	0.344	0.185	0.680	- V = 3.284

Table 5 shows that there are no statistically significant differences in the success of the application of solar energy technology, solar energy price, by sample members due to the governorate in which they live. But, there are no statistically significant differences in the success of the application of solar energy technology, market value, by the sample members due to living governorate as in table 6.

Table 7 displays that there are no statistically significant differences in the success of the application of solar energy technology, total, by the sample due to living governorate.

The second hypothesis results: to check the second hypothesis **"**There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the house ownership.**"** the One-Way ANOVA test "F test" was used to find the differences between the two variables.

Table (8): Comparison between the study sample responses according to house ownership

		Squares' sum	the degree of freedom	average squares value	the "F" test	The significance level
Environmental benefit	Between groups	0.621	2	0.311	0.296	0.744//
	Within groups	206.526	197	1.048		
	The total	207.147	199			
Solar Energy Price	Between groups	0.004	2	0.002	0.002	0.998//
	Within groups	175.440	197	0.891		
	The total	175.445	199			
Market value	Between groups	0.282	2	0.141	0.163	0.850//
	Within groups	170.757	197	0.867		
	The total	171.039	199			
The total	Between groups	0.028	2	0.014	0.018	0.982//
	Within groups	153.722	197	0.780		
	The total	153.749	199			

**significant at 0.01 *significant at 0.05 // not significant

The results of the One-Way ANOVA test "F test" shows that there is no statistically significant difference in the degree of success of the application of adoption solar energy technology (environmental benefit, solar energy, market value, total) by the sample due to house ownership as presented in table 8.

The third hypothesis results: to check the third hypothesis **"**There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the type of house, which they are living in.**"** One-Way ANOVA test "F test" was used to find the differences between the two variables.

Table (9): Comparison between the study sample responses according to type of house.

		Squares' sum	the degree of freedom	average squares value	the "F" test	The significance level
Environmental benefit	Between groups	13.536	2	6.768	6.887	0.001**
	Within groups	193.611	197	0.983		
	The total	207.147	199			
Solar Energy Price	Between groups	5.998	2	2.999	3.487	0.032*
	Within groups	169.446	197	0.860		
	The total	175.445	199			
Market value	Between groups	5.815	2	2.907	3.467	0.033*
	Within groups	165.224	197	0.839		
	The total	171.039	199			
The total	Between groups	7.599	2	3.799	5.121	0.007**
	Within groups	146.150	197	0.742		
		153.749	199			
**significant at 0.01 *significant at 0.05 // not significant						

Table 9 demonstrates that there are statistically significant differences in the success of applying solar energy technology (environmental benefit, solar energy price, market value, total) by the respondents due to the house type. To illustrate the differences between the categories of the type of house in which the employee lives according to environmental benefit, solar energy price, market value, and total, the Scheffe' Test are used and results are given in Figs. 10–13 respectively.

Table (10): Shows the differences between the categories of the type of house in which the employee lives according to environmental benefit

	Independent house V = 3.190	**Apartment in a building** **V = 3.637**	**House in a farm** **V = 2.607**
Independent house V = 3.190	-	0.447*	-0.582
Apartment in a building V = 3.637	-0.447*	-	-1.029*
House in a farm V = 2.607	0.582	1.029*	-

As shown in table 10, there are statistically significant differences in the attitudes of the respondents in the success of applying the solar energy technology, environmental benefit, according to the categories of housing type apartment in a building and (independent house, a house on a farm) in favor to apartment in the building.

Table (11): Shows the differences between the categories of the type of house in which the employee lives according to solar energy price

	Independent house V = 3.285	**Apartment in a building** **V = 3.485**	**House in a farm** **V = 2.619**
Independent house V = 3.285	-	0.199	-0.666
Apartment in a building V = 3.485	-0.1993	-	-0.866
House in a farm V = 2.619	0.666	0.866	-

But there are no statistically significant differences in the attitudes of the respondents regarding the success of applying the solar energy technology, energy price, according to the categories of housing type (apartment in a building, an independent house, a house on a farm) as in table 11.

Table (12): Shows the differences between the categories of the type of house in which the employee lives according to market value

	Independent house V = 3.559	**Apartment in a building** **V = 3.665**	**House in a farm** **V = 2.743**
Independent house V = 3.559	-	0.107	-0.816
Apartment in a building V = 3.665	-0.107	-	-0.922*
House in a farm V = 2.743	0.816	0.922*	-

And there are statistically significant differences in the attitudes of the sample members regarding the success of applying the solar energy technology, market value, according to the categories of housing type (apartment in a building, and a house on a farm) in favor to apartment in a building house type.

