

Innovations

Green marketing of solar energy projects in Iraq is a way to ensure sustainable development-Analytical Study

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Received: 19 May 2022 Accepted: 25 June 2022 Published: 30 June 2022

Abstract

The research aims to demonstrate the role of green marketing of solar energy projects in Iraq to achieve the sustainable development. The marketing mixture, green marketing strategies and sustainable development were highlighted. To achieve the research objectives, a questionnaire has been utilized as a source to collect information from specialists working in research and academic centers for solar energy projects. The first axis included the personal aspect, while the second axis included scientific research questions from green marketing strategies and dimensions of sustainable development (economic, social, environmental). The total value of the stability was 85%, and the data were analyzed using the Statistical Analysis System -SAS program. The research reached a set of conclusions and recommendations, including that green energy plays an important role in achieving the sustainable development of the electric energy by improving economic and social conditions. Therefore, it is necessary to encourage the use of solar energy to obtaining electricity as it is clean, safe, healthy environmental energy and achieves significant savings in the long term.

Keywords: 1.green marketing, 2.green marketing, 3.green defense strategy, 4.sustainable development.

Introduction

As a result of the rise in energy prices and the increase in demand for it as well as its link to traditional fuels and the environmental pollution that the earth is exposed to as a result of the emission of carbon dioxide and other gases that led to global warming and high temperatures. Clean, non-polluting, and sustainable energy represented by solar energy, wind energy and hydroelectricity. The importance of using solar energy projects will be explained, as one of the green marketing activities to ensure energy sustainable development.

Iraq has a huge solar energy throughout around the year, as it is located in the global solar belt, as every 100 square kilometers of the western and southern deserts (Northern and Southern Badia).it has the ability to produce energy equivalent to 30 million tons of oil equivalent annually by using photovoltaic panels, this makes Iraq an ideal place to invest in solar energy, which can be a long-term solution to the electricity shortage. The potential solar energy is estimated at 3.4 billion kilowatts per year, equivalent to a total capacity of 5.9 gigawatts, corresponding to an area of approximately 10 square kilometers of solar cells with an efficiency of up to 16%.

Therefore, we tried with this research to shed light on the impact of green marketing with its four strategies on achieving sustainable development using solar energy projects in providing electrical energy. In the third part, we presented the practical side, and the fourth part included conclusions and recommendations.

First: The Research Methodology

1. Research problem

The research starts with a question: Can green marketing of solar energy projects (with its four strategies) contribute to achieving sustainable development energy in Iraq?

2. Research objectives

- a. The role of green marketing of solar energy projects in achieving sustainable development energy in Iraq.
- b. The most important challenges that prevent the feasibility of using green marketing of solar energy projects in achieving sustainable development energy.
- c. An attempt to activate the green marketing of solar energy projects in order to achieve sustainable development energy and increase the awareness of the Iraqi consumer of the need to replace traditional electric energy with solar energy.

3. Research importance

- a. Identifying the role of green marketing of solar energy projects and its importance in achieving sustainable development.
- b. The importance of using solar energy to support renewable energy projects
- c. An attempt to draw consumers' attention to the importance of using solar energy in achieving sustainable development and the importance of their support for it.

4. Research limits

This research was applied to a sample in the field of renewable energy (solar energy) in the city of Baghdad, numbering forty workers in various research centers, colleges and institutes as spatial limits, while the temporal limits of research were limited to the period from 1/1/2021 to 31/12/2021.

5 .Research hypotheses

- a. There is a significant correlation between green marketing strategies for solar energy projects in achieving sustainable development.
- b. There is an impact of green marketing strategies of solar energy projects in achieving sustainable development.

6 .Research methods and tools used

Using the descriptive analytical approach in order to understand the aspects of the subject and understand its components and analyze its dimensions, where many studies, research and books were used. In the analytical aspect, the questionnaire was relied upon after its examined by the arbitrators, as it was distributed electronically to a sample of 40 specialists in the field of solar energy, To find out their views on the subject, the statistical program Statistical Analysis System -SAS was used to analyze the data to study the effect of different factors on the studied variables, and the significant differences between the averages, T-test and F test were compared, the correlation coefficient-r and the regression coefficient were estimated. -b). In addition to percentages, arithmetic mean, standard deviation.

