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Topic:

Contribution Of Green Technological Innovations To The Sustainability Of Tourist Destinations

The Impact of Solar Energy Technologies on Algerian

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Abstract

This study aims to assess how solar energy adoption affects environmental, economic, and social sustainability - alongside shaping the competitive edge of hotels in Algeria. A descriptive and analytical method guided the work, relying on a survey shared with 50 staff members from various hotels, particularly those at The Mirador Hotel, to collect firsthand information. Empirical findings were processed via SPSS to evaluate proposed relationships among variables. Results helped uncover links: installing solar systems ties to lower carbon output, cuts in daily expenses contribute to cost savings, while an emerging green reputation supports stronger positioning amid rivals in Algeria's hospitality industry.

Keywords: Solar Energy, Hotel Sustainability, Green Innovation, The Mirador Hotel, Competitiveness, Algeria.

ملخص

تهدف هذه الدراسة إلى تقييم تأثير تبني الطاقة الشمسية على الاستدامة البيئية والاقتصادية والاجتماعية، بالإضافة إلى تعزيز القدرة التنافسية للفنادق في الجزائر. وقد اعتمدت الدراسة على المنهج الوصفي التحليلي، بالاعتماد على استبيان وُزِّع على 50 موظفًا من فنادق مختلفة، ولا سيما فندق ميرادور، لجمع معلومات مباشرة. وتم تحليل النتائج التجريبية باستخدام برنامج SPSS لتقييم العلاقات المقترحة بين المتغيرات. وقد كشفت النتائج عن روابط مهمة: يرتبط تركيب أنظمة الطاقة الشمسية بانخفاض انبعاثات الكربون، ويساهم خفض النفقات اليومية في توفير التكاليف، بينما تدعم السمعة الخضراء المتنامية مكانة أقوى للفنادق في مواجهة المنافسين في قطاع الضيافة الجزائري.

الكلمات المفتاحية: الطاقة الشمسية، استدامة الفنادق، الابتكار الأخضر، فندق ميرادور، التنافسية، الجزائر .

INTRODUCTION

Introduction

Tourism is a rapidly growing sector, accounting for over 10% of global GDP and employment . As tourism grows, it puts stress on resources, energy, and local areas via transportation, lodging, and related infrastructure (Guo, Toward green tourism: The role of renewable energy for environmental quality in tourism systems, 2025).Hotels, resorts, and heritage sites consume a significant amount of energy for heating, cooling, lighting, and operational purposes. Therefore, the environmental impact of tourism is a key concern for those seeking to cut emissions, protect the environment, and promote sustainability (Makoondlall-Chadee, Environmental sustainability in hotels: A review of practices and impacts, 2024).

Renewable energy (RE) is seen as key to improving tourism's environmental record and operational strength. Renewable energy comes from sources like solar, wind, and hydroelectric, which release little to no carbon dioxide when making electricity or heat (Elsevier, 2025).By using renewables instead of fossil fuels, tourist spots can lower emissions, improve energy security, and save money, aligning with global climate aims like the UN Sustainable Development Goals (SDGs). Renewable energy can help tourism sustainability by lowering environmental effects and boosting economic and social benefits for local communities (Guo, Toward green tourism: The role of renewable energy for environmental quality in tourism systems, 2025).

Research on renewable energy and tourism has grown as experts study how clean energy affects the environment and sustainability. Guo et al. (2025) state that renewable energy use in tourism improves environmental health by improving load capacity, which reduces the bad effects of tourism (Guo, Toward green tourism: The role of renewable energy for environmental quality in tourism systems, 2025).Suryawan (2025) notes renewable energy can change tourism, mainly in coastal spots, by boosting sustainability and local economies (Suryawan, 2025).These points back up that using renewable energy in tourism helps shift away from harmful ways to ones that support saving the environment and long-term money gain.

INTRODUCTION

Solar energy is a useful, easy-to-use tech for tourist places. Solar photovoltaic (PV) systems and solar thermal collectors can meet much of the power and heat needs at hotels and visitor centers. Studies on using solar tech at heritage sites show that it cuts environmental harm and helps cultural tourism by showing off green ideas (Xia & He, Sustainable heritage tourism: Integrating solar energy systems, 2024).This goes along with the move toward green spots that use renewable energy to meet environmental plans and improve their image with eco-aware travelers (Torres-Sainz, Trinchet-Varela, Pérez-Vallejo, & Borrero-Neninger, On the way to sustainable energy management in tourism: A bibliometric study, 2024).

Aside from green pluses, using renewable energy like solar is tied to better sustainability results in tourism. Policy work from Uzbekistan found that more renewable power helps tourism spending and supports sustainable growth, showing that clean energy can raise both the money and environmental worth of tourism (Işık, 2025).Energy management ideas, like efficiency rules and tech that includes renewables, are seen as key to cutting costs, lowering environmental effects, and improving how well tourist spots do in a shifting market (Torres-Sainz, Trinchet-Varela, Pérez-Vallejo, & Borrero-Neninger, On the way to sustainable energy management in tourism: A bibliometric study, 2024).

In short, these ideas say that renewable energy, mainly solar tech, is key to making tourist spots more sustainable. It does this by cutting emissions, boosting energy strength, saving money, and improving the view of tourism spots. As countries work harder to meet climate aims and travelers want greener tourism, using renewable energy at tourist spots is a must. Using these green ideas with wider sustainability plans can change how tourism helps protect the environment and support lasting money growth in the future.

The tourism sector is a major part of the global economy, but it also impacts the environment through energy use, emissions, and resource consumption. Using green tech like solar power in tourism can help fix sustainability problems by cutting down on fossil

Fuel , making energy use better, and helping the environment and economy in the long run (Guo, Toward green tourism: The role of renewable energy for environmental quality in tourism systems, 2025; Zmami, Ben-Salha, Alrumayh, Almarshad, & Abid, 2025).