Table (13): Shows the differences between the categories of the type of house in which the employee lives according to the total

	Independent house V = 3.345	**Apartment in a building** **V = 3.596**	**House in a farm** **V = 2.656**
Independent house V = 3.345	-	0.251	-0.688
Apartment in a building V = 3.596	-0.251	-	-0.939*
House in a farm V = 2.656	0.688	0.939*	-

Further, Table 13 exhibits that there are statistically significant differences in the attitudes of the sample members regarding the success of applying the solar energy technology, total, according to the categories of housing type (apartment in a building, an independent house, a house on a farm).

The fourth hypothesis results: to check the fourth hypothesis **"**There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the knowledge of renewable energy types.**"** the independent sample "T" test was used to determine the differences between the two variables (Yes and No). "Yes" indicates that they know renewable energy. "No" indicates that they do not know renewable energy.

Table (14): Comparison between the study sample responses according to the knowledge of renewable energy types.

		the number	arithmetic average	standard deviation	the "T" test	the significance level
Environmental benefit	Yes	172	3.609	0.917	4.096	0.000**
	No	28	2.625	1.216		
Solar Energy Price	Yes	172	3.495	0.839	2.856	0.008**
	No	28	2.790	1.263		
Market value	Yes	172	3.722	0.808	3.534	0.001**
	No	28	2.864	1.243		
The total	Yes	172	3.609	0.767	3.772	0.001**
	No	28	2.760	1.151		
**significant at 0.01 *significant at 0.05 // not significant						

Table 14 displays a statistically significant differences in the success of applying solar energy technology (environmental benefit, solar energy price, market value, total) by repondents due to variable “Do you know the most important types of renewable energy” in favor of yes they know the most important types of renewable energy.

The fifth hypothesis results: to verify the fifth hypothesis **“**There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the knowledge of the use of solar energy or solar panels.**”** the independent sample “T” test was used to find the differences between the two variables. “Yes” indicates that they have knowledge of the use of solar energy and solar panels. “No” indicates that they do not have knowledge of the use of solar energy and solar panels.

Table (15): Comparison between the study sample responses according to the knowledge of usage of solar energy or solar panels.

		the number	arithmetic average	standard deviation	the "T" test	the significance level
Environmental benefit	Yes	154	3.578	0.930	2.375	0.021*
	No	46	3.114	1.223		
Solar Energy Price	Yes	154	3.447	0.838	1.152	0.254//
	No	46	3.227	1.213		
Market value	Yes	154	3.704	0.816	2.388	0.020*
	No	46	3.261	1.177		
The total	Yes	154	3.576	0.773	2.114	0.039*
	No	46	3.201	1.129		
**significant at 0.01 *significant at 0.05 // not significant						

Table 15 diaplays that there are no statistically significant differences in the success of the application of solar energy technology (solar energy price) by respondents due to the variable “Do you have a background on solar energy or the use of solar panels”. But there are statistical differences in the success of application of solar energy technology (environmental benefit, market value, total) by respondents due to variable “Do you have a background on solar energy or the use solar panels” for the benefit of their background on solar energy or solar panel.

Results related to the sixth hypothesis: “There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the energy cost per month.**”** To validate the hypothesis, the One-Way ANOVA “F” test was used to determine the differences between the two variables.

Table (16): Comparison between the study sample responses according to the energy cost per month.

		Squares' sum	the degree of freedom	average squares value	the "F" test	The significance level
Environmental benefit	Between groups	5.045	2	2.523	2.459	0.088//
	Within groups	202.102	197	1.026		
	The total	207.147	199			
Solar Energy Price	Between groups	3.116	2	1.558	1.781	0.171//
	Within groups	172.328	197	0.875		
	The total	175.445	199			
Market value	Between groups	0.756	2	0.378	0.437	0.646//
	Within groups	170.283	197	0.864		
	The total	171.039	199			
The total	Between groups	2.608	2	1.304	1.7	0.185//
	Within groups	151.141	197	0.767		
	The total	153.749	199			
**significant at 0.01 *significant at 0.05 // not significant						

Table 16 displays that there are no statistically significant differences in the success of the application of solar energy technology (environmental benefit, solar energy price, market value, total) by the respondents and the energy cost per month payable to utility company.