Second: Green Marketing: A Defining Framework

a. Green Marketing Concept

Green marketing seeks in the context of its application to prepare early for the possibility of the end of natural resources or their scarcity significantly in the future (in the medium and long term), and the excessive depletion of natural resources, especially those that give a cheerful image of nature, would affect the natural aesthetic and spoil the enjoyment of life for humans From here, man began to think about the issues of green marketing, which are the recycling of resources and end-of-use goods or their consumption to benefit from them as a suitable alternative to primary or natural resources by consuming new raw materials from manufactured nature instead of consuming new raw materials from nature.

Green marketing is defined as an integrated systemic approach aimed at influencing the preferences of customers in a way that pushes them to seek harmless products and modify their consumption habits in line with the requirements of the environment and provide products whose end result is to protect the consumer and the environment and achieve profits for the organization (**Al Bakri & Al Nouri, 2007**). It is also the institution's commitment to deal with goods that are not harmful to the environment and society and to carry out marketing activities within the framework of a strong commitment to environmental responsibility and within specific controls to ensure the preservation of the environment and not to harm it. (**Aisha & Al-Jilali, 2020**).

b. Green marketing mix

The difference between the components of the green marketing mix and traditional marketing lies in the way they are managed to achieve the required goals, as green marketing seeks to achieve environmental and social goals in addition to meeting the desires of consumers and achieving the goal of profitability. The following are the components of the green marketing mix:

- 1- The green product: It is a product that is designed to reduce the consumption of natural resources and meet the needs of consumers in terms of quality, performance and price, and does not leave negative effects on the environment. (**Solaiman et al, 2015**)

2- Green pricing: It is an important and decisive factor in the green marketing mix. Most consumers are not willing to pay a higher price to get a green product unless they have a clear perception of the added value of the green product related to improving performance, efficiency, design, product attractiveness and other characteristics. As green products carry a price addition due to the additional costs of research and development and modification in the production method to make the product environmentally viable and in line with the goal of efficient use of energy and reduce spoilage and loss in the use of raw materials. **(Sudhalakshmi,2014).**

3. Green promotion: It is a set of means used by organizations to convey their image and environmental trends to customers while conveying their marketing message regarding the products or services they provide. Promotion takes several forms such as advertising, sales promotion, public relations and personal selling, packaging in addition to environmental labels, which is a type of symbol used as a guarantee to customers that the products bearing the sign comply with environmental standards**(Al-Heali,2020).**

4. Green distribution: It means the use of distribution outlets that deal with green products and are suitable for consumers in terms of easy access to them while ensuring their environmental commitment. Distribution is considered the main link in achieving the goal of any organization, which is the arrival of products to the final customer and distributors, which is a competitive advantage for the organization by maintaining the relationship with customers and distributors, building new technologies that distinguish it from others and obtaining the support of reference groups. **(Kafi, 2014).**

c. Green marketing mix strategies

The literature indicates that there are four green marketing strategies:**(Shahed &Daffrou, 2017),(Shabaniet al, 2013).**

1. The green-leaning strategy: This strategy is adopted by the organization that has environmental awareness and takes the social responsibility upon itself to protect the environment, and at the same time it does not promote its products in the media.

2. Green defense strategy: This strategy is adopted by organizations that emphasize that their products are green and integrate green marketing in their activities and inform consumers of their green products through communication channels in a limited way. They use the green product in addition to promoting and adopting it when the organization faces intense competition.

3. Green shadow strategy: This strategy is adopted by organizations that have long-term investments aimed at developing their products and services to be environmentally friendly and depends on the elements of the marketing mix product, price and promotion. When the product promotion is effective, it performs its role and justifies the price that may be high for green products.

4- The highly green strategy: The organization focuses its green strategy on the product in its entire life cycle and integrates all environmental issues and this strategy uses all the elements of the marketing mix.

d. Solar energy

Solar energy is one of the clean, renewable and sustainable energy sources that never run out, and it is one of the most important types of energy that a person can use for its relative abundance, but it does not flow regularly throughout the day due to clouds and dust, and its intensity varies during the seasons of the year **(Shehata, 2001)**. It can be used to develop techniques for water desalination and electric power generation to rationalize the use of electricity and reduce waste, and to modify government support policies so it reduce the total cost to the government by significantly reducing consumption and motivate citizens to rationalize energy consumption **(Shehab El-Din, 2010)**. The most common uses of solar energy at present is the applications of solar energy for domestic uses in heating homes, water heating and air conditioning **(U.S. Department of Energy, 2008)(Omar, 2004).**