First, studies show that renewable energy, like solar, is key to making tourism areas more environmentally friendly. Guo et al. (2025) discovered that using more renewable energy in tourism helps the environment, showing a clear link between using green tech and keeping tourist spots sustainable (Guo, Toward green tourism: The role of renewable energy for environmental quality in tourism systems, 2025).This is tied to the topic's importance since sustainability is a big worry for global tourism because of climate change.

Second, research on using solar power in tourism businesses shows that new tech, like solar PV and other solar setups, can lower running costs and help the environment. Though, things like cost and support from institutions still affect how quickly it's being used (Zmami, Ben-Salha, Alrumayh, Almarshad, & Abid, 2025).These results back up the focus on solar power as something that can have a real, measurable impact on keeping things sustainable.

Third, projects looking at putting renewable energy systems into tourism spots (like historical sites and rural tourism) show that there could be environmental and social benefits, giving ideas for using green tech in places that are different from each other (Xia & He, Sustainable heritage tourism: Integrating solar energy systems in historical sites for environmental conservation and economic development, 2024).

In short, these studies say that green tech innovations like solar energy are good for sustainable tourism in theory and are important in practice. This makes the topic relevant and worth studying

INTRODUCTION

RESEARCH PROBLEM

The subject of this research is : **"The impact of green technological innovations, particularly solar energy technologies, on the sustainability of tourist destinations in Algeria."**

Today, with worries about the environment growing and the push for practices that can be kept up, tourist spots are feeling the heat to use green tech. Solar energy is key in changing how energy is used, lowering emissions, and shifting costs in tourism. So, adding solar power is a smart move to help the environment, economy, and social scene in tourism.

But, to make it all work, putting solar energy tech in place needs a solid plan, help from those involved in tourism, and a setup that helps green ideas grow. So, it's important to see how using solar tech helps tourist spots reach their goals for staying sustainable long -term.

Therefore, the central research problem can be formulated as follows:

_What is the impact of solar energy technologies on the environmental, economic, and social sustainability of hotels in Algeria ?

In order to respond more precisely to the central issue, it is necessary to examine several sub-questions that arise from it:

- **Sub-question 1**

- What is the impact of adopting solar energy technologies in hotels on reducing greenhouse gas emissions and decreasing reliance on conventional energy sources?

- **Sub-question 2**

- To what extent does the use of solar energy contribute to achieving financial efficiency by reducing operational costs and improving the profitability of hotel establishments?

- **Sub-question 3**

- What is the role of solar energy in enhancing a hotel's social sustainability, particularly regarding its responsibility toward the local community and customer satisfaction?

- **Sub-question 4**

- How does the transition toward clean energy influence a hotel's competitiveness and its market position compared to its competitors?

In order to address the main issue as well as the sub-questions of our study, we have formulated several working hypotheses that we will seek to verify during our empirical study:

❖ **MAIN HYPOTHESIS**

- The adoption of solar technologies has a significant and positive impact on the environmental, economic, and social sustainability of hotels, leading to enhancing their competitive position and improving the overall performance of Algerian hotels.

- **Hypothesis 01**

- The adoption of solar technologies has a significant and positive impact on the environmental sustainability of hotels.

- **Hypothesis 02**

- The adoption of solar technologies has a significant and positive impact on the economic sustainability of hotels.

- **Hypothesis 03**

- The adoption of solar technologies has a significant and positive impact on the social sustainability of hotels.

- **Hypothesis 04**

- The adoption of solar technologies has a significant and positive impact on the market competitiveness of hotels.

RESEARCH OBJECTIVES

Here are some potential research directions concerning renewable energy adoption in hotels:

- **Evaluating Renewable Energy Integration:** To assess how renewable energy sources (especially solar energy) are integrated into strategic plans for hotel sustainability, and to identify the specific types used and the precise impact of each.
- **Analyzing Management and Hotel Orientations:** To study the attitudes and perspectives of hotel managers toward sustainable energy, and to understand how financial and environmental factors influence their decisions to adopt these technologies.
- **Identifying Barriers to Adoption:** To monitor and analyze the technical, economic, and structural challenges (such as high initial costs, infrastructure limitations, and availability) that hotels face when transitioning to clean energy.
- **Measuring Environmental and Marketing Impacts:** To investigate the impact of renewable energy utilization on reducing carbon dioxide (CO_2) emissions, and to determine its contribution to attracting eco-conscious tourists and enhancing brand loyalty.
- **Formulating Supportive Proposals and Policies:** To provide practical strategies and actionable policies that incentivize the hospitality and tourism sector to expand its reliance on renewable energy solutions.

IMPORTANCE OF RESEARCH

The significance of this research stems from its position at the intersection of energy consumption, economic competitiveness, and environmental protection, as demonstrated through the following dimensions:

- **Environmental and Climate Importance:** The hotel sector contributes significantly to carbon emissions. Recent studies (such as those from China and Tunisia) confirm that solar energy technologies and smart lighting represent practical solutions to improve carbon efficiency, reduce pollution, and support the global goal of reaching "Carbon Neutrality" by 2050.

- **Financial and Competitive Importance:** Green energy does not merely enhance a hotel's brand image; it delivers tangible economic returns. It helps reduce electricity procurement costs and achieves a positive Net Present Value (NPV), thereby boosting hotel profitability and market competitiveness.
- **Managerial and Organizational Importance:** Transitioning toward renewable energy requires a comprehensive shift that impacts all hotel departments. Research (such as the 2026 Bangladesh study) has proven that top management support and employee engagement are the fundamental pillars for the successful implementation of sustainable energy systems.
- **Scientific and Academic Importance:** The scientific value of this research lies in its adoption of an "integrated, multidisciplinary perspective" that links energy efficiency, financial sciences, management, and consumer/employee behavior. This addresses the current research gap calling for comprehensive studies that account for variables such as property type, occupancy rates, and local energy tariffs.

Research Limitations

- Varied methods make comparisons hard.

The mix of methods in studies—like reviews and data analysis—complicates direct comparisons of how renewable energy helps hotels become more sustainable.