The seventh hypothesis results: to verify the seventh hypothesis **"**There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the availability of space for solar panels.**"** the One-Way ANOVA "F" test was used to find the differences between the two variables.

Table (17): Comparison between the study sample responses according to the availability of space for solar panels.

		Squares' sum	the degree of freedom	average squares value	the "F" test	The significance level
Environmental benefit	Between groups	1.095	2	0.547	0.523	0.593//
	Within groups	206.052	197	1.046		
	The total	207.147	199			
Solar Energy Price	Between groups	4.288	2	2.144	2.468	0.087//
	Within groups	171.156	197	0.869		
	The total	175.445	199			
Market value	Between groups	0.412	2	0.206	0.238	0.788//
	Within groups	170.627	197	0.866		
	The total	171.039	199			
The total	Between groups	1.548	2	0.774	1.001	0.369//
	Within groups	152.202	197	0.773		
	The total	153.749	199			
**significant at 0.01 *significant at 0.05 // not significant						

From table 17, we see that there are no statistically significant differences in the success of the application of solar energy technology (environmental benefit, solar energy price, market value, total) by respondents and the availability of space for solar panels

The eigth hypothesis results: to verify the eigth hypothesis **"**There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the willingness to share solar systems with neighbors.**"** the independent sample "T" test was used to find the differences between the two variables.

Table (18): Comparison between the study sample responses according to the willingness to share solar systems with neighbors.

		the number	arithmetic average	standard deviation	the "T" test	the level of significance
Environmental benefit	Yes	99	3.534	0.894	0.864	0.389//
	No	101	3.410	1.131		
Solar Energy Price	Yes	99	3.477	0.828	1.202	0.231//
	No	101	3.318	1.034		
Market value	Yes	99	3.709	0.801	1.624	0.106//
	No	101	3.497	1.029		
The total	Yes	99	3.573	0.743	1.335	0.183//
	No	101	3.408	0.991		
**significant at 0.01 *significant at 0.05 // not significant						

Table 18 exhibits that there are no statistically significant differences in the success of applying solar energy technology (environmental benefit, solar energy price, market value, total) by respondents due to the willingness to share solar systems with neighbors.

The ninth hypothesis results: To verify the ninth hypothesis “There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to possible sharing the cost of installing the solar systems.” the One-Way ANOVA “F” test was used to find the differences between the two variables.

Table (19): Comparison between the study sample responses according to possible sharing the cost of installing the solar systems.

		Sum of squares	the degree of freedom	the value of the average squares	the "F" test	the level of significance
Environmental benefit	Between groups	1.185	2	0.592	0.567	0.568//
	Within groups	205.963	197	1.045		
	The total	207.147	199			
Solar Energy Price	Between groups	1.391	2	0.695	0.787	0.457//
	Within groups	174.054	197	0.884		
	The total	175.445	199			
Market value	Between groups	0.403	2	0.202	0.233	0.793//
	Within groups	170.636	197	0.866		
	The total	171.039	199			
The total	Between groups	0.830	2	0.415	0.535	0.587//
	Within groups	152.919	197	0.776		
	The total	153.749	199			
**significant at 0.01 *significant at 0.05 // not significant						

Table 19 shows that there are no statistically significant differences in the success of the application of solar energy technology (environmental benefit, solar energy price, market value, total) by sample members due to possible sharing the cost of the solar systems with neighbors.

The tenth hypothesis results: To verify the tenth hypothesis “There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the fact the worker is already having the solar systems in his/her house.” the independent sample “T” test was used to find the differences between the two variables.

Table (20): Comparison between the study sample responses according to the fact the worker is already having the solar systems in his/her house.

		the number	arithmetic average	standard deviation	the "T" test	the level of significance
Environmental benefit	Yes	39	3.510	0.962	0.261	0.794//
	No	161	3.462	1.037		
Solar Energy Price	Yes	39	3.427	0.884	0.227	0.821//
	No	161	3.389	0.954		
Market value	Yes	39	3.851	0.797	1.884	0.061//
	No	161	3.542	0.948		
The total	Yes	39	3.596	0.797	0.840	0.402//
	No	161	3.464	0.898		
**significant at 0.01 *significant at 0.05 // not significant						

Table 20 shows that there are no statistically significant differences in the success of the application of solar energy technology (environmental benefit, solar energy price, market value, total) by respondents due to the fact the worker is already having the solar systems in his/her house.

