Contents lists available at EKB

Minia Journal of Tourism and Hospitality Research

Journal homepage: https://mjthr.journals.ekb.eg/

Exploring the Effectiveness of Using Green Technology to Enhance Sustainability in Aswan

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Keywords

Aswan,
Green technology,
Renewable energy,
Sustainability.

Abstract

Green technologies improve efficiency and production without having a greater negative influence on the environment. This research indicates that green technology has a direct and beneficial influence on sustainability performance. The study aimed to explore the effectiveness of using green technology to enhance sustainability in Aswan. The research used a descriptive analytical methodology, using a questionnaire as a quantitative method, and the sample included a random sample of stakeholders, with a total of 129 questionnaires distributed online over the sample. Using SPSS version 25, a variety of analytical techniques were used to analyze the findings, including descriptive statistics, reliability analysis, coefficient analysis, and Pearson correlation analysis. Aswan was chosen for the study because it has the largest solar power plants and is one of the most important tourist destinations in the world. The research reached several results, the most important of which is that there is a use of green technology tools to achieve sustainability in Aswan, and the most common item is that an intelligent transportation system provides benefits to the local community by reducing traffic congestion at tourist destinations. The study recommended increasing renewable energy infrastructure through the utilization of solar, wind, and geothermal power to decrease dependence on fossil fuels and decrease greenhouse gas emissions.

Printed ISSN 2357-0652 **Online ISSN** 2735-4741

1. Introduction

Tourism is a highly profitable, revenue-generating, and progressive industry. It has emerged with several socioeconomic potentials and a broad reach in both established and emerging nations. Over the last two decades, worldwide tourism has grown at a 4% yearly rate and is anticipated to reach 1.80 billion people by 2030 (Zhang, 2021). Technology plays a huge role in shaping any industry. Green technology is a wide term that refers to a field of new, innovative methods to create everyday changes that are more ecologically friendly; it is produced and utilized with regard for the environment and natural resources (Wang et al., 2019). Green technology is intended to reduce waste and pollutants generated during manufacturing and usage. Green technology encompasses the capacity to achieve efficiency, enhance, and build systems and instruments for monitoring and manufacturing processes, resulting in a reduction in the cost of services required for each unit of resource (energy, water, soil, etc.) (Sachin & Pujari, 2020). The challenge of investing in green technology is a two-fold challenge: to achieve the business (economic) goals of the organization and to use technology for socially and environmentally responsible purposes (Bhardwaj & Neelam, 2015).

Research Problem

The tourism industry faces a major challenge in the field of using green technology and developing its practices to achieve sustainable development through exploiting natural resources in an organized manner based on sound scientific foundations. From this standpoint, it is necessary to provide modern technology that enables the application of green technology to transform into a society with low carbon emissions and reduce the percentage of waste and pollution in order to preserve the environment and enhance sustainability in Aswan city. The problem of the study is summarized in the following questions:

RQ1: What are the types of green technology in Aswan?

RQ2: What are green technologies tools used to achieve sustainability in Aswan?

RQ3: What are the benefits of implementing green technologies in Aswan?

RQ4: What are the challenges facing implementing green technologies in Aswan?

Research aims

The main aim of this research is to explore the effectiveness of using green technology to enhance sustainability in Aswan. Following were some objectives that were aimed at in order to fulfill the main aim of the study:

1- Studying the green technology fields.
2- Analyzing the benefits of applying green technology.
3- Exploring the challenges facing the application of green technology.
4- Identifying the technological tools needed to achieve sustainability in Aswan.

2. Literature Review

2.1.The concept of green technologies

Green technology, sometimes called clean technology, is technology that aims to provide goods and services that are sustainable and kind to the environment (Koutroumanis, 2011). According to Bhardwaj and Neelam (2015), green technology is the creation and usage of goods, machinery, and systems that protect the environment and resources while lessening the adverse effects of human activity. Green technologies provide an improvement in production and efficiency without increasing the environmental impact (Sachin& Pujari, 2020).

