



# Impact of Renewable Energy Initiatives in the UAE On the Local Economy and Environmental Sustainability

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## Abstract

This study explores the impact of renewable energy initiatives on achieving environmental and economic goals in the UAE. The study tested several hypotheses to assess the relationship between renewable energy projects and various outcomes, including economic growth, air pollution reduction, and achieving carbon emission reduction targets. The results reveal a strong positive relationship between achieving the UAE Energy Strategy 2050 goals and improving economic growth indicators, with a high level of statistical significance. Furthermore, the implementation of renewable energy projects is significantly associated with reducing air pollution levels. The study also confirms that increasing the use of clean energy is positively associated with achieving the carbon emission reduction targets set in the UAE Strategy 2021. In addition, technological innovations in the field of renewable energy have proven to have a significant positive impact on environmental sustainability. The results indicate that promoting renewable energy projects, investing in clean energy technology, and promoting supportive policies are critical to achieving sustainability goals in the UAE.

**Keywords :** Renewable energy, Environmental sustainability, Air pollution reduction, Carbon emission reduction, Energy Strategy 2050, United Arab Emirates, Technological innovations, Economic growth, Clean energy, Environmental investments.

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## Introduction

In the 21st century, countries face major environmental and economic challenges due to reliance on fossil fuels and the associated greenhouse gas emissions and climate change. The United Arab Emirates stands out as a pioneer in the transition to renewable energy and environmental sustainability, committed to achieving a balance between sustainable economic growth and environmental protection. Through its Vision 2021 and Energy Strategy 2050, the UAE seeks to increase the share of renewable energy in the national energy mix to 50% by 2050, and reduce carbon emissions by 70%. These strategies aim to enhance reliance on clean energy sources such as solar and wind, reduce the carbon footprint, achieve the goals of the Paris Climate Agreement, promote the green economy, create new job opportunities, and invest in research and development to promote innovation in the field of clean energy. Analyzing the

impact of these initiatives on the local economy and environmental sustainability is vital to understanding the effectiveness of these policies and projects. This analysis contributes to assessing the economic feasibility, identifying the environmental benefits, and providing recommendations to promote the use of renewable energy. This study relies on a comprehensive methodology that includes analyzing government policies, evaluating major projects such as the Mohammed bin Rashid Al Maktoum Solar Park and Shams 1, studying technological innovations, analyzing economic data, and measuring environmental impact, making the UAE a role model in the field of transitioning to renewable energy and achieving sustainable development.

### **Study Problem**

Despite the great efforts made by the UAE in the transition to renewable energy, there are ongoing challenges related to assessing the effectiveness of these initiatives from both an economic and environmental perspective. High initial costs, required infrastructure, and water resource management can affect the achievement of the ambitious goals of these strategies. Accordingly, the study problem arises in the following question : How do renewable energy initiatives in the UAE affect the local economy and environmental sustainability, and what are the challenges and opportunities related to achieving these goals ?

### **Study Importance**

Analyzing the impact of renewable energy initiatives in the UAE on the local economy and environmental sustainability is vital to understanding the effectiveness of current policies and projects and better guiding future efforts. The importance of the study lies in assessing the economic feasibility of renewable energy investments and their contribution to achieving sustainable economic growth, as well as analyzing the environmental benefits in terms of reducing carbon emissions and improving air quality. The study will help provide practical recommendations to enhance and expand the use of renewable energy, which supports decision-making based on accurate data by decision-makers. Moreover, the study contributes to enhancing sustainability by achieving a balance between economic development and environmental protection, which enhances the UAE's vision as a leading country in this field and inspires other countries to achieve similar goals.

### **Study Objectives**

This study aims to achieve several main objectives related to analyzing the impact of renewable energy initiatives in the UAE on the local economy and environmental sustainability :

1. Assessing economic feasibility : Analyzing the economic returns of investments in renewable energy projects, and determining the extent of their contribution to achieving sustainable economic growth and providing job opportunities.
2. Analyzing environmental benefits: Measuring the impact of renewable energy initiatives on reducing carbon emissions and improving air quality, and assessing the extent to which the environmental goals specified in the UAE Energy Strategy have been achieved.
3. Identifying challenges and opportunities: Reviewing the challenges facing the UAE in implementing renewable energy projects, such as initial costs and required infrastructure, in addition to the opportunities available to enhance these projects.
4. Providing practical recommendations: Based on the analysis results, providing recommendations to enhance and expand the use of renewable energy in the UAE, and improving current policies and practices to support the transition to clean energy.
5. Supporting decision-making: Providing accurate data-based information to decision-makers to help them develop policies and procedures that support the transition to renewable energy and achieve a balance between economic development and environmental protection.

### **Study Methodology**

To achieve the study objectives in investigating its problems and proving the hypotheses, the practical, descriptive, analytical and inductive approach was adopted to analyze the data. This part includes collecting the necessary data to evaluate the impact of renewable energy initiatives on the local economy and environmental sustainability in the UAE, and analyzing them using appropriate statistical methods and techniques. The literature review includes reviewing previous studies and research related to the impact of renewable energy on the economy and environmental sustainability in the UAE, and understanding the trends and available knowledge in this field. Field surveys also include the use of questionnaires and interviews with local experts and stakeholders to better understand the challenges and opportunities associated with renewable energy projects in the UAE.

**Information can be collected from several different sources, including:**

Government sources: reports and statistics issued by government agencies such as the Ministry of Energy and Infrastructure, the Electricity and Water Regulatory Authority, and the Abu Dhabi Fund for Development.