The eleventh hypothesis results: To verify the eleventh hypothesis “There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the year that the worker insulated the solar systems in his/her house.” the One-Way ANOVA “F” test was used to find the differences between the two variables.

Table (21): Comparison between the study sample responses due to the year that the worker insulated the solar systems in his/her house.

		Squares' sum	the degree of freedom	average squares value	the "F" test	The significance level
Environmental benefit	Between groups	0.902	2	0.451	0.474	0.626//
	Within groups	34.235	36	0.951		
	The total	35.137	38			
Solar Energy Price	Between groups	0.755	2	0.377	0.469	0.629//
	Within groups	28.938	36	0.804		
	The total	29.692	38			
Market value	Between groups	2.050	2	1.025	1.671	0.202//
	Within groups	22.087	36	0.614		
	The total	24.137	38			
The total	Between groups	1.113	2	0.556	0.871	0.427//
	Within groups	23.010	36	0.639		
	The total	24.123	38			
**significant at 0.01 *significant at 0.05 // not significant						

There are no statistically significant differences in the success of the application of solar energy technology (environmental benefit, solar energy price, market value, total) by the respondents due to the year that the employee insulated the solar systems in his/her house as in table 21.

The twelfth hypothesis results: to verify the twelfth hypothesis "There is statistically significant differences in the attitudes of the employees of Al-Shifa Medical Complex in Gaza regarding the success of applying the solar energy technology (environmental benefit, solar energy price, market value) due to the percent of dependency on using solar systems in his/her house." the One-Way ANOVA "F" test was used to find the differences between the two variables.

Table (22): Comparison between the study sample responses due to the percent of dependency on using solar systems in his/her house.

		Squares' sum	the degree of freedom	average squares value	the "F" test	The significance level
Environmental benefit	Between groups	2.019	2	1.009	1.097	0.345//
	Within groups	33.118	36	0.920		
	The total	35.137	38			
Solar Energy Price	Between groups	2.925	2	1.462	1.967	0.155//
	Within groups	26.767	36	0.744		
	The total	29.692	38			
Market value	Between groups	1.832	2	0.916	1.479	0.241//
	Within groups	22.305	36	0.620		
	The total	24.137	38			
The total	Between groups	2.166	2	1.083	1.775	0.184//
	Within groups	21.957	36	0.610		
	The total	24.123	38			
**significant at 0.01 *significant at 0.05 // not significant						

Table 22 shows that there is no statistically significant difference in the success of the application of solar energy technology (environmental benefit, solar energy price, market value, total) by the respondents due to the percent of dependency on using solar systems in his/her house as an energy source.

Conclusion

This work aims to find out the main reasons for Gazans household to adopt solar energy systems in their houses as replacement to the traditional sources of energy. Authors built electronic questionnaire that has been distributed to the study sample that consists of 200 employees working at Al-Shifa medical complex. In the study, the role of different attributes of the study sample including gender, income and job titles is studied. Authors also considered the effect of environmental, marketing and price factors on motivating the study sample to use solar energy. Authors found out that the sample members use solar energy to complement the current traditional energy system. The collected data have been analyzed using SPSS. The results show that the governorate in which employees are living, house ownership, total cost of energy/month, space to install the space to install the panes, and the desire to share the cost with neighbor do not affect sample decision on

adopting solar energy. But, type of house, knowledge of renewable energy and how to use solar panel affected the sample decision on adopting solar energy system. The result makes sense because the adoption of solar energy requires good budget.

Recommendations

According to our results, we recommend researcher for further researching in finding the awareness of local people of adopting other renewable energy, i.e. wind energy, in Palestine and in particular in Gaza Strip. We also recommend that the government should make clear policy for implement solar energy systems. Further, government should provide ways of support to Gazans to be able to adopt the solar energy system. In addition, universities should expand the knowledge about solar system to local society through general lectures, training courses and/or required courses. We recommend businessmen to invest in the renewable energy sector in particular solar energy system.

Declarations

3.1. Availability of data and materials

The data is the collection of information from the questionnaires. It will be provided upon request.