For instance, one review on renewable energy use in hotels covers work from 2008 to 2023. This range includes varied settings for tech and hotel work, which makes it hard to keep knowledge current after 2023.

- Limited Attention to Tech Impact

More quantitative work is needed to measure how solar, wind, and geothermal energy affect sustainability, looking at things like cutting emissions, saving costs, and guest satisfaction. This lack of detail means we do not fully grasp how renewable energy use truly affects hotel sustainability.

- Studies tied to place

Some work on clean energy in hotels is specific to places, like one study in Northern Cyprus. This focus makes it hard to apply findings worldwide because of different financial, governmental, and climate issues.

- No set sustainability measures

There is no agreement on how to measure sustainability for hotels. Some studies look at environmental factors, like emissions, while others include social or financial ones but not consistently. This lack of standards makes it hard to combine results from work.

- Emphasis on Overviews

Though reviews exist, current on-site work with up-to-date info from hotels using renewable systems is scarce. This lack makes it harder to see real results and gains.

Socio-economics was left out

Most work points to factors like laws, money, and awareness but does not include them in models. That leaves unclear how these things shape renewable energy adoption and its effect on hotel sustainability.

CONTEXT OF THE STUDY

- Research Conducted At The University Of Algiers, Led By Ben Azzah,In 2023. Work Carried Out In 2023 Under Ben Azza's Direction At Algiers' University

This work looked at how Algeria plans to shift toward a greener economic model. Solar power integration into buildings_ especially tourism sites in southern regions _emerged as a key move, according to findings. Such technology helps lower emissions from hotels and guesthouses, making operations cleaner over time (Benazza, 2023, pp. 51-64).

- Study By Haddad And Boulehashish (2025) _Algerian Journal Of Electrical Systems

With sunlight powering remote spots and desert resorts, older energy expenses drop sharply, sometimes near 40%. Such savings come through installing grid-linked solar systems, showing both practical function and financial sense. These setups shift places once dependent on conventional sources into examples of cleaner operation. Performance

data supports this change, pointing toward lower bills alongside stronger environmental profiles (Haddad & Boulahchiche, Solar PV development in Algeria: Status and prospects: Status and prospects, 2025, pp. 10-16).

- Study By J. Habib Alongside El Hani, 2025 - Conducted At Djelfa University - As Part Of A PhD Thesis Or Article

This research looked into how renewable energy supports environmental protection. Green tech advances like solar water heating and self-powered lights push forward nature-based tourism across Algeria because they help shield fragile habitats found in desert springs and highland zones (Elhannani & Farah, 2025; Habili, 2024).

RESEARCH STRUCTURE

This work looks into solar power's role in helping Algerian tourism spots last longer. One part checks environmental effects; another reviews cost changes over time. Energy reliability becomes clearer when daily operations are observed closely. Local community reactions often shape long-term project success. Infrastructure needs shift as sunlight availability varies by region. Policy support sometimes speeds up adoption rates unexpectedly.

_ The reduction of carbon footprints in hospitality establishments.

_ Running things using less power cuts spending over time. Equipment works longer when energy use drops slowly each year.

_Enhancing the "Eco-friendly" brand image of tourist destinations.

_Improving tourism competitiveness through sustainable energy solutions.

For these goals, the study breaks down into three core parts

- **Chapter 1:** dives into earlier research while shaping core ideas about renewable power. It zeroes in on laws tied to clean energy alongside how solar projects take form across Algeria. The section builds understanding through past findings, yet keeps attention on structure and context. Instead of listing facts, it weaves them into a clearer picture. What stands out is its grounding in real policies rather than broad claims. Each idea links back to how rules shape progress. Not every detail gets spotlighted; only what matters most does.

- **Chapter 2:** looks at how tourism has shifted over time. Renewable energy now plays a part where it once had none. Instead of ignoring nature, some destinations begin working within its limits. Progress shows up unevenly across regions. Still, new methods mix green tech with visitor needs. What was once rare becomes slowly more common. Energy choices shape the way trips unfold today.
- **Chapter 3:** lays out how the work was done - using surveys and SPSS software. A real example comes next, focused on one particular hotel. Findings appear after that, along with checks to see if guesses were right. The way things connect becomes clear toward the end.

CHAPTER 01: REVIEW OF LITERATURE AND CONCEPTUAL FRAMEWORK ON RENEWABLE ENERGY WITH A FOCUS ON SOLAR ENERGY

Introduction

This chapter covers the relevant literature and the conceptual framework used in this research.

Section 01: Literature Review

- This section reviews existing studies related to our research.
- The main aim is to explain what sustainable tourism, green technology, and renewable energy (especially solar energy) mean for this study. It sets up a base for understanding how eco-friendly technologies help improve environmental, economic, and social sustainability in tourist spots.
- This setup explains how using green technologies relates to the lasting sustainability and competitiveness of tourist places. The review summarizes past academic work and places our research in a wider academic conversation.
- This review involved looking at and critically assessing studies, articles, and reports on sustainable tourism, green ideas, and renewable energy use in tourism.

1.1. Previous studies

❖ Study on the adoption of renewable energy technologies and the supply chain management of green tourism in Zimbabwe (2023):

In 2023, Otchiwaridzo examined how using renewable energy, like solar power, affects Zimbabwe's tourism industry's energy independence and sustainability. The research used surveys and statistics to see how things are linked in terms of making tourism more sustainable (Chiwaridzo, 2023)

The study looked at how renewable energy affects the handling of the green tourism supply chain. It checked four areas of sustainability:

* How well the tourist electrical network holds up.

* How well the country can provide its own energy.

* How much energy is made?

* How easy it is to get energy and how well it works.

A standard survey was given to managers and workers in the tourism supply chain, like service people and energy project supervisors. The data was studied with the SMART PLS 3 program to test ideas and find statistical links between what was measured.

The results showed a clear and statistically supported link between using renewable energy and positive sustainability results. It turns out that managing the green tourism supply chain helps a lot in making sustainability better, like making energy networks stronger and being able to provide more energy for itself.