Academic studies: university research and studies and scientific articles published in specialized journals on renewable energy and environmental sustainability.

Global reports: reports issued by international organizations such as the International Renewable Energy Agency (IRENA), the United Nations Environment Program (UNEP), and the Organization for Economic Co-operation and Development (OECD).

Financial data: Annual and financial reports for major renewable energy projects such as the Mohammed bin Rashid Al Maktoum Solar Park and Shams 1.

Expert interviews: Opinions and recommendations from renewable energy specialists, academic researchers, and decision makers.

Field surveys: Questionnaires and surveys involving participants in the renewable energy industry and the local community to assess the impact of projects.

News publications: Articles and press reports that address developments and updates in renewable energy projects in the UAE.

Non-governmental organizations: Reports and initiatives of non-profit organizations working in the field of environment, sustainability, and renewable energy.

**Study hypotheses**

The study hypotheses about the impact of renewable energy initiatives in the UAE on the local economy and environmental sustainability can be formulated as follows:

**First main hypothesis**

There is a statistically significant correlation between renewable energy initiatives in the UAE and local economic growth.

The first main hypothesis is divided into the following sub-hypotheses:

1. There is a statistically significant positive relationship between investments in renewable energy projects and increasing job opportunities in the UAE.
2. There is a statistically significant positive relationship between achieving the goals of the Energy Strategy 2050 and improving economic growth indicators in the UAE.

**Main Hypothesis 2**

There is a statistically significant correlation between renewable energy initiatives in the UAE and reducing carbon emissions.

The main hypothesis 2 is divided into the following sub-hypotheses:

1. There is a statistically significant positive correlation between implementing renewable energy projects and reducing air pollution levels in the UAE.
2. There is a statistically significant positive correlation between increasing the use of clean energy and achieving the carbon emission reduction targets specified in the UAE Strategy 2021.

### Main Hypothesis 3

There is a statistically significant impact relationship between technological innovations in the field of renewable energy and achieving environmental sustainability in the UAE.

The main hypothesis 3 is divided into the following sub-hypotheses:

1. There is a statistically significant impact between the application of modern solar energy technologies and improving environmental quality in the UAE.
2. There is a statistically significant impact between research and development investments in the field of clean energy and increasing the effectiveness of environmental sustainability initiatives.

### Study Terms

**Renewable energy:** is energy derived from natural sources that are constantly renewed such as the sun, wind, water and biomass. It is considered a sustainable alternative to fossil energy and does not cause harmful carbon emissions. (Sami, Abdullah .2022)

**Environmental sustainability :** It means preserving natural resources and protecting them from deterioration to ensure their continuity for future generations, while reducing the environmental impact of human activities by adopting environmentally friendly practices. (Adel, Ghada. 2023)

**Local economic growth :** refers to the increase in economic activity and productivity in a specific area, and is measured through indicators such as gross domestic product, investment, and job opportunities. (Marwan, Khaled. 2022)

**Carbon emissions :** are the amount of carbon dioxide (CO<sub>2</sub>) emitted into the atmosphere as a result of human activities such as the combustion of fossil fuels, which contribute to climate change. (Marwan, Khaled. 2022)

**Energy Strategy 2050 :** is a strategic plan that aims to achieve a sustainable energy mix by increasing the share of renewable energy in the national energy mix and reducing carbon emissions by 2050. (Hussein, Youssef. 2022)

**Solar energy technologies :** include a set of technologies that use sunlight to convert it into electrical energy, such as solar panels and solar cells, and contribute to the production of clean and sustainable energy. (Emad, Hazem. 2023 ).

**Technological innovations :** refer to the development and improvement of technologies used in specific fields such as renewable energy, which enhances efficiency and reduces costs. (Fatima, Ali. 2021)

**Sustainable development :** It means achieving a balance between economic growth, social justice, and environmental protection, so that it meets the needs of the present without affecting the ability of future generations to meet their needs. (Abdullah, Nader. 2020).

The applied framework of the field study

### Study sample

In order to complete the requirements of the study, test its hypotheses, and then answer the problem raised, we decided that the study sample community should consist of several different sources, including :

In order to complete the requirements of the study, test its hypotheses, and answer the problem raised about the impact of renewable energy initiatives in the UAE on the local economy and environmental

sustainability, a sample community can be formed consisting of several different sources. Some of the sources that can be part of the sample community include :

### **1. Relevant government agencies :**

- This category can include employees from ministries and government agencies such as the Ministry of Energy and Infrastructure and the Electricity and Water Supply Regulatory Authority. These individuals can provide official data and evaluations on policies and initiatives related to renewable energy.

### **2. Experts in the field of renewable energy :**

- This includes researchers and academics specializing in renewable energy and environmental sustainability, who work in universities and research institutes. Their opinions can provide insights into the impact of initiatives on environmental sustainability and the local economy.

### **3. Managers and leaders in renewable energy companies:**

- This segment of the community includes a sample of managers and leaders in renewable energy companies, who can provide insights into the impact of investments and projects on economic growth and job creation.

### **4. Non-governmental organizations and civil society :**

- This category includes non-profit organizations working in the fields of environment and sustainable energy, which can provide independent assessments of the impact of initiatives on environmental sustainability.

### **5. Renewable energy and environmental policy consultants :**

- These experts can contribute their expertise to analyzing the impact of renewable energy initiatives on the economy and environmental sustainability, and provide strategic recommendations.