2.2.Green technologies goals

Green technology is giving space to new goals; these goals are represented in Source Reduction. By utilizing green technology to alter production and consumption practices, this strategy aims to lower waste and pollution. Sustainability: goals must be sustainable (Bhardwaj & Neelam, 2015). Innovation: new inventive approaches must be created that work to improve efficacy and production while cutting costs and being environmentally friendly, and the items and technologies should complement one another (Wang et al., 2019). Green technology strategy: When selecting a sector for green technology investment, it becomes necessary to connect the commercial objectives with the environmental goals. Finally, energy: the emphasis must be on the development of alternative fuels (Asadi et al., 2020).

2.3. Green technology fields

- **Green energy technology** means seeking unconventional alternatives to energy consumption and taking clean energy measures (Kasavana, 2008).
- **Green marketing technology:** One of the advantages of green marketing is that it protects the environment by reducing waste, making optimal use of resources, and increasing customer awareness of the need to obtain new environmental products (Wang et al., 2019).
- **Green information technology:** Information technology has become an important element of tourism activity carried out by business organizations due to the accurate and rapid data and information that this technology provides that helps senior management make the right decision at the right time (Sachin& Pujari, 2020).
- **Green building technology:** Green buildings seek to be more environmentally friendly through the effective use of energy, water, and resources, as the benefits of reducing costs and obligations and positive cash flows make green buildings in continuous growth, and the demand for them is increasing (Koutroumanis, 2011).
- **Fresh water technology:** The technique of generating water from the air is the latest sustainable green technology utilized to tackle the problem of fresh water shortages through an air water generator system that meets the climatic conditions in Egypt (Hereher & El-Ezaby, 2012).

- **Green chemistry technology:** Green chemistry applications can be used in many requirements as an alternative to using traditional chemistry, which causes many

negative and harmful effects on the environment and human health. The new materials are characterized by being environmentally friendly because they are produced from renewable sources, are biodegradable, and do not produce gaseous emissions (Bhardwaj&Neelam, 2015).

2.4. Green technology and sustainable tourism development

Tourism has emerged as a significant transforming force, influencing the lives of countless people. This is because it is one of the world's largest employment generators (Scowsill, 2017). Despite the tourist industry's economic benefits, there is no denying the harm done to the environment, since it accounts for 8% of the world's greenhouse gas emissions (Asadi et al., 2020). Technological steps should also be taken to ensure the development of sustainable tourism strategies, given the negative impact of tourism on climate change and global warming (Zhang, 2021). There are numerous techniques for achieving sustainable tourism development, one of which is to encourage the use of renewable energy sources such as solar and wind power in order to lower the carbon footprint of tourism operations (Ali et al., 2021). As customers' awareness of environmental concerns grows, so does the demand for green goods and services. Businesses across a range of industries are under a lot of pressure to become greener and more ecologically friendly (Hameed et al., 2021). Protecting the environment and preserving cultural legacy and natural assets by reducing energy consumption and dangerous pollutants would result in an economically, socially, and environmentally sustainable tourist sector (Kasavana, 2008). Green technology is a comprehensive and necessary instrument for achieving sustainable development in line with the 2030 development framework. Green technologies commonly used in the tourist industry include key card systems, room occupancy sensors, centralized air-conditioning systems, light-emitting diode lights, water restrictors, and food decomposers, among others. However, as demonstrated in this research, other green technologies used by tourism firms are connected to energy and environmental improvements, as well as the construction of smart buildings, both of which seek to increase efficiency and minimize environmental pollution (Ali et al., 2021).

2.5. Aswan city

Aswan, Egypt, is a city rich in history and culture. Aswan is located in the south of Egypt, on the east bank of the Nile River. The city of Aswan is around 85 meters above sea level, 879 km from Cairo, and its area is approximately 34,608 km2. (Information and Decision Support Center of Aswan Governorate, 2023). Aswan is a prominent tourist site that has lately emerged as a cultural hub in Africa. It is one of Egypt's most important tourist destinations, with a rich cultural heritage and fundamental attractions such as warm sun and desert, pure atmosphere and weather, landscapes, the Nile, and modern landmarks, all of which have earned it global recognition as an international winter tourist destination since ancient times. It also acts as a hub for a variety of tourist activities, such as therapeutic, adventure, Nile, and cultural tourism (Amen et al., 2017). One of the top attractions in Aswan is the Abu Simbel Temples, Temple of Philae, Temple of Kom Ombo, The unfinished obelisk, The Nubian village, Elephantine Island, Lake Nasser and the High Dam (Information and Decision Support Center of Aswan Governorate, 2023).