Solar energy is also among the renewable energies that have been satisfied with Western and Arab countries as a clean and low-cost energy, and it is used directly as thermal energy or to secure energy, and its use has expanded to provide buildings with electricity; They are used to provide electric power for navigation boats, to dry some agricultural crops to protect them from damage, and to feed some household needs such as a water pump and lighting **(Center for Studies and Research,2010)**. In Iraq, its cities enjoy a sunny atmosphere most days of the year, where the number of sunny days is not less than (200) days, and thus it is considered one of the areas of high thermal energy. Therefore, solar energy is a source of sustainable energy and a renewable resource of national wealth resources, and it can be exploited in a variety of fields, including Generating electric power for domestic uses, street lighting, squares, public parks and traffic signs. **(Mustafa & Hamid, 2020)**.

One of the advantages of solar energy is that it does not contribute to environmental pollution, as it does not cause any harmful gas emissions to the environment and is also not subject to the control of international and local policy systems that limit the expansion of the exploitation of any quantity of it, in addition to its non-depletion and availability in almost all places.

e. The concept of sustainable development and its dimensions

The concept of sustainable development emerged during 1987 and means, according to international organizations affiliated with the United Nations, that it is that development that contributes to the rational management of the society's natural resources to satisfy the needs of the current generation without compromising the needs of future generations. **(Abdullah,1998)**. It was also defined as the use of natural resources in order to achieve the well-being of society, without harming or harming the environment **(Abdul-Badi', 2001)**. Sustainable development is linked to the concept of economic stability, which is defined as achieving the best possible use of the economic resources available in the economy.**(Husain&Ayesh,2020)**.

Sustainable development is characterized by a set of features:

- a. Time dimension: long-term development, as the time dimension is the basis on which its strategies are built.
- b. Caring for human rights: take it as meeting the needs of the current and future generations
- c. Preserving the sustainability of natural resources: sustainable development places among its priorities the preservation and development of natural resources in all their forms.
- d. Balanced integrated development: regulating and balancing policies for the use of natural and human resources, investment opportunities, and the best choice of technology in order to achieve coordination and integration between the economic, social and environmental dimensions of sustainable development. Therefore, it can be said that sustainable development has economic, social and environmental dimensions. In the next paragraph, we will discuss the role of solar energy in achieving those dimensions.

f. The role of solar energy in achieving dimensions of sustainable development

Sustainable development has economic, social and environmental dimensions, and the question that arises is how does solar energy contribute to achieving these dimensions?**(AL- Sarn, 2012)**.

- **The role of solar energy in achieving sustainable development within the economic dimension**

Achieving economic development requires investment in the sectors of the economy (industrial, agricultural, service and related diversified activities), as more investment will increase the demand for traditional (non-renewable) energies, leading to a decrease in their quantities (scarcity) over time, and higher prices, etc. This is related to a decrease in the volume of investment and job opportunities in the context of a decrease in the national income of the country. Therefore, investment in solar energy projects, which are

among the sources of renewable energy, will work towards implementing macroeconomic policies that contribute to achieving sustainable development, creating new sustainable job opportunities, and establishing investment projects that achieve Added value, as well as achieving balanced development in rural areas.

- **The role of solar energy in achieving sustainable development within the social dimension**

Investing in solar energy projects contributes to improving the quality of life and reducing poverty and unemployment rates in society. The United Nations Conference on Sustainable Development, held in Rio de Janeiro in 2012, highlighted the need for the world to move towards obtaining energy from its renewable sources (such as solar energy). Solar as a main source of electrical energy will improve human development indicators through the impact it has on improving health and education services. Also, the electric energy from solar energy will be consistent with the reality of development in remote and rural areas, as it will meet the needs of the residents of those areas in order to achieve balanced development in various regions. Also, the waste left by solar energy (as a source of electricity generation) is considered harmless to health compared to the waste generated by the use of traditional energy, which improves the quality of life.

Infrastructure projects such as health facilities, hospitals and schools, especially in isolated desert areas, need huge funding sources, but if they are designed with green building techniques, as they draw their energy from renewable energy sources (sun, wind, water, etc.), it will reduce connection costs. It would also stimulate investment in this field and contribute to distributing fair opportunities among all regions of the same country.