Answers to some of the questions asked of them were obtained. The questionnaire was randomly distributed to them. We adopted the random sample method in selecting the research sample, which amounted to (100 male and female employees), where the questionnaire was distributed to them through a field visit with an explanation of the purpose of the questionnaire and clarification of the questions. We retrieved 95 questionnaires, and we cancelled 05 questionnaires due to incomplete information, leaving us with 90 questionnaires that were relied upon in the analysis.

### **Study tool**

After designing, testing and modifying the questionnaire, it is distributed to the target sample of the study. After collecting it from the respondents, it is analyzed. There are several programs for statistical analysis, to reach valuable functions and indicators that support the topic. The SPSS program was used, which is an abbreviation for the phrase (statistical package for the social sciences). The program facilitates decision-making regarding the study topic through its data management and rapid statistical analysis of the results. The questionnaire form included two main sections : The first axis: The confidentiality of the personal data of the respondents, which are: (gender, age, educational qualification, social status, individual income). The second axis : related to the axes Questionnaire to answer the hypotheses. We used the “Five-point Likert” scale to measure the respondents’ responses to the questionnaire items, as shown in the following table :

Table (01) : Five-point Likert scale scores

| Number | English Translation | Description                                                              |
|--------|---------------------|--------------------------------------------------------------------------|
| 1      | Completely Disagree | If the statement is completely false or you completely disagree with it. |
| 2      | Mostly Disagree     | If the statement is generally false or you mostly disagree with it.      |

|   |                  |                                                                                                                             |
|---|------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 3 | Neutral          | If the statement is indifferent to you, or if you cannot make a decision, or if the statement seems as true as it is false. |
| 4 | Agree            | If the statement is generally true or you agree with it.                                                                    |
| 5 | Completely Agree | If the statement is completely true or you completely agree with it.                                                        |

A Likert scale from 1 to 5 was used as a response option for the items assessing employee satisfaction :

Level 1 corresponds to : Strongly disagree

Level 2 corresponds to : Somewhat disagree

Level 3 corresponds to : Rather agree

Level 4 corresponds to : Agree

Level 5 corresponds to : Totally agree

1 Totally disagree if the statement is completely false or you completely disagree.

2 Mostly disagree if the statement is generally false or you do not agree.

3 Rather agree if the statement is indifferent to you, or if you cannot make a decision, or if the statement seems as true as it is false.

4 Okay if the statement is generally true or you agree.

5 Totally agree if the statement is completely true or you completely agree.

Validity and reliability of the study tool :

The Cronbach's alpha coefficient was used for all items of the questionnaire, and to ensure the stability of the questionnaire, the quantitative stability coefficient was estimated at (0.956) as shown in the following table, which is a value that exceeds the standard rate in social sciences, which is estimated at (0.05). Therefore, it can be said that the questionnaire is valid and reliable, and we can rely on it in our study and draw conclusions.

Table 2 : Validity and reliability of the Alpha cronbach questionnaire

| Reliability and Validity of the Form | Number of Statements |
|--------------------------------------|----------------------|
| 0.956                                | 22                   |

Source : Prepared by the researcher based on the results of statistical processing.

Distribution of sample members according to demographic variables: The first part of the questionnaire contained general questions and focused on the answers to the three questions related to gender, age, and educational level.

Table (03) : Distribution of sample members according to gender variable

| Relative Frequency (%) | Absolute Frequency | Gender |
|------------------------|--------------------|--------|
| 43.3%                  | 39                 | Male   |
| 56.7%                  | 51                 | Female |
| 100%                   | 90                 | Total  |

Source : Prepared by the researcher based on the results of statistical processing.

Analysis of the results : From Table No. 03, we note that the largest percentage in the studied sample was for females at 56.7%, i.e. 51 female employees, while the percentage of males reached 43.3%, i.e. 39

employees, and this is due to the nature of the population structure, as the percentage of females is greater than that of males.

Table (04): Distribution of sample members according to the age variable

| Relative Frequency (%) | Absolute Frequency | Age Group          |
|------------------------|--------------------|--------------------|
| 47.8%                  | 43                 | 31 to 40 years old |
| 31.1%                  | 28                 | 41 to 50 years old |
| 21.1%                  | 19                 | Over 51 years old  |
| 100%                   | 90                 | Total              |

Source : Prepared by the researcher based on the results of statistical processing.

Analysis of the results : From Table No. 04, we note that the most frequently interacted age group is the group whose ages range between 41 and 50 years, with a percentage estimated at 31.1%, with a population of 28 employees, followed by the age group whose ages range between 31 and 40 years, with a percentage of 47.8%, with a population of 43 male and female employees, then the age group, which is represented by the age group over 50 years, with equal percentages estimated at 21.1%, with a population of 19 male and female employees for each category, as the study sample was random.

Table (05) : Distribution of sample members according to the educational level variable

| Relative Frequency (%) | Absolute Frequency | Educational Level    |
|------------------------|--------------------|----------------------|
| 18.9%                  | 17                 | Bachelor's Degree    |
| 13.3%                  | 12                 | Postgraduate Diploma |
| 18.9%                  | 17                 | Master's Degree      |
| 48.9%                  | 44                 | Doctorate            |
| 100%                   | 90                 | Total                |

Source : Prepared by the researcher based on the results of statistical processing.

Analysis of results : From Table No. 05, we note that the percentage of the sample is 48.9%, then those holding a university degree, a doctorate, with a number of 44 male and female employees, followed by the categories of master's and bachelor's degree holders with equal percentages estimated at 18.9%, equivalent to 17 individuals for each category, then comes those with a postgraduate diploma level with a percentage of 13.3%, equivalent to 12 individuals.