3.2. Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

3.3. Funding

There is no available funding to declare

3.4. Ethics approval and consent to participate

Not applicable

3.5. Consent for publication

Not applicable

3.6. Authors' contributions

Hala J. El-Khozondar: stated the idea of the work, built the questionnaire, analyzed data collected and write up the manuscript. Fady El-batta: wrote the methodology and helped in analyzed the collected data. All authors read and approved the final manuscript

References

1. Roos, C., *Solar Electric System Design, Operation and Installation*. 2009, Washington State University Extension Energy Program.: Olympia.

2. Parimita Mohanty, K.R., *Solar Photovoltaic System Applications*. 2016, London: Springer.

3. Dar-Mousa, R.N.a.M., Z., *Analysis of the pattern of energy consumptions and its impact on urban environmental sustainability in Jordan: Amman City as a case study.* Energy, Sustainability and Society, 2019. **9**(15): p. 1-12.

4. Nassar Y. F., A.S.Y., *Assessment of solar energy potential in Gaza Strip-Palestine.* Sustainable Energy Technologies and Assessments, 2019. **31**: p. 318-328.

5. *Case Study: "Renewable Energy in the Gaza Strip: Short, Mid, and Long-Term"*. 2014, PalThink for Strategic Studies: Gaza.

6. Nassar Y. F., A.S.Y., *Wind Energy Potential in Gaza Strip-Palestine state.* Solar Energy And Sustainable Development 2018. **7**(2): p. 41-57.

7. Elnaggar, M., Edwan, E., & Ritter, M. , *Wind Energy Potential of Gaza Using Small Wind Turbines: A Feasibility Study.* Energies, 2017. **10**: p. 1-13.

8. Abo Hamed T., F.H., Azraq M., *Renewable energy in the Palestinian Territories: Opportunities and challenges.* Renewable and Sustainable Energy Reviews, 2012. **16**: p. 1082– 1088.

9. Beithou N., A.A.-G.Z., *Geothermal Energy in Palestine: Practical Applications.* Journal of Applied Research on Industrial Engineering, 2017. **4**(3): p. 174–179.

10. MOH, *Solar energy implementation at local hospitals*. 2017, Ministry of health: Gaza.

11. MOEHE, *Solar system to power schools in Gaza*. 2017: Gaza.

12. GEDCO. 2017, Gaza Electricity Distribution Corporation: Gaza.

13. Nassar, Y.F., Alsadi, S., *Economical and Environmental Feasibility of the RenewableEnergy as a Sustainable Solution for the Electricity Crisis in the Gaza Strip.* International Journal of Engineering Research and Development, 2016. **12**(3): p. 35-44.

14. Ismail M, M.M., Mahlia T. , *Energy trends in Palestinian territories of West Bank and Gaza Strip: possibilities for reducing the reliance on external energy sources.* Renew Sustain Energy Rev, 2013. **28**: p. 117–129.

15. Aydi, j.y., *The solar Energy potential of gaza strip.* Global Journal of researches, 2011. **7**: p. 47-51.

16. Abo Hamed T., F.H., Isma'il L. , *Assessing renewable energy potential in Palestine.* Am Sol Energy Soc, 2013: p. 1–6.

17. Juaidi, A.F., *An overview of renewable energy potential in Palestine.* Renewable and Sustainable Energy Reviews, 2016. **65**: p. 943–960.

18. Ouda, M., *Prospects of Renewable Energy in Gaza Strip*. NET2001. 2001, China: Energy Research and Development Center. 1-6.

19. Naim, A.N., *Potential of Solar Pumping in Palestine*, in *International Water Technology Conference (IWTC)*. 2010, Cairo. p. 1-11.

20. Nassara, Y.F., Alsadib, S. Y., *Assessment of solar energy potential in Gaza Strip-Palestine.* Sustainable Energy Technologies and Assessments, 2019. **31**: p. 318-328.

21. Yaseen, B.T., *Renewable Energy Applications in Palestine*, in *2nd International Conference on the Palestinian Environment*. 2009, An-Najah University: Nablus, Palestine. p. 52-65.

22. Abu-Hafeetha, M.F.N., *Planning for Solar Energy as an Energy Option for Palestine*, in *Urban and Regional Planning*. 2009, An-Najah National University: Palestine.

23. Studies, P.f.S., *Case Study: "Renewable Energy in the Gaza Strip: Short, Mid, and Long-Term"*. 2014: Gaza.

24. El-Khozenadar, H.J., & El-batta, F. F. , *Solar Energy as an alternative to conventional energy in Gaza Strip: Questionnaire based study.* An -Najah Univ. J. Res. (N. Sc.), 2018. **32**(1).