- **The role of solar energy in achieving sustainable development within the environmental dimension**

Investment in solar energy projects works to ensure the provision of a healthy and safe environment to sustain life and protect it from pollution caused by traditional energy sources, by reducing greenhouse gas emissions, protecting the atmosphere, supporting and financing projects for the use of solar energy, and achieving consistency and integration between the policies of the energy sector and various sectors of the economy, including the transport sectors. And industry, is among the gains that can be achieved in the environmental aspect to achieve sustainable development.

Third: The applied aspect of research

1. Description of the search community

The research was applied to a sample of consumers specialized in the field of solar energy, the number of the sample members was forty, who were chosen randomly. It has been notes in Table (1) the distribution of the sample members according to personal variables that.

1 .With regard to the gender variable, we find that the largest proportion is the proportion of males, which constituted approximately 75% of the sample, while the proportion of females constituted about 25%.

2 .It is noted that the age group between 26-35 years represented the largest part of the sample members as it constituted 40%, while the age group of 18-25 years was the least of the total sample members by about 5%.

3 .With regard to the certificate, we note that the category of individuals who obtained a higher degree (Master's or Ph.D.) constituted the largest proportion of the sample 40%, while the category of higher diploma was the lowest, constituting about 2.5%.

4.Also, it has been noted that the years of service from 1-5 years for the sample members were the highest, as they constituted 37.5%, followed by the years of service 21 years and over at 25%, while the years of service 16-20 constituted the lowest percentage of the sample members, which amounted to 7.5%.

5. With regard to the training courses for the sample members, the largest percentage of them participated in training courses by 75%, and the least percentage that did not participate in the training courses reached (25).

Table 1: Distribution of the sample members according to personal information

Properties	the details	the number	%
gender	Male	30	75
	female	10	25
age (year)	18- 25	2	5
	26- 35	16	40
	36- 45	9	22.5
	46- 45	5	12.5
	56- 65	5	12.5
	greater than 66	3	7.5
Academic achievement	Preparatory and below	2	5
	Technical Diploma	1	2.5
	Initial certificate	20	50
	Higher Diploma	1	2.5
	Master's/PhD	16	40
Years of service	1-5	15	37.5
	6-10	5	12.5
	11-15	7	17.5
	16- 20	3	7.5
	>20	10	25
training courses	Yes	30	75
	No	10	25

2. Field search results

In this section, we highlight the statistical results that we obtained as a result of analyzing the answers of the 40 members of the targeted sample of specialists in the field of solar energy, analyzing the research variables, and displaying and interpreting the results of their answers statistically through the

arithmetic mean and standard deviation of the research variables, as well as the relative importance of each of them, as we note in Tables 2 and 3.

Table 2: Statistical indicators of the green marketing strategy for solar energy projects according to the answers of the research sample members

N	green marketing strategy	arithmetic average	standard deviation	Rank	Level
1	The green-leaning strategy	3.77	0.6	1	high
2	Green defensive strategy.	3.66	0.72	2	high
3	Green Shadow Strategy.	3.57	0.66	3	Average
4	very green strategy	3.34	0.54	4	Average
	Total	3.58	0.63		Average

The level of practicing green marketing and sustainable development strategies was measured for each of the questionnaire phrases according to the formula:

Extent of practice = the highest score - the lowest score/3, so the formula becomes the extent of practice = $5-1/3 = 1.33$

Therefore, the results will be as follows:

1. Low application range represented by the items with an arithmetic mean >2.33
2. Average level of application: represented by the paragraphs whose arithmetic average is between 2.33-3.66.
3. High level of application: It is embodied by the items whose arithmetic mean is greater than 3.66.

We notice in Table 3 that the arithmetic mean value of the extent of application of the total variables of green marketing strategies in its four forms, reached 3.58, while the standard deviation was 0.63 and the level of average application.

Table 3: Statistical indicators and the extent of the overall application of sustainable development variables in their economic, social and environmental dimensions, according to the answers of the members of the research sample.