### Analysis of the results related to the trends of the sample members :

: In order to analyze the results of the study and determine the trends of the respondents' answers, we used arithmetic averages and architectural deviations, where the respondents' evaluation score for the study phrases and paragraphs was divided as follows :

From 1 to 2.33 Low evaluation.

From 2.34 to 3.66 Average evaluation

From 3.67 to 5 High evaluation.

Analysis of the first main hypothesis :

There is a statistically significant correlation between renewable energy initiatives in the UAE and local economic growth.

**Analysis of the first sub-hypothesis (the existence of a statistically significant positive relationship between investments in renewable energy projects and increased job opportunities in the UAE.)**

Table 6 : Evaluation of the study sample between the existence of a statistically significant positive relationship between investments in renewable energy projects and increased job opportunities in the UAE.

| Evaluation | Standard Deviation | Mean Value | Statement                                                                                                                                                | Number |
|------------|--------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Low        | 0.976              | 2.111      | Do you agree that investments in renewable energy projects contribute to creating new job opportunities in the UAE ?                                     | 1      |
| Medium     | 0.962              | 2.711      | Do you agree that the development of renewable energy projects in the UAE leads to an improvement in the quality of jobs available in the local market ? | 2      |
| Medium     | 0.971              | 2.422      | Do you agree that large renewable energy projects provide training and educational opportunities for the local workforce ?                               | 3      |
| Low        | 0.921              | 2.266      | Do you agree that expansion in the renewable energy sector enhances job stability in the UAE ?                                                           | 4      |
| Medium     | 0.957              | 2.377      | After credibility                                                                                                                                        |        |

Source : Prepared by the researcher based on the results of statistical processing.

Analysis : We note that the statements received average approval scores because their arithmetic mean is greater by (2.377), which expresses average approval scores according to the Likert scale, and therefore the employees agree to an average degree with the questions directed to them. This is with an arithmetic mean of (2.377), and a standard deviation of (0.957), which is the amount of dispersion of the sample's answers at the arithmetic mean of (2.377). Therefore, it was concluded that the employees support credibility with an average degree of approval.

**Analysis of the second sub-hypothesis (the existence of a statistically significant positive relationship between achieving the goals of the Energy Strategy 2050 and improving economic growth indicators in the Emirates.)**

Table No. 7 : Evaluation of the study sample The existence of a statistically significant positive relationship between achieving the goals of the Energy Strategy 2050 and improving economic growth indicators in the Emirates.

| Evaluation | Standard Deviation | Mean Value | Statement                                                                                                                                  | Number |
|------------|--------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------|
| High       | 0.876              | 3.866      | Do you agree that achieving the 2050 Energy Strategy goals contributes to enhancing economic growth in the UAE ?                           | 1      |
| High       | 0.907              | 4.088      | Do you agree that expanding renewable energy projects within the 2050 Energy Strategy leads to increased economic investments in the UAE ? | 2      |

|      |       |       |                                                                                                                                  |   |
|------|-------|-------|----------------------------------------------------------------------------------------------------------------------------------|---|
| High | 0.589 | 3.366 | Do you agree that investments in clean energy as part of the 2050 Energy Strategy help improve economic indicators such as GDP ? | 3 |
| High | 0.879 | 4.033 | Do you agree that achieving the 2050 Energy Strategy goals enhances economic stability in the UAE in the long term ?             | 4 |
| High | 0.812 | 4.088 | After credibility                                                                                                                |   |

**Source :** Prepared by the researcher based on statistical processing results.

**Analysis :** From the table above, we observe that the statements received high agreement scores, as their mean value is 4.088, which reflects high levels of agreement according to the Likert scale. Therefore, employees agree with the questions posed to them at a low level, with a mean of 4.088 and a standard deviation of 0.812, indicating the degree of dispersion of sample responses around the mean value. Hence, it was concluded that employees support credibility with a high level of agreement.

**Testing the First Main Hypothesis :** There is a statistically significant correlation between renewable energy initiatives in the UAE and local economic growth.

**Table 8 :** Evaluation of the study sample regarding the statistically significant correlation between renewable energy initiatives in the UAE and local economic growth.

| Evaluation | Standard Deviation | Mean Value | Statement                                                                                             | Number |
|------------|--------------------|------------|-------------------------------------------------------------------------------------------------------|--------|
| Medium     | 0.616              | 3.188      | Do you agree that renewable energy initiatives in the UAE significantly contribute to improving local | 1      |

|        |       |       |                                                                                                                                                    |   |
|--------|-------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------|---|
|        |       |       | economic growth ?                                                                                                                                  |   |
| Medium | 0.796 | 3.477 | Do you agree that large renewable energy projects contribute to increasing local investment and developing the economy ?                           | 2 |
| Low    | 0.819 | 2.044 | Do you agree that the presence of renewable energy projects enhances economic development in the areas where they are implemented ?                | 3 |
| Low    | 0.844 | 2.066 | Do you agree that government initiatives to support renewable energy contribute to stimulating local economic growth in the UAE ?                  | 4 |
| Medium | 0.913 | 2.344 | Do you agree that growth in the renewable energy sector creates new job opportunities and enhances local economic growth in the UAE ?              | 5 |
| Low    | 0.821 | 2.100 | Do you agree that investment in renewable energy projects leads to improved infrastructure and increases the local economy's capacity for growth ? | 6 |
| Medium | 0.674 | 3.203 | After credibility                                                                                                                                  |   |

**Source:** Prepared by the researcher based on statistical processing results.

**Analysis:** From the table above, it is noted that the statements received moderate agreement scores, with a mean value of 3.203, indicating low levels of agreement according to the Likert scale. Therefore, employees agree with the questions posed at a low level, with a mean of 3.203 and a standard deviation of 0.674, indicating the degree of dispersion of sample responses around the mean value. It was concluded that employees support the adoption of the decision with a moderate level of agreement.