The study also noted problems with using renewable energy in Zimbabwe's tourism sector. These included high start-up costs, weak laws, and trouble getting funding, all of which make it harder to put eco-friendly plans into action.

The study ended with some advice for government officials and those involved in tourism. They should create helpful policies and put money into solar and other renewable energies to support sustainable tourism and meet energy independence goals.

- ❖ The Study by Erasmia Papallou, Martha Katafygiotou and Thomas Dimopoulos (2024)

Papallou, Katafygiotou, and Dimopoulos (2024) examined sustainability practices in hotels and resorts in Cyprus, Greece, and the Maldives. The study aimed to evaluate the environmental, economic, and social dimensions of sustainability in the hospitality sector.

The researchers used a comparative analytical approach based on sustainability reports and case studies of several hotels. The findings showed that sustainable practices such as renewable energy use, water conservation, waste recycling, and community engagement helped reduce environmental impacts and operational costs while improving hotel competitiveness and customer satisfaction.

The study also highlighted that sustainable tourism contributes to local community development through job creation, support for local suppliers, and cultural preservation. However, the researchers noted that many hotels still need stronger sustainability strategies and greater investment in renewable energy technologies, especially solar energy. (Papallou, Katafygiotou, & Dimopoulos, 2024, p. 3536).

❖ A recent study conducted by J. Li et al. (2024)

J. Li et al. (2024) recently published a study in Energy Policy that looks at how using solar energy impacts the environmental health of tourist spots. The study reviews existing writings and then compares how solar energy policies are used in North African (e.g., Tunisia) and European (e.g., Spain) tourist areas. The findings suggest that solar energy not only lowers energy expenses but also draws in environmentally aware tourists, which makes these locations more appealing. The study points out that public-private funding approaches, like those in Spain, can really push the use of solar tech in tourist zones (Li & al, 2024).

The methods used were:

* A review of existing writings on solar energy policies in tourism.

* A comparison of policies and plans for using solar energy in different tourist countries.

* An analysis of running costs before and after solar tech was added to tourist sites.

❖ The study by Qamruzzaman (2024):

Qamruzzaman's 2024 study looked at how tourism growth affected renewable energy use and environmental sustainability in the top 20 tourist destinations from 2005 to 2020. The research used CS-ARDL and NARDL models, sophisticated econometric methods, to examine the relationships between tourism, renewable energy use, and environmental impact over both the short- and long-term. Data was gathered from a group of tourist countries to assess tourism's impact on both clean energy use and CO_2 emissions (Qamruzzaman, 2024).

The findings indicated a positive link between tourism growth and increased renewable energy use; for every 10% rise in tourism GDP, there was a 1.448% increase in clean energy use over the long run. The study also showed that tourism causes higher CO_2 emissions and a decline in the ecological footprint, so sustainable tourism practices are required. The results stress how vital it is to include governmental regulations and tax breaks to promote the use of renewable energy sources in the tourism industry. This

research suggests that tourism can boost renewable energy use, but it's critical to implement sound regulations to lessen negative environmental damage.

❖ The study by Avcı et al. (2024):

Avcı et al. ((2024)explored how tourism and green tech affect carbon dioxide emissions in the 15 most visited countries from 1995 to 2019. The research uses methods like quantile regression and cointegration tests to see how tourism, green tech, renewable energy use, and carbon dioxide emissions relate over time. The findings suggest tourism helps cut carbon dioxide emissions, especially in countries focused on sustainable energy through increased renewable energy use. Green tech also has a substantial impact, reducing emissions by 0.106% for every 1% increase in green tech. Economic growth and financial progress, though, are linked to higher carbon dioxide emissions, pointing to the need for green growth strategies. The study also found that using renewable energy greatly helps lower emissions, suggesting a good way to boost environmental sustainability in tourism (Avcı, Sarıgül, Karataşer, Çetin, & Aslan, 2024).

❖ The Study of Papan Island (2025)

A 2025 study looked into how using solar energy affects managing a tourist island. It used an empowerment model to see how solar energy could help lower running costs and pollution in a sector where profits are usually small. The study found that using solar energy can lower management costs and make the destination more environmentally sound (Ismail & Mansor, 2025, pp. 45-62).

The study's methods mixed numbers and words. Researchers used surveys for hotel managers and tourism infrastructure managers to gather info on energy use before and after using solar systems.

The results showed that hotels with solar panels had lower energy costs, with big savings in places that used large solar setups.

❖ Comparative Analysis of Green Technological Innovations

Pena Dimas (2025) examined how using solar energy affects tourism, looking specifically at Papan Island. The work reviews existing research and compares tourist

places that use green tech, like solar power, with those that do not. The study finds that renewable energy can cut running costs and encourage sustainable tourism, leading to economic and environmental gains over time.

The research showed that hotels using solar energy saw lower energy bills and reduced their carbon output. Tourist spots using these methods did better money-wise, with higher profits and a stronger brand image tied to being eco-friendly. Places not using renewable energy kept dealing with high expenses and harm to the environment.

The study notes problems some places face in using these technologies, such as not enough help from the government and high start-up costs. But, countries like Spain and the United States have led by example with good subsidy plans and teamwork between the public and private sectors. This has helped tourism companies that use green energy get their money back faster. These findings back up the idea that using green technologies, like solar energy, can be a key way to make tourism economically and environmentally sustainable (Adam, et al., 2025, pp. 86-96).

- The Study of Zmami and al (2025):

Zmami and al. (2025) investigated what makes tourism businesses use solar power for greener operations. Their work combines numbers with interviews to get a full view. They started by looking at past work to find common issues and chances for using solar energy in tourist spots (Zmami, Ben-Salha, Alrumayh, Almarshad, & Abid, 2025).

How they did it:

First, they read papers about green tech in tourism to see what problems others had with renewable energy, like price, public opinion, and what the government does to support it.