Table 1: Number of Tourism Establishments in Aswan 2023

Tourism Establishment	
Travel Agencies	**25**
Tourist Bazaars	**228**
Tour Guides	**753**
Rooms in Hotels& Resorts	**2380**
Beds in Hotels& Resorts	**4760**
Restaurants& Cafeterias	**16**

Source: Ministry of Tourism and Antiquities (2023).

3. Research Methodology

The study used a descriptive analytical approach that was appropriate to the subject of the study. The study also used a quantitative approach in the statistical analysis of the questionnaire form that was distributed to the study sample, and the data was analyzed using the statistical program SPSS V.25.

3.1.Questionnaire Design and Measure

The research aims to explore the effectiveness of using green technology to enhance sustainability in Aswan. This study used a descriptive analytical approach using a questionnaire instrument. Data was collected using a seven-section survey. The first part discusses respondents' demographic data (gender, age group, educational level, and years of experience). The second section included seven items, representing the types of green technology in Aswan. The third section included six variables, representing the main reasons for using green technologies in Aswan. The fourth section included six variables representing the impact of using green technology on environmental dimensions; the fifth section included six variables representing using green technology tools to achieve sustainability in Aswan; the sixth section included six variables representing the benefits of green technology in Aswan; and the seventh section included four variables representing the challenges of green IT. Questionnaire items were anchored on a three-point Likert scale: “1 = disagree”, “2 = neutral”, and “3 = agree” (Ragab & Hassan, 2011). The questionnaires were directed and distributed to a random sample of stakeholders, with a total of 129 questionnaires distributed online. From January 5 to February 10, 2024. The questionnaire was distributed online on Google Drive. A questionnaire was developed and directed to stakeholders in hotels, travel agencies, and tourist bazaars. The questionnaire was also distributed to tour guides, tour leaders, and employees at the Tourism Administration in Aswan Governorate.

3.2.Data Analysis

The search depends on leveraging the data, which was processed analytically using the Statistical Package for Social Sciences (SPSS) software. The therapy included the following analytic techniques:

- The survey's stability coefficients and the coefficient of stability for each research axis are determined using the Cronbach's alpha test.
- Percentage and frequency: Analyze the research population's functional variable features and responses to study axes.

- Mean and standard deviation (SD).
- Pearson Correlation.

3.3. Data Validity and Reliability

The scale reliability of the questionnaire was tested using Cronbach's alpha coefficient, which is useful in achieving scale stability.

Table 2: Cronbach's Alpha Value

Variables	No. of items	Cronbach's Alpha	Validity Coefficient*
The main reasons for using green technologies in Aswan	**6**	**0.787**	**0.887**
The impact of using green technology on environmental dimensions	**6**	**0.737**	**0.858**
Using green technology tools to achieve sustainability in Aswan	**6**	**0.762**	**0.873**
Benefits of Green Technology in Aswan	**6**	**0.737**	**0.858**
Challenges of green IT	**4**	**0.715**	**0.846**
Total	**28**	**0.866**	**0.931**

* Validity coefficient = $\sqrt{}$ Reliability coefficient

Cronbach's alpha (α) was used to evaluate the reliability and internal consistency of the study's constructs. The reliability of the measures was evaluated, and the Cronbach's alpha values for each scale in Table (2) varied from 0.715 to 0.787, for a total of 0.866 for survey answers. This provides an appropriate Cronbach's alpha value for each field, assuming it is more than 0.7(Ragab & Hassan, 2011).