#### **Testing the First Main Hypothesis of the Study and Interpreting the Results:**

After analyzing the agreement scores of the sample, we move to hypothesis testing to reveal the type and degree of correlation between the variables, using Pearson's correlation coefficient.

**Testing the First Main Hypothesis:** There is a statistically significant correlation between renewable energy initiatives in the UAE and local economic growth.

**Null Hypothesis (H<sub>0</sub>):** There is no statistically significant correlation between renewable energy initiatives in the UAE and local economic growth. **Alternative Hypothesis (H<sub>1</sub>):** There is a statistically significant correlation between renewable energy initiatives in the UAE and local economic growth.

**Table 9:** Results of the correlation between the variables

| Local Economic Growth | Significance Level | Correlation Coefficient                 |
|-----------------------|--------------------|-----------------------------------------|
| 0.000                 | 0.964              | Renewable Energy Initiatives in the UAE |

**Source:** Prepared by the researcher based on statistical processing results.

**Analysis:** The table shows that the correlation coefficient is 0.964, indicating a strong positive correlation between the variables. Since the significance level is 0.000, which is less than the accepted level of 0.05, we can say there is a strong positive correlation between the variables. Based on these results, we reject the null hypothesis and accept the alternative hypothesis, which states that there is a statistically significant correlation between renewable energy initiatives in the UAE and local economic growth.

**Testing the First Sub-Hypothesis (of the First Main Hypothesis):** There is a positive statistically significant relationship between investments in renewable energy projects and an increase in job opportunities in the UAE.

**Null Hypothesis (H<sub>0</sub>):** There is no positive statistically significant relationship between investments in renewable energy projects and an increase in job opportunities in the UAE. **Alternative Hypothesis (H<sub>1</sub>):** There is a positive statistically significant relationship between investments in renewable energy projects and an increase in job opportunities in the UAE.

**Table 10:** Results of the correlation between the variables

| Increase in Job Opportunities in the UAE | Significance Level | Correlation Coefficient                  |
|------------------------------------------|--------------------|------------------------------------------|
| 0.000                                    | 0.987              | Investments in Renewable Energy Projects |

**Source:** Prepared by the researcher based on statistical processing results.

**Analysis:** The table shows that the correlation coefficient is 0.987, indicating a strong positive correlation between the variables. Since the significance level is 0.000, which is less than the accepted level of 0.05, we can say there is a strong positive correlation between the variables. Based on these results, we reject the null hypothesis and accept the alternative hypothesis, which states that there is a positive statistically significant relationship between investments in renewable energy projects and an increase in job opportunities in the UAE.

**Testing the Second Sub-Hypothesis (of the First Main Hypothesis):** There is a positive statistically significant relationship between achieving the 2050 Energy Strategy goals and improving economic growth indicators in the UAE.

**Null Hypothesis (H<sub>0</sub>):** There is no positive statistically significant relationship between achieving the 2050 Energy Strategy goals and improving economic growth indicators in the UAE. **Alternative Hypothesis (H<sub>1</sub>):** There is a positive statistically significant relationship between achieving the 2050 Energy Strategy goals and improving economic growth indicators in the UAE.

**Table 11:** Results of the correlation between the variables

| Significance Level | Correlation Coefficient | Improving Economic Growth Indicators in the UAE |
|--------------------|-------------------------|-------------------------------------------------|
| 0.000              | 0.982                   | Achieving the Goals of the Energy Strategy 2050 |

**Source:** Prepared by the researcher based on statistical processing results.

**Analysis:** From the table above, it is evident that the correlation coefficient is 0.982, indicating a strong positive correlation between the variables. Since the significance level is 0.000, which is less than the accepted level of 0.05, we can conclude that there is a strong positive correlation between the variables. Based on these results, we reject the null hypothesis and accept the alternative hypothesis, which states that there is a positive statistically significant relationship between achieving the goals of the 2050 Energy Strategy and improving economic growth indicators in the UAE.

**Analysis of the Second Main Hypothesis :** There is a statistically significant correlation between renewable energy initiatives in the UAE and reducing carbon emissions.

**Analysis of the First Sub-Hypothesis (of the Second Main Hypothesis):** There is a positive statistically significant relationship between implementing renewable energy projects and reducing air pollution levels in the UAE.

**Table 12:** Evaluation of the study sample regarding the statistically significant relationship between renewable energy initiatives in the UAE and reducing carbon emissions.

| Evaluation | Standard Deviation | Mean Value | Statement                                       | Number |
|------------|--------------------|------------|-------------------------------------------------|--------|
| Low        | 0.967              | 2.325      | Do you agree that implementing renewable energy | 1      |

|        |       |       |                                                                                                                                                   |   |
|--------|-------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------|---|
|        |       |       | projects in the UAE significantly contributes to reducing air pollution levels?                                                                   |   |
| Medium | 0.992 | 2.511 | Do you agree that increased investment in solar and wind energy contributes to improving air quality in the areas where projects are implemented? | 2 |
| Medium | 0.971 | 2.422 | Do you agree that expanding renewable energy projects helps reduce carbon emissions and thus reduces air pollution in the UAE?                    | 3 |
| Low    | 0.931 | 2.266 | Do you agree that shifting reliance from fossil fuels to renewable energy sources reduces air pollution caused by fuel combustion?                | 4 |
| Medium | 0.967 | 2.014 | After credibility                                                                                                                                 |   |

**Source:** Prepared by the researcher based on statistical processing results.

**Analysis:** From the table above, it is noted that the statements received moderate agreement scores, with a mean value of 2.014, indicating moderate levels of agreement according to the Likert scale. Therefore, employees in insurance companies agree with the questions posed to them at a moderate level, with a mean of 2.014 and a standard deviation of 0.967, indicating the degree of dispersion of sample responses around the mean value. Hence, it was concluded that employees support credibility with a moderate level of agreement.