Next, they spoke with hotel owners, site managers, and energy pros. They wanted to learn what they thought about solar power and if they believed it helped a place's finances and environment. The goal was to see why some people in the field liked the idea of solar energy.

Then, they used structural equation models (SEM) to study the facts they gathered. These models helped them judge what things affected if someone used solar tech, like costs, cutting pollution, and if locals liked it.

After that, they looked at tourist areas that use solar power and those that do not. This let them see how solar power really changed things, such as lower power bills, drawing tourists who care about nature, and helping the environment.

The results show that using solar energy helps tourist spots become more sustainable. Solar power cut costs, made energy use better, and made these destinations known for being environmentally friendly.

- The exploratory study on the adoption of solar technologies in Makkah (2025)

A study of sustainable tourism development in Makkah (2025) looked at how using solar energy in tourist spots changes things. Using both numbers and interviews, the study tried to get a good sense of the context and the money side of using renewable energy in the tourism business. The study puts a focus on what hotel bosses and local leaders think about how solar energy helps the environment, the economy, and society.

A look at how different hotels in the area decided to use solar energy showed that the big cost of setting things up is a main reason why more places haven't used it yet, and a few hotels don't like changing how they do things. Findings point to tourist spots that use solar energy having lower energy costs, but money problems, like needing to invest for a long time, are still big concerns (Basyouni & Ahmed, 2025, pp. 112-128).

Looking at different examples, it becomes clear that using solar energy works best when both companies and local governments are very involved and good money plans are in place. The study also shows that support from the government and making sure people know what's going on for a long time are helpful.

- The study on the adoption of solar technologies

This research examines how using solar power impacts tourism, focusing on whether it makes destinations more sustainable. It uses both numbers and observations to see what helps or hurts when tourist spots try to use renewable energy like solar. The study looks at what's been written about solar power around the world and then checks out successful examples from different tourist areas. The results suggest that slowly switching to solar tech can cut costs and bring in tourists who care about the environment (Ismail & Mansor, The study on the adoption of solar technologies for sustainable tourism development, 2025, pp. 145-163).

- The comparative study of tourist destinations:

This study compares tourist locations that use solar energy with those that do not. The goal is to see how solar tech changes operating costs, energy use, and sustainability. The data shows that using solar power cuts costs, boosts profits for tourist spots, and helps the environment by lowering emissions and reliance on fossil fuels (Chen, Paramaiah, Kumar, Khan, & Haomu, 2025).

- The study by Guo and Chai (2025):

Guo and Chai (2025) look at how renewable energy, like solar power, affects how sustainable tourist spots are, especially when it comes to meeting sustainable development goals. They use a strict method, mixing complex ways to measure things with data gathered over many years, to figure out how renewable tech influences the environment at these locations.

The study starts by checking out what others have written, seeing how tourism and using renewable tech (mainly solar energy) play together to affect how well the environment lasts in BIMSTEC countries.

The info used comes from 2000 to 2022 and has important stuff like GDP, how much renewable energy is used, and how many tourists visit.

To look at the info, they use panel data regression methods, focusing on the CS-ARDL model. This helps them see the relationships between tourism, renewable energy, and environmental quality, which they measure with the load capacity factor.

They also do a time-based check using wavelet analysis. This lets them better understand how tourist growth and environmental quality act together over different amounts of time, studying the short, mid, and long-term outcomes (Chai & Guo, 2025) .

- ❖ The study by Zaghdoud (2025):

Zaghdoud's study (2025) looks at how using renewable energy and tech affects sustainable tourism in Tunisia. They used a method called Autoregressive Distributed Lag (ARDL) to see how tourism growth relates to things like environmental damage, renewable energy use, tech, and foreign investment (Zaghdoud, 2025).

The study found that environmental damage hurts tourism in the long run. It also found that using renewable energy and tech helps the industry grow. Foreign investment was seen as a big plus for tourism. The research suggests that Tunisia needs to better manage its environment, use more renewable energy in tourism, push tech, and get foreign investment in clean tech to help build sustainable tourism.

The study's results suggest that renewable energy and tech have a notable, long-term impact on tourism. This shows that including these things in plans for sustainable tourism is very important.

- ❖ The study on the adoption of renewable energy in the hospitality sector in Northern Cyprus (2025):

A 2025 study in Northern Cyprus looked at how renewable energy, especially solar, affects the sustainability of tourist spots. It involved a field study of managers from 3-, 4-, and 5-star hotels to see how aware they are of sustainable energy management and what problems they face when trying to use eco-friendly energy methods (Sezenler & Aga, Managerial Perspectives on the Use of Environmentally Friendly Energy in Accommodation Facilities in Northern Cyprus, 2025).

The study used both interviews and online surveys. The hotels included were mainly those that could afford to use solar tech. The research focused on energy practices within the hospitality industry, paying close attention to what the government is doing and what legal changes are needed to switch to sustainable energy solutions. The research showed that most hotel managers know solar energy is good, but laws and infrastructure get in the way of using it.

The study also found differences between hotel types. Five-star hotels are doing better at using renewable energy, while 3- and 4-star hotels have more trouble.

This example could help other developing island destinations create sustainable energy plans for their hospitality sectors.

1.2. Commentary on previous studies

A detailed look at past work on using renewable energy, especially solar, in tourism shows where studies agree and differ from our own research on how green tech boosts tourist spot sustainability.

Generally, studies like Michalena and Tsekouras (2010), Otchiwaridzo (2023), Li et al. (2024), Qamruzzaman (2024), Avcı et al. (2024), and Zmami et al. (2025) share a key idea: using renewable energy, like solar power, improves both the environment and the local economy of tourist spots.

1. Overlapping Points with Our Work

We found several important common ideas:

1. Concept Understanding

The studies we looked at helped clear up ideas like:

* Green tech

* Sustainable tourism growth

* Energy independence

* Managing sustainable tourism supply chains

For example, Michalena and Tsekouras (2010) show how using solar power cuts energy costs, while Qamruzzaman (2024) and Avcı et al. (2024) connect tourism growth, renewable energy use, and CO_2 levels. These ideas strengthened our base by bringing together economic, environmental, and management views.