25. El-Khozenadar, H.J., & El-Batta, F. F., *Survey Study for the Usage of Solar Energy at Household by the Employees of Al-Shifa Medical Complex in Gaza Strip.* ournal of Physics: Conference Series, 2018. **1108(1)**.

Figures

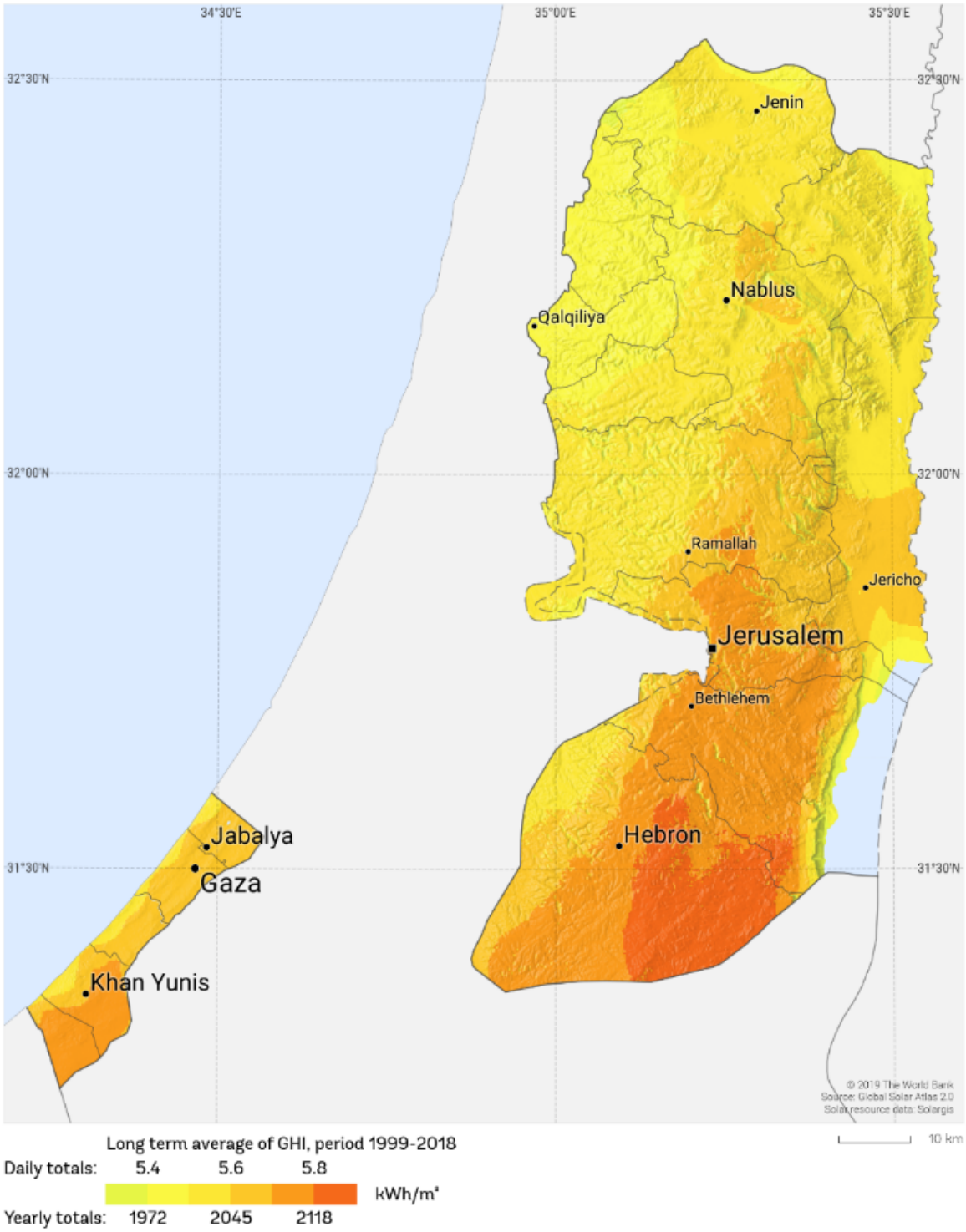

Figure 1

Location and Global horizontal irradiation (GHI) for Gaza Strip, Palestine. Source: https://rb.gy/nsmlfk