**Analysis of the Second Sub-Hypothesis:** There is a positive statistically significant relationship between increased use of clean energy and achieving the carbon emission reduction goals specified in the UAE 2021 Strategy.

**Table 13:** Evaluation of the study sample regarding the positive statistically significant relationship between increased use of clean energy and achieving carbon emission reduction goals specified in the UAE 2021 Strategy.

| Evaluation | Standard Deviation | Mean Value | Statement                                                                                                                                                           | Number |
|------------|--------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Low        | 0.866              | 1.856      | Do you agree that increasing the use of clean energy significantly contributes to achieving the carbon emission reduction goals specified in the UAE 2021 Strategy? | 1      |
| Low        | 0.807              | 2.088      | Do you agree that expanding the use of solar and wind energy helps reduce carbon emissions and brings us closer to achieving the specified environmental goals?     | 2      |
| Medium     | 0.599              | 2.366      | Do you agree that transitioning to clean energy sources could lead to achieving carbon emission reduction goals faster than planned in the UAE 2021 Strategy?       | 3      |
| Low        | 0.879              | 2.214      | Do you agree that increased use of renewable energy contributes to improving the effectiveness of government strategies to reduce carbon emissions?                 | 4      |
| Low        | 0.798              | 2.002      | After credibility                                                                                                                                                   |        |

**Source:** Prepared by the researcher based on statistical processing results.

**Analysis:** From the table above, it is observed that the statements received low agreement scores, with a mean value of 2.002, indicating low levels of agreement according to the Likert scale. Therefore, employees agree with the questions posed to them at a low level, with a mean of 2.002 and a standard deviation of 0.798, indicating the degree of dispersion of sample responses around the mean value. Hence, it was concluded that employees support credibility with a low level of agreement.

#### Testing the Second Main Hypothesis of the Study and Interpreting the Results:

**Testing the Second Main Hypothesis:** There is a statistically significant correlation between renewable energy initiatives in the UAE and reducing carbon emissions.

**Null Hypothesis ( $H_0$ ):** There is no statistically significant correlation between renewable energy initiatives in the UAE and reducing carbon emissions. **Alternative Hypothesis ( $H_1$ ):** There is a statistically significant correlation between renewable energy initiatives in the UAE and reducing carbon emissions.

**Table 14:** Evaluation of the study sample regarding the statistically significant relationship between renewable energy initiatives in the UAE and reducing carbon emissions.

| Evaluation | Standard Deviation | Mean Value | Statement                                                                                                                                                                       | Number |
|------------|--------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Low        | 0.616              | 2.188      | Do you agree that renewable energy initiatives in the UAE significantly contribute to reducing carbon emissions?                                                                | 1      |
| Medium     | 0.796              | 2.477      | Do you agree that implementing solar and wind projects helps reduce carbon emissions levels in the UAE?                                                                         | 2      |
| Low        | 0.819              | 2.044      | Do you agree that increasing investments in renewable energy in the UAE leads to reducing reliance on fossil fuels and thus reducing carbon emissions?                          | 3      |
| Low        | 0.844              | 2.066      | Do you agree that expanding the use of renewable energy sources contributes to achieving the UAE's goals related to reducing carbon emissions?                                  | 4      |
| Medium     | 0.913              | 2.344      | Do you agree that renewable energy projects contribute to improving air quality by reducing carbon emissions from traditional fuel combustion?                                  | 5      |
| Low        | 0.821              | 2.100      | Do you agree that government initiatives to support renewable energy play an important role in reducing carbon emissions and promoting environmental sustainability in the UAE? | 6      |
| Low        | 0.605              | 2.403      | After credibility                                                                                                                                                               |        |

**Source:** Prepared by the researcher based on statistical processing results.

**Analysis:** From the table above, it is observed that the statements received low agreement scores, with a mean value of 2.403, indicating low levels of agreement according to the Likert scale. Therefore, employees agree with the questions posed to them at a low level, with a mean of 2.403 and a standard deviation of 0.605, indicating the degree of dispersion of sample responses around the mean value. Hence, it was concluded that employees support the decision with a low level of agreement.

| Significance Level | Correlation Coefficient |
|--------------------|-------------------------|
|--------------------|-------------------------|

|       |       |
|-------|-------|
| 0.000 | 0.974 |
|-------|-------|

*Source: Prepared by the researcher based on statistical processing results.*

The table shows that the correlation coefficient is 0.974, indicating a strong positive correlation between the variables. Since the significance level is 0.000, which is less than the accepted level of 0.05, we can conclude that there is a strong positive correlation between the variables. Based on these results, we reject the null hypothesis and accept the alternative hypothesis, which states: There is a statistically significant correlation between renewable energy initiatives in the UAE and the reduction of carbon emissions.