4. Results and Discussion

4.1.Descriptive Analysis of Research Variables

First Section: Respondent Demographic Characteristics

Table 3: Demographic profile of sample elements

Variable		Frequency	Percentage (%)
Gender			
	Male	**78**	**60.5**
	Female	**51**	**39.5**
age group			
	18-28 years old	**33**	**25.6**
	29-39 years old	**36**	**27.9**
	40-50 years old	**51**	**39.5**
	51-59 years old	**9**	**7.0**
	60 and More	**0**	**0**
Education level			
	Bachelor Degree	**108**	**83.7**
	Diploma	**15**	**11.6**
	Master Degree	**6**	**4.7**
	PhD degree	**0**	**0**
Years of Experience			
	1 to 2 years	**30**	**23.3**

	3 to 5 years	**12**	**9.3**
	6 to 10 years	**12**	**9.3**
	more than 10 years	**75**	**58.1**

According to the survey's final figures, by gender, male employees accounted for 60.5%, female employees accounted for 39.5%; by the age division, 40–50 accounted for 39.5%, 29–39 accounted for 27.9%, and 18–28 years of age accounted for 25.6%; according to the education division, a bachelor's degree accounted for 83.7%, accounting for 11.6% of the diploma, and a master's degree accounted for 4.7%. According to the Years of Experience division, more than 10 years accounted for 58.1. %, accounting for 1 to 2 years, 23.3%, 6 to 10 years, and 3 to 5 years accounted for 9.3%.

Second Section: Types Of Green Technology in Aswan (multiple choice)

Table 4: Types of Green Technology in Aswan

Variables	Frequency		Percentage (%)	
	Yes	**No**	**Yes**	**No**
Utilizing renewable energy sources including sun, wind, and hydropower.	**105**	**24**	**81.4**	**18.6**
Energy-efficient lighting and appliances	**60**	**69**	**46.5**	**53.5**
Green building materials	**39**	**90**	**30.2**	**69.8**
Electric cars and other forms of transportation that rely on alternative fuels	**18**	**111**	**14**	**86**
Smart grids that optimize energy use	**15**	**114**	**11.6**	**88.4**
Technologies that reduce waste and pollution	**42**	**87**	**32.6**	**67.4**
Water conservation systems	**48**	**81**	**37.2**	**62.8**

To determine which types of green technology are available in Aswan, these approaches and formats are provided in a table, with the reference that picking more than one alternative is permissible. It is obvious from Table 4 that the majority of the sample agreed that the items “Utilizing renewable energy sources, including sun, wind, and hydropower,” with a percentage 81.4%, and “Energy-efficient lighting and appliances,” with a percentage 46.5%, are the most applied green technology techniques in Aswan.

Third Section: The main reasons for using green technologies in Aswan.

Table 5: The main reasons for using green technologies in Aswan

Variables	Mean	Std Deviation	Rank	Attitude
Increasing tourist sales.	**2.81**	**.467**	**2**	**Agree**
Improving the quality of tourism products and services.	**2.72**	**.500**	**3**	**Agree**
Reducing the use of raw materials or other inputs.	**2.47**	**.662**	**6**	**Agree**
Reducing tourism operating costs.	**2.58**	**.621**	**5**	**Agree**
Decreasing environmental footprint.	**2.70**	**.553**	**4**	**Agree**
Developing and expanding the tourism business.	**2.81**	**.447**	**1**	**Agree**
Total Mean	**2.68**			**Agree**

The key motivations for adopting green technology in Aswan are shown in Table (5) together with their means and standard deviations. The means varied from 2.81 to 2.47 when compared to the domain's overall instrument mean of 2.68. When compared to the mean and standard deviation of the entire instrument, the item "Developing and expanding the tourism business" came in first place with a mean of 2.81 and a standard deviation of 0.447. When compared to the mean and standard deviation of the entire instrument, the item "Reducing the use of raw materials or other inputs." came in last, with a mean of (2.47) and a standard deviation of (0.662).