2. What Makes People Use Solar Energy

Newer studies point to common things that push solar energy use, such as:

* High setup costs

* Weak rules

* Tax breaks and aid from the government

* Manager awareness and care for the environment

* Money access

Studies by Zmami et al. (2025) and one in Makkah (2025) note how important government help and money tools are, which is a key part of our research on the role of government.

3. How They Did It

The papers used different ways to study their topics:

* Surveys (Michalena & Tsekouras; Zmami et al.)

* Complex models (CS-ARDL, NARDL, panel data regression) like those used by Qamruzzaman (2024)

* Comparing policies between countries (Li et al., 2024)

* Mixing numbers and stories

Seeing these different ways of researching helped us pick the right ways to look at our own data.

2. Problems with Past Studies

Despite good points, we saw some problems:

1. Too Much Focus on National Data

Some studies (Qamruzzaman, Avcı et al., Guo & Chai) use mainly national-level data. This is good for big trends but misses what actually happens at tourist spots.

2. Too Much Focus on the Environment

Many studies look at environmental results like CO_2 cuts or footprint but not enough at:

* Social effects (local jobs, community agreement)

* How things are run

* How green ideas fit into business plans

3. Not Enough on Developing Countries

Some studies look at places like Zimbabwe, Tunisia, Makkah, and Northern Cyprus, but we still need deep studies in new places with:

* Money troubles

* Energy dependence

* Unstable rules

4. Missing the Big Picture

Most studies see solar energy as just a tech fix, not part of a plan. Few link:

* Tech ideas

* Tourism plans

* Local competition

* Goals for staying power

3. What Our Study Adds

Our study is different because:

* It combines green tech, economic results, and staying power.

* It looks at how solar energy can help long-run competition.

* It studies a less-known area, giving new facts.

* It gives real, specific advice based on what we found and what works worldwide.

In short, past studies say solar energy helps tourist spots stay sustainable. But they miss joined-up thinking, local details, and management views.

So, our work builds on what's there but tries to fix these gaps by looking at green tech in a detailed, useful way for sustainable tourism.

SECTION 02 : Conceptual Framework of Renewable Energy with a Focus on Solar Energy

Drawing from earlier studies on both renewable energy and sustainable tourism, it becomes clear we need a conceptual framework to better understand how these areas connect. Specifically, solar power stands out as a crucial renewable resource. It helps push tourism towards sustainability by making environmental performance better in travel destinations. For this integration to really work well, it relies on several factors: the right regulations, sufficient investment, ongoing technological advancements, and active involvement from all relevant parties (Sharma & al, 2024; Navarro M. C., 2025).

Here, we will introduce the core ideas behind renewable energy and green technologies, focusing particularly on solar energy and its significance for developing sustainable tourism. The discussion will also cover how tourism businesses, especially hotels, are incorporating solar energy to lessen their environmental footprint and boost energy efficiency.

Given this context, the upcoming section will delve into the following key areas:

1. Fundamental concepts surrounding renewable energy and green technologies, with a particular emphasis on solar power;
2. The principal factors influencing tourism development;
3. And the interplay between embracing solar energy and overall sustainable tourism performance (Sharma & al, 2024; Navarro M. C., 2025).

2.1. Conceptual Foundations of Sustainability and Green Tech

2.1.1. Definition of Sustainable Development

It is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. It is built upon a balance between three core pillars: environmental protection (the environmental dimension), continuous economic growth (the economic dimension), and social equity and well-being (the social dimension).

2.1.2. Definition of Green Technology and Innovation

It refers to a category of environmentally friendly technologies, innovations, and systems designed to mitigate or reverse the negative impacts of human activity on the Earth. It aims to conserve natural resources, minimize carbon emissions, and reduce pollution. Key examples include renewable energy technologies (such as the solar energy), recycling, and energy efficiency.

2.2. Fundamentals Of Energy

2.2.1. Definitions of renewable energy

Biomass energy differs from fossil fuels because it replenishes naturally, making it renewable. According to Diaconescu (2024), renewable energy comes from sources that renew faster than we consume them, so they are basically unlimited. This idea highlights why renewables are important for clean energy systems and global sustainability.

Rodríguez-Aburto et al. (2025) point out that renewable energy stems from natural processes that keep renewing themselves, playing a key role in fighting climate change. This fits with how solar, wind, and hydro are included in sustainability plans since they tend to have low environmental impact.

Key points from these definitions:

Natural source: Comes from natural processes such as solar, wind, water, geothermal, and biomass.

Refilling: Renewed at a rate equal to or greater than how fast we use it.

Sustainability: Offers a cleaner alternative to fossil fuels with less environmental damage and long-term use potential.

These elements are crucial when discussing how renewable energy contributes to clean energy transitions and sustainable development.

Considering the current context, solar energy is widely recognized as a pivotal renewable resource. Its significance stems from its considerable availability, efficient conversion processes, and diverse applicability, especially relevant for sectors such as tourism that are actively pursuing sustainable energy options (International Renewable Energy Agency, 2023; United Nations World Tourism Organization, 2022)

2.2.2. Legal framework for the authorization and use of renewable energy

legal framework for renewable energy- specifically solar energy- is the system of laws, rules, policies, and organizations that control how renewable energy projects are approved, built, managed, and used in an area. These frameworks give investors assurance, protect the environment, and match national energy plans with sustainability aims (Wojtaszek, 2025).

1. Purpose of Legal Frameworks

- ✓ Legal frameworks for renewable energy have several goals:
- ✓ They clarify the roles and duties of everyone involved, such as governments, regulators, investors, and builders (Wojtaszek, 2025).
- ✓ They offer regulatory certainty and make sure rules are followed, which boosts investor trust and helps more renewable projects get off the ground (Kazimi, 2025).
- ✓ They add renewable energy targets to national and international climate goals, like the promises made in the Paris Agreement (Kaya & Kaya, 2025).
- ✓ A clear legal framework makes sure that approval processes, like permits, licenses, tariff setting, and grid access rules, are open, reliable, and in line with environmental standards (Wojtaszek, 2025; Kazimi, 2025).