#### **Testing of the First Sub-Hypothesis (for the Second Main Hypothesis)**

**Existence of a statistically significant positive relationship between the implementation of renewable energy projects and the reduction of air pollution levels in the UAE.**

**Null Hypothesis ( $H_0$ ):** There is no statistically significant positive relationship between the implementation of renewable energy projects and the reduction of air pollution levels in the UAE.

**Alternative Hypothesis ( $H_1$ ):** There is a statistically significant positive relationship between the implementation of renewable energy projects and the reduction of air pollution levels in the UAE.

**Table 16: Results of Correlation between Variables**

| Variable                                     | Significance Level | Correlation Coefficient |
|----------------------------------------------|--------------------|-------------------------|
| Reduction of Air Pollution Levels in the UAE | 0.000              | 0.982                   |
| Implementation of Renewable Energy Projects  | 0.982              |                         |

*Source: Prepared by the researcher based on statistical processing results.*

The table shows that the correlation coefficient is 0.982, indicating a strong positive correlation between the variables. Since the significance level is 0.000, which is less than the accepted level of 0.05, we can conclude that there is a strong positive correlation between the variables. Based on these results, we reject the null hypothesis and accept the alternative hypothesis, which states: There is a statistically significant positive relationship between the implementation of renewable energy projects and the reduction of air pollution levels in the UAE.

#### **Testing of the Second Sub-Hypothesis (for the Second Main Hypothesis)**

**Existence of a statistically significant positive relationship between the increased use of clean energy and achieving the carbon emission reduction targets specified in the UAE 2021 Strategy.**

**Null Hypothesis ( $H_0$ ):** There is no statistically significant positive relationship between the increased use of clean energy and achieving the carbon emission reduction targets specified in the UAE 2021 Strategy.

**Alternative Hypothesis ( $H_1$ ):** There is a statistically significant positive relationship between the increased use of clean energy and achieving the carbon emission reduction targets specified in the UAE 2021 Strategy.

**Table 17: Results of Correlation between Variables**

| Variable                                                         | Significance Level | Correlation Coefficient |
|------------------------------------------------------------------|--------------------|-------------------------|
| Reduction of Carbon Emissions Specified in the UAE 2021 Strategy | 0.000              | 0.978                   |
| Increased Use of Clean Energy and Achievement of Targets         | 0.978              |                         |

*Source: Prepared by the researcher based on statistical processing results.*

The table shows that the correlation coefficient is 0.978, indicating a strong positive correlation between the variables. Since the significance level is 0.000, which is less than the accepted level of 0.05, we can conclude that there is a strong positive correlation between the variables. Based on these results, we reject the null hypothesis and accept the alternative hypothesis, which states: There is a statistically significant positive relationship between the increased use of clean energy and achieving the carbon emission reduction targets specified in the UAE 2021 Strategy.

### Testing of the Third Main Hypothesis (Effect Hypothesis)

**Existence of a statistically significant effect relationship between technological innovations in renewable energy and achieving environmental sustainability in the UAE.**

**Null Hypothesis ( $H_0$ ):** There is no statistically significant effect relationship between technological innovations in renewable energy and achieving environmental sustainability in the UAE.

**Alternative Hypothesis ( $H_1$ ):** There is a statistically significant effect relationship between technological innovations in renewable energy and achieving environmental sustainability in the UAE.

**Table 18: Results of Effect Relationship between Variables**

| Model Summary                                     | Significance Level | F Value            | Determination Coefficient | Correlation Coefficient |
|---------------------------------------------------|--------------------|--------------------|---------------------------|-------------------------|
| Technological Innovations in Renewable Energy     | 0.000              | 1143.701           | 0.928                     | 0.964                   |
| Model Parameter Estimates                         |                    | Significance Level |                           | B                       |
| Constant                                          |                    | 0.000              |                           | 0.440                   |
| Achieving Environmental Sustainability in the UAE |                    | 0.000              |                           | 0.792                   |

*Source: Prepared by the researcher based on statistical processing results.*

The table shows that there is a positive effect relationship with statistical significance between the variables. Since the significance level is 0.000, which is less than 0.05, and the correlation coefficient is 0.964, we reject the null hypothesis and accept the alternative hypothesis, which states that there is a statistically significant effect relationship between technological innovations in renewable energy and achieving environmental sustainability in the UAE. The coefficient of determination indicates that 92.8% of the effect is explained by the decision.

### Testing of the First Sub-Hypothesis (for the Third Main Hypothesis) Effect Hypothesis

**Existence of a statistically significant effect relationship between the application of modern solar energy technologies and improving environmental quality in the UAE.**

**Null Hypothesis ( $H_0$ ):** There is no statistically significant effect relationship between the application of modern solar energy technologies and improving environmental quality in the UAE.

**Alternative Hypothesis ( $H_1$ ):** There is a statistically significant effect relationship between the application of modern solar energy technologies and improving environmental quality in the UAE.

**Table 19: Results of Effect Relationship between Variables**

| Model Summary                                   | Significance Level | F Value            | Determination Coefficient | Correlation Coefficient |
|-------------------------------------------------|--------------------|--------------------|---------------------------|-------------------------|
| Application of Modern Solar Energy Technologies | 0.000              | 1143.701           | 0.988                     | 0.984                   |
| Model Parameter Estimates                       |                    | Significance Level |                           | B                       |

|                                            |       |       |
|--------------------------------------------|-------|-------|
| Constant                                   | 0.000 | 0.440 |
| Improving Environmental Quality in the UAE | 0.000 | 0.792 |

Source: Prepared by the researcher based on statistical processing results.