N	Dimensions of sustainable development	arithmetic average	standard deviation	Rank	Level
1	Diversify sources of income and create new job opportunities.	3.94	0.66	1	High
2	Development of agricultural activities and related industries.	3.9	0.61	2	High
3	Reducing the level of unemployment and poverty.	3.89	0.75	3	High
4	Improving the standard of living in the countryside and reducing their migration to the city.	3.77	0.71	4	High
5	Preserving the environment from pollution	3.76	0.48	5	Average
6	Mitigating the effects of climate change in the long run.	3.73	0.42	6	Average
	Total	3.83	0.6		High

It has been noted in Table 3 that the total arithmetic mean of the dimensions of sustainable economic, social and environmental development has reached 3.83 and the standard deviation is 0.60, which indicates a high level of application. The economic dimension (diversification of income sources and creation of new job opportunities) achieved the highest arithmetic average, reaching 3.94 with a standard deviation of 0.66 and a high application extent. While the environmental dimension, in its paragraphs (preserving the environment from pollution and mitigating the effects of climate changes in the long run), achieved the lowest arithmetic average of 3.76 and 3.73, and it has been noted, the answers were mostly high, which indicates the agreement of the sample that there is a relationship between green marketing strategies and achieve the dimensions of sustainable development. Therefore, we can accept the first hypothesis of the research, which indicates that there is a significant correlation between green marketing strategies for solar energy projects and the achievement of sustainable development dimensions.

In order to test the hypothesis of the research, we used Simple Linear Regression to verify the existence of a statistically significant influence relationship at the level of significance ≤ 0.05 between green marketing strategies (green slanted strategy, green defensive strategy, green shadow strategy, highly green strategy) and development dimensions. sustainable (economic, social, environmental) as shown in Table 4.

Table 4: Simple regression analysis of the variables of green marketing strategies and sustainable development.

Statistical indicators	R	R ²	F	level of statistical significance
Value	0.786	0.615	78.078	0.000 ^b
Parameters of the form	code	Value	T- test	level of statistical significance
stability coefficient	α	1.52	6.668	0.000
simple linear regression coefficient	β	0.704	12.352	0.000

From the results of the simple regression analysis shown in Table 4, the following is evident:

- The value of R (Pearson's linear correlation coefficient) was 0.786, and that value is statistically significant at the level of $\alpha \leq 0.005$. It indicates that there is a positive relationship between the four green marketing strategies as independent variables and the dimensions of sustainable development as dependent variables, as well as the sign of the positive correlation coefficient indicating that the relationship is direct positive. The more we direct towards these strategies, the more this leads to them serving as a means to achieve sustainable development.
- The value of the simple linear regression coefficient (β) was 0.704, which indicates that it is statistically significant, as the value of the t-test reached 12,352 at a significance level of ≤ 0.005 , which confirms the existence of an influence and explanatory relationship between the independent variable (green marketing strategies) and the dependent variable (dimensions of development). The positive sign of the value of the simple linear regression coefficient β means that an increase in green marketing strategies by one unit leads to an increase in the indicators and dimensions of sustainable development by a value of 0.786 units. Also, the value of α for the simple linear regression model was 1.52, which means that it is statistically significant, as the value of the t-test statistical reached 6.665 at the level of statistical significance ≤ 0.005 α , as it embodies the value of the dependent variable when the value of the independent variable is equal to zero.
- We note in Table 5 that the value of the coefficient of determination R², which embodies the explanatory power of the simple linear regression model, has reached 0.615, which is statistically

significant, as the value of the F-test amounted to 78.078 at the level of statistical significance ≤ 0.005 , which means that the simple linear regression model, through the green marketing strategies that represent the independent variable, can explain 0.615 of the difference in the dependent variable (dimensions of sustainable development), and this is a relatively high percentage and confirms the existence of a statistically significant influence relationship at the level of significance Statistical $0.005 \leq \alpha$ between green marketing strategies and the dimensions of sustainable development.

Therefore, we reject the null hypothesis and accept the alternative hypothesis, meaning that there is a statistically significant influence relationship at the significance level of $\alpha \leq 0.005$ between green marketing strategies and the dimensions of achieving sustainable development, in other words, the use of green marketing strategies is a means of achieving sustainable development indicators.

Fourth: Conclusions and Recommendations

1. Green energy plays an important role in achieving the dimensions of sustainable development and improving economic and social conditions.
2. Rationalizing the consumption of electrical energy and encouraging the use of solar energy to obtain electricity because it is clean and safe energy, healthy, environmental friendly, and achieves great material savings in the long run.
3. Intensifying efforts to carry out guidance campaigns and educational programs to raise consumers' awareness and change their culture towards environmental responsibility.
- 4- Activating the role of the Consumer Protection Association towards educating consumers about the importance of using solar energy to generate electricity instead of traditional energy sources, which in turn affects the preservation of the environment, consumer health, and the preservation of energy sources from exhaustion.

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