2. National and Comparative Legal Frameworks

Nationally, legal frameworks differ from place to place, but they usually have these things in common:

Laws and policies that set renewable energy targets and say which technologies are allowed (Wojtaszek, 2025).

Regulatory motivators, such as feed-in tariffs, renewable portfolio standards, tax breaks, and auction systems, that push project growth and funding (Kazimi, 2025).

Permitting and approval steps that manage the permissions, land use, and grid connection needs for renewable energy setups (Wojtaszek, 2025).

Studies show that countries with simple, enforceable legal frameworks tend to be better at putting renewable energy to work. For instance, Germany's renewable energy growth was helped by steady regulatory tools (like feed-in tariffs), while inconsistent rule enforcement in other countries has made things slower (Kazimi, 2025).

Legal frameworks also lay out the roles of organizations, like energy regulators that check compliance, environmental impact reviews, and contract terms for developers (Kazimi, 2025).

3. International Legal Interactions

Globally, there's no single legal system that manages renewable energy. Instead, international agreements work with national legal systems, influencing how renewable energy policy is made by changing motivators and duties (Kaya & Kaya, 2025):

The UN Framework Convention on Climate Change (UNFCCC) and the Paris Agreement push countries to cut emissions, which often leads to renewable energy laws at home (Kaya & Kaya, 2025).

Experts note that current international frameworks often are not legally binding ("soft law"). They lack teeth but offer guidance for national laws (Kaya & Kaya, 2025).

National renewable energy laws often add international goals into their own approval and regulatory steps, linking global promises with local action (Kaya & Kaya, 2025).

This link shows that strong renewable energy systems are shaped by both national laws and international climate policy (Kaya & Kaya, 2025).

4. Key Legal Principles in Frameworks

- ✓ Modern legal frameworks for renewable energy include these ideas:
- ✓ Regulatory Certainty and Enforcement:
- ✓ Stable, reliable regulations help investment, lower risk, and make it easier to plan renewable energy projects for the long run (Kazimi, 2025).
- ✓ Institutional Capacity:

Strong legal frameworks define the roles of agencies and ensure they can enforce rules. This is key for applying approval processes fairly, checking compliance, and solving disagreements (Kazimi, 2025).

- ✓ Policy Coherence:

Legal frameworks try to line up policies across different areas — energy, climate, environment, and the economy — to avoid mixed messages and regulatory confusion (Kaya & Kaya, 2025).

2.2.3. Types of renewable energy (Green energies)

Renewable energy, often called green energy, comes from natural sources such as sunlight, wind, and water that keep replenishing over time. These sources produce power with low greenhouse gas emissions, which helps reduce carbon footprints worldwide (Sharma & al, 2O24; Navarro M. C., 2025)

Our research prominently features solar energy, primarily because it is so widely available and highly adaptable for many different technical uses.

1. Solar Power

Solar power transforms sunlight into electricity using panels or collects heat for various uses. Technological progress has made solar energy one of the more common and affordable renewable options. (Sharma & al, 2O24).

2. Wind Power

Wind power captures energy from moving air through turbines. The number of wind farms on land and offshore is increasing quickly, driven by their efficiency and the steady winds found over water (Sharma & al, 2O24; von Jouanne & al, 2025).

3. Water Power

Water power produces electricity from flowing water and is still a key renewable source worldwide. It generally provides a steady energy supply, but its use depends on location and environmental conditions (Sharma & al, 2O24).

4. Biomass and Bio energy

Biomass, which includes plant and farm waste, can be converted into heat, power, or biofuels. Common techniques involve burning or anaerobic digestion, often applied in rural areas or combined heat and power systems (Sharma & al, 2O24; Navarro M. C., 2025)

5. Geothermal Power

Geothermal power uses heat from inside the Earth to generate energy or heat buildings directly. It offers a steady source of power with low emissions, though its availability is limited to certain places (Sharma & al, 2O24; Navarro M. C., 2025)

6. New Marine and Ocean Power

Marine energy covers wave, tidal, and ocean thermal energy and is an emerging option for coastal areas. While still less developed than solar or wind, it broadens the range of renewable energy sources (von Jouanne & al, 2025).

7. Combined Systems

Current studies point to combining different renewable sources, like solar, wind, and energy storage, to improve reliability and energy security, especially in off-grid or developing regions (Navarro M. C., 2025).

Among the diverse array of renewable energy sources available, solar power is widely acknowledged as a highly pertinent and extensively implemented option. This prominence stems from its widespread accessibility, continually falling installation expenses, and remarkable adaptability across numerous sectors. In contrast to other renewable options, including wind, hydropower, biomass, and geothermal energy, solar power proves especially well-suited for decentralized deployment. Its straightforward integration into both urban and rural environments further enhances its appeal. Consequently, solar energy holds considerable significance for sectors like tourism, where

the demand for sustainable energy solutions continues to grow (Sharma & al, 2024; Navarro M. , 2025).

2.2.4. The process of development and elaboration of renewable energies

The growth of renewable energy-particularly solar energy- is a complex, collaborative effort, touching on innovation, regulations, funding, tech, and how people accept it. Studies from 2021 to 2026 show how the successful development of solar infrastructure necessitates a harmonious integration of innovation, effective regulations, adequate funding, and broad societal acceptance (Kunskaja L. , 2025; Beschea A. , 2026).

- Determinants and Drivers of Development

Many things push renewable energy forward or hold it back. A study found eight main things that matter: money, the environment, energy needs, government, rules, where you are, technology and people's feelings. These all change how fast and how much renewable energy is used. It shows that it's not just about the technology it's also about money, society, and what the government does (Kunskaja S. , Determinants of renewable energy technology deployment, 2025).