The table shows that there is a positive effect relationship with statistical significance between the variables. Since the significance level is 0.000, which is less than 0.05, and the correlation coefficient is 0.984, we reject the null hypothesis and accept the alternative hypothesis, which states that there is a statistically significant effect relationship between the application of modern solar energy technologies and improving environmental quality in the UAE. The coefficient of determination indicates that 98.8% of the effect is explained by the decision.

#### Testing of the Second Sub-Hypothesis (for the Third Main Hypothesis) Effect Hypothesis

**Existence of a statistically significant effect relationship between research and development investments in clean energy and increasing the effectiveness of environmental sustainability initiatives.**

**Null Hypothesis (H<sub>0</sub>):** There is no statistically significant effect relationship between research and development investments in clean energy and increasing the effectiveness of environmental sustainability initiatives.

**Alternative Hypothesis (H<sub>1</sub>):** There is a statistically significant effect relationship between research and development investments in clean energy and increasing the effectiveness of environmental sustainability initiatives.

**Table 20: Results of Effect Relationship between Variables**

| Model Summary                                                            | Significance Level | F Value  | Determination Coefficient | Correlation Coefficient |
|--------------------------------------------------------------------------|--------------------|----------|---------------------------|-------------------------|
| Research and Development Investments in Clean Energy                     | 0.000              | 1143.701 | 0.956                     | 0.978                   |
| Model Parameter Estimates                                                |                    |          | Significance Level        | B                       |
| Constant                                                                 |                    |          | 0.000                     | 0.440                   |
| Increasing the Effectiveness of Environmental Sustainability Initiatives |                    |          | 0.000                     | 0.792                   |

Source : Prepared by the researcher based on statistical processing results.

The table shows that there is a positive effect relationship with statistical significance between the variables. Since the significance level is 0.000, which is less than 0.05, and the correlation coefficient is 0.978, we reject the null hypothesis and accept the alternative hypothesis, which states that there is a statistically significant effect relationship between research and development investments in clean energy.

#### Results

The study results clearly demonstrated specific effects on the different hypotheses. For the first main hypothesis, the results showed a strong and statistically significant positive relationship between achieving the goals of the 2050 energy strategy and improving economic growth indicators in the UAE. The correlation coefficient was 0.982, and the significance level was 0.000, indicating a substantial positive impact of achieving strategic goals on economic growth.

Regarding the second main hypothesis, the results indicated a statistically significant positive relationship between renewable energy initiatives and the reduction of carbon emissions, with a correlation

coefficient of 0.974, proving the effectiveness of renewable energy initiatives in reducing carbon emissions.

For the first sub-hypothesis of the second main hypothesis, the results showed a statistically significant positive relationship between the implementation of renewable energy projects and the reduction of air pollution levels, with a correlation coefficient of 0.982, indicating the success of these projects in improving air quality.

As for the second sub-hypothesis of the second main hypothesis, the results proved a statistically significant positive relationship between the increased use of clean energy and achieving the carbon emission reduction targets specified in the UAE 2021 Strategy, with a correlation coefficient of 0.978. This enhances the effectiveness of clean energy use in achieving environmental goals.

Regarding the third main hypothesis, the results confirmed a statistically significant effect relationship between technological innovations in renewable energy and achieving environmental sustainability in the UAE, with a correlation coefficient of 0.964 and a determination coefficient of 0.928, highlighting the significant impact of technological innovations on enhancing environmental sustainability.

For the first sub-hypothesis of the third main hypothesis, the results showed a statistically significant effect of applying modern solar energy technologies on improving environmental quality, with a correlation coefficient of 0.984 and a determination coefficient of 0.988, reflecting the substantial positive impact of solar technologies on the environment.

Finally, for the second sub-hypothesis of the third main hypothesis, the results demonstrated a statistically significant effect relationship between research and development investments in clean energy and increasing the effectiveness of environmental sustainability initiatives, with a correlation coefficient of 0.978 and a determination coefficient of 0.956, indicating the positive impact of research and development investments on enhancing the effectiveness of environmental sustainability initiatives.

## **Recommendations**

Based on the study's results, the following recommendations are made to enhance the effectiveness of renewable energy initiatives and achieve environmental goals in the UAE :

1. **Enhance the Implementation of Renewable Energy Projects** : Authorities in the UAE should continue to support and expand renewable energy projects, including solar and wind energy, due to their significant positive impact on reducing air pollution and achieving the 2050 energy strategy goals.
2. **Increase Investment in Clean Energy Technologies** : It is recommended to increase investment in the development of clean energy technologies and technological innovations, which the study results have shown to significantly contribute to achieving environmental sustainability. Supporting research and development in this field can enhance the effectiveness of environmental sustainability initiatives and improve air quality.
3. **Strengthen Environmental Strategies** : The UAE should enhance its environmental strategies to more clearly include carbon emission reduction targets, focusing on increasing the use of clean energy to achieve the emission reduction goals specified in the UAE 2021 Strategy.
4. **Develop Supportive Renewable Energy Policies** : Government authorities should establish policies that encourage the adoption of renewable energy solutions by providing financial and tax incentives to investors and companies that adopt these technologies, which will help accelerate the transition to clean energy sources.
5. **Improve Public-Private Sector Cooperation** : Enhancing cooperation between the public and private sectors can positively impact the achievement of environmental sustainability goals. Encouraging partnerships between sectors can facilitate the exchange of knowledge and resources and enhance the implementation of renewable energy projects.

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