Fourth Section: The impact of green technologies used in Aswan on the following environmental dimensions

Table 6: The impact of using green technology on environmental dimensions

Variables	Mean	Std Deviation	Rank	Attitude
Reducing greenhouse gas emissions	**2.86**	**.344**	**3**	**Agree**
Sustainable use of water and marine resources	**2.74**	**.438**	**6**	**Agree**
Pollution prevention and control	**2.88**	**.322**	**1**	**Agree**
Protection and restoration of biodiversity	**2.84**	**.371**	**5**	**Agree**
Transition to a green economy by designing and producing sustainable products.	**2.86**	**.348**	**4**	**Agree**
Helping to confront the phenomenon of climate change.	**2.86**	**.332**	**2**	**Agree**
Total Mean	**2.84**			**Agree**

The table clarifies the impact of using green technology on environmental dimensions, and the most common items are "pollution prevention and control," "helping to confront the phenomenon of climate change," and "reducing greenhouse gas emissions," with a mean of 2.88 and 2.86, respectively.

Fifth Section: Using green technology tools to achieve sustainability in Aswan

Table 7: Using green technology tools to achieve sustainability in Aswan

Variables	Mean	Std Deviation	Rank	Attitude
Environment Management Information Systems analyses environmental data using methods such as tracking, waste monitoring, emissions, and cost-benefit analysis.	**2.63**	**.574**	**5**	**Agree**
The Destination Management System collects and distributes a wide range of tourist information and goods via various channels and platforms. Platforms may also increase tourist engagement and happiness by providing useful, easily available location information.	**2.65**	**.525**	**4**	**Agree**
Virtual tours might serve as a full or partial replacement for places that have exceeded their capacity.	**2.23**	**.776**	**6**	**Neutral**
An intelligent transport system helps the local population by decreasing traffic congestion at tourist attractions.	**2.74**	**.489**	**1**	**Agree**
Geographical information systems assist in planning the geographical and temporal distribution of visitors by tracking mobility, allowing environmental consequences to be managed and minimized.	**2.74**	**.498**	**2**	**Agree**
Climate forecasting software implements methods to mitigate dangers and risks connected with inclement weather, providing visitors with up-to-date information and energy management.	**2.72**	**.450**	**3**	**Agree**
Total Mean	**2.62**			**Agree**

Table (7) shows using green technology tools to achieve sustainability in Aswan, and the most common items are "An intelligent transport system helps the local population by decreasing traffic congestion at tourist attractions," "Geographical information systems assist in planning the geographical and temporal distribution of visitors by tracking mobility, allowing environmental consequences to be managed and minimized," and " Climate forecasting software implements methods to mitigate dangers and risks connected with inclement weather, providing visitors with up-to-date information and energy management.," with a mean of 2.74 and 2.72, respectively.

Sixth Section: Benefits of Green Technology in Aswan

Table 8: Benefits of Green Technology in Aswan

Variables	Mean	Std Deviation	Rank	Attitude
Green technology reduces carbon emissions.	**2.93**	**.256**	**1**	**Agree**
Green technology improves air and water quality.	**2.91**	**.292**	**2**	**Agree**
Green technology creates new jobs in the green technology sector.	**2.84**	**.382**	**5**	**Agree**
Green technology saves money on energy costs over the long term.	**2.81**	**.447**	**6**	**Agree**
Green technology encourages innovation and technological advancement.	**2.86**	**.348**	**3**	**Agree**
Green technology contributes to a future that is more sustainable for future generations by lessening the effects of human activities on the environment.	**2.84**	**.371**	**4**	**Agree**
Total Mean	**2.87**			**Agree**

The benefits of green technology in Aswan are shown in Table (8) together with their means and standard deviations. The means varied from 2.93 to 2.81 when compared to the domain's overall instrument mean of 2.87. When compared to the mean and standard deviation of the entire instrument, the item "Green technology reduces carbon emissions" came best (mean = 2.93, SD = 0.256). When compared to the mean and standard deviation of the entire instrument, the item "Green technology saves money on energy costs over the long term." came in last, with a mean score of (2.81) and a standard deviation of (0.447).