- Economic and Policy Dimensions

A stable economy, supportive policies, and access to financing significantly impact renewable energy promotion. Funding mechanisms, trade rules, and strong institutions are key for investment. Government measures such as tariffs and subsidies can help finance projects and shape market behavior (Kunskaja S. , Determinants of renewable energy technology deployment, 2025).

- Technological Innovation and Integration

New tech is a big part of growing renewable energy. Things like better solar panels, storing energy with batteries, connecting to the grid, and smart systems lower costs and make things more reliable, which speeds up use. Tech improvements also work with government and money incentives to make renewable energy more competitive with older energy sources (Kunskaja S. , Determinants of renewable energy technology deployment, 2025).

- Social Acceptance and Public Participation

What people think and know about renewable energy greatly affects whether it gets used. What the public thinks, how much they trust it, and how well they understand it can help or hurt its use. Talking with communities, what people believe, and trust in groups are important for renewable energy to grow (Kunskaja S. , Determinants of renewable energy technology deployment, 2025).

Interdependency of Factors

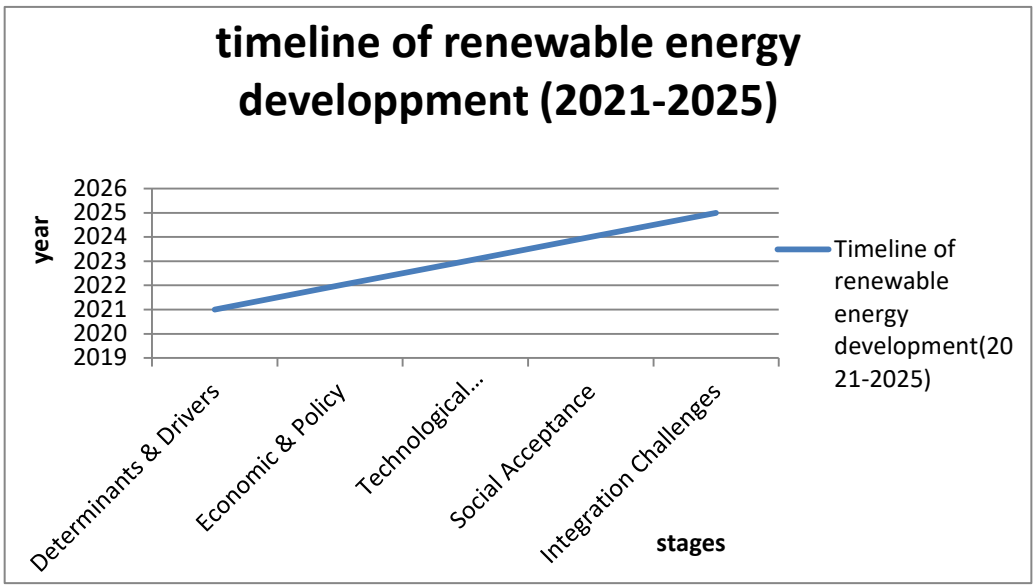
The growth of renewable energy isn't simple; it's a mix of many things. Money matters, tech abilities are needed, people's acceptance affects government, and rules shape where money goes. Because everything is connected, we need to look at the big picture and deal with tech, people, and government issues to grow renewable energy (Kunskaja S. , Determinants of renewable energy technology deployment, 2025).

Transition and Integration Challenges

Recent studies show that adding renewable energy to what we already have, like power grids, makes things complicated with how things work and what the rules are. We need to handle this to grow effectively. Things like wind and solar that change need good planning, flexible grids, and good storage. Funding and sharing models can help with adding renewable energy (Beschea G. A., 2026)

Considering renewable energy technologies, solar power notably exemplifies the developmental patterns previously outlined. The expansion of solar energy systems is considerably shaped by economic forces, governmental strategies, and advancements in technology, especially breakthroughs in photovoltaic efficiency and energy storage solutions. Moreover, solar energy enjoys growing public acceptance, a trend attributable to its environmental benefits and its adaptability for use in both urban and rural settings. Nevertheless, incorporating solar power into established energy grids continues to encounter obstacles, primarily concerning grid stability and the inherent intermittency of solar generation. Addressing these issues necessitates sophisticated planning and robust regulatory support (Beschea G. A., 2026; Kunskaja L. , 2025)..

Figure 1: *Timeline of renewable energy development(2021-2025)*



Source: Prepared by us same with Excel

In conclusion, this chapter has shown that renewable energy, particularly solar energy, is a key element in the global transition toward sustainability. It has also demonstrated that its development is shaped by legal, technological, economic, and social factors, as well as by international and national frameworks that support its implementation (Sharma & al, 2024; Navarro M. C., 2025; Kazimi, 2025).

2.2.5. . Renewable energies in Algeria, especially solar energy

- Solar Power Possibilities in Algeria

Across Algeria's Sunbelt location, sunlight intensity ranks among the world's strongest. Spreading through wide open territories, its solar capacity unfolds in large regional patterns

Each year, sunlight sweeps across Algeria for roughly two thousand to nearly four thousand hours (Haddoum & al, 2024, pp. 51-65). Reaching deep into the Sahara's southern zones, energy from the sun hits levels near 2,263 kilowatt-hours per square meter annually - far above what most parts of Europe see (Haddad & Boulahchiche, Solar PV development in Algeria: Status and prospects, 2026, pp. 10-22).

Across the country, sunlight shifts dramatically by region - reaching just 4.66 kWh/m² each day along the northern coast, yet climbing to 7.26 kWh/m² under the intense sun of the southern deserts. This stark contrast positions the Sahara at the center of major solar projects using photovoltaic and concentrated technologies (Haddoum & al, 2024).

- National Strategy and Implementation 2021–2026

Algeria began adjusting its renewable energy goals in 2021, responding to obstacles in execution alongside rising internal consumption needs.

By 2035, the planned solar capacity will reach 15,000 MW - down from an earlier objective of 22,000 MW by 2030 (Haddad & Boulahchiche, Solar PV development in Algeria: Status and prospects, 2026). Shifting course slowly, officials