Seventh Section: Challenges of green information technology

Table 9: Challenges of green information technology

Variables	Mean	Std Deviation	Rank	Attitude
Cost: The initial cost of implementing new green technologies and programs can be expensive.	**2.67**	**.561**	**2**	**Agree**
Cultural pushback: Implementing green IT may need new methods of functioning, which may encounter internal resistance and cause problems with consumers and suppliers.	**2.63**	**.531**	**3**	**Agree**
Prioritization: It might be tough to know where to start when implementing green IT.	**2.58**	**.658**	**4**	**Agree**
Emerging fields: Some sectors of green technology are very young, with few best practices. Developing green software is one of these developing industries.	**2.77**	**.424**	**1**	**Agree**
Total Mean	**2.66**			**Agree**

The table identifies the challenges that face implementing green information technology in Aswan, and the most common items are "Emerging fields: Some sectors of green technology are very young, with few best practices. Developing green software is one of these developing industries." and "The initial cost of implementing new green technologies and programs can be expensive," with a mean of 2.77 and 2.67, respectively.

4.2.Pearson correlation

Table 10: Correlation between the main reasons for using green technologies in Aswan and the impact of using green technology on environmental dimensions

		The impact of using green technology on environmental dimensions
the main reasons for using green technologies in Aswan	Pearson Correlation	**.648****
	Sig. (2-tailed).	**.000**

The impact of implementing green technologies on environmental parameters and the primary motivations for doing so in Aswan are positively and significantly correlated, as table 10 illustrates. At sig = 0.000, the Pearson correlation coefficient was (.648**). These findings demonstrated a good. This positive association suggests that the adoption of green technologies in Aswan has a growing influence on environmental parameters in tandem with a rise in the primary motivations for doing so.

Table 11: Correlation between the main reasons for using green technologies in Aswan and using green technology tools to achieve sustainability in Aswan

		Using green technology tools to achieve sustainability in Aswan
the main reasons for using green technologies in Aswan	Pearson Correlation	**.760****
	Sig. (2-tailed).	**.000**

The study reveals a positive and significant correlation between the main reasons for using green technologies in Aswan and the use of green technology tools to achieve sustainability in Aswan, with a Pearson correlation coefficient of.760** - sig = 0.000.

Table 12: Correlation between Correlation between the main reasons for using green technologies in Aswan and Benefits of Green Technology in Aswan

		Benefits of Green Technology in Aswan
The main reasons for using green technologies in Aswan	Pearson Correlation	**.710****
	Sig. (2-tailed).	**.000**

The table (12) indicates a statistically significant and positive correlation between the primary drivers of green technology adoption in Aswan and the advantages of green technology in the region. At sig = 0.000, the Pearson correlation coefficient was (.710**). These findings demonstrated a good. This positive association suggests that the advantages of green technology in Aswan rise in tandem with the primary justifications for their use.

Table13: Correlation between using green technology tools to achieve sustainability in Aswan and the impact of using green technology on environmental dimensions

		The impact of using green technology on environmental dimensions
Using green technology tools to achieve sustainability in Aswan	Pearson Correlation	**.748****
	Sig. (2-tailed).	**.000**

The impact of applying green technology to environmental parameters and the use of green technology instruments to achieve sustainability in Aswan are positively and significantly correlated, as the table (13) illustrates. At sig = 0.000, the Pearson correlation coefficient was (.748**). These findings demonstrated a good. This positive connection shows that the influence of employing green technology on environmental parameters grows with the use of green technology instruments to attain sustainability in Aswan.

Table 14: Correlation between using green technology tools to achieve sustainability in Aswan and Benefits of green technology in Aswan

		Benefits of Green Technology in Aswan
Using green technology tools to achieve sustainability in Aswan	Pearson Correlation	**.664****
	Sig. (2-tailed).	**.000**

The advantages of green technology in Aswan and the use of green technology instruments to attain sustainability in Aswan are positively and significantly correlated, as seen in Table 14. At sig = 0.000, the Pearson correlation coefficient was (.664**). These findings demonstrated a good. This positive association suggests that the advantages of green technology in Aswan rise in tandem with the use of these instruments to attain sustainability.

5. Conclusion

The concept of green technology is one of the modern concepts that are receiving increasing attention from tourist destinations with the aim of achieving sustainable tourism development, as mentioned by Ali et al. (2021). Utilizing renewable energy sources like solar, wind, and hydropower is one of the most popular forms of green technology employed in Aswan to achieve sustainable tourist development, according to the statistical analysis's findings. The results of the study showed that the main reasons for using green technologies in Aswan are developing and expanding the tourism business. The research clarifies the impact of using green technology on environmental dimensions, and the most common items are "pollution prevention and control," "helping to confront the phenomenon of climate change," and "reducing greenhouse gas emissions," respectively. The findings demonstrate the use of green technology tools to attain sustainability in Aswan. One of the most prevalent points is that the local community benefits from an intelligent transportation system's reduction

of traffic at tourist spots. Zhang (2021) also mentioned that lower carbon emissions are one of the main advantages of using green technology. One of the biggest obstacles to the widespread use of green technology in Aswan is that some of its applications are still relatively new, with few best practices, and that putting new green programs and technologies into place may be costly initially.

6. Recommendations

The study proposes a number of recommendations for future green technology trends and carbon-free initiatives in Aswan:

- The ministry of tourism and antiquities should increase funding for green technology research and development and implement circular economy principles to reduce waste and build closed-loop systems for resource utilization.
- The ministry of electricity and renewable energy should develop renewable energy infrastructure, including solar, wind, and geothermal power, to reduce dependency on fossil fuels and lower greenhouse gas emissions.
- Owners of tourism establishments in Aswan should utilize smart technologies and data analytics to optimize energy use, reduce waste, and improve industrial efficiency. And apply green building approaches, including sustainable materials and energy-efficient design.
- The ministry of higher education and scientific research should encourage scientific research on the application of green technology and sustainability.
- Encourage participation between the private sector, staff of tourism administration in the governorate, the Environmental Affairs Agency, and members of the local community, coordinating the different roles of each to apply green technology in Aswan.

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الكلمات الدالة

أسوان، التكنولوجيا الخضراء، الطاقة المتجددة، الاستدامة.

المستخلص

تعمل التقنيات الخضراء على زيادة الإنتاجية والكفاءة دون زيادة الأثر البيئي. تؤكد هذه الدراسة التأثير المباشر والإيجابي للتكنولوجيات الخضراء على أداء الاستدامة. هدفت الدراسة إلى استكشاف مدى فعالية استخدام التكنولوجيا الخضراء لتعزيز الاستدامة في أسوان. ولهذا استخدم البحث المنهج الوصفي التحليلي باستخدام الاستبيان كمنهج كمي، وقد شملت عينة المسح عينة عشوائية من أصحاب المصلحة، حيث بلغ عددها 129 استبانة تم توزيعها إلكترونياً على العينة. تم اختيار أسوان للدراسة لأنها تمتلك أكبر محطات الطاقة الشمسية وتعد من أهم الوجهات السياحية العالمية. وقد تم تحليل النتائج باستخدام الإحصاء الوصفي، وتحليل الموثوقية، وتحليل المعاملات، وتحليل ارتباط بيرسون، وتحليل الانحدار بدعم من الإصدار 25 من برنامج SPSS. وتوصل البحث إلى عدة نتائج أهمها أن هناك استخدام لأدوات التكنولوجيا الخضراء لتحقيق الاستدامة في أسوان، والعنصر الأكثر شيوعاً هو أن نظام النقل الذكي يوفر فوائد للمجتمع المحلي من خلال تقليل الازدحام المروري. وبالتالي أوصى البحث بتوسيع البنية التحتية للطاقة المتجددة من خلال تسخير الطاقة الشمسية وطاقة الرياح والطاقة الحرارية الأرضية لتقليل الاعتماد على الوقود الأحفوري وخفض انبعاثات الغازات الدفيئة.

Printed ISSN 2357-0652 **Online ISSN** 2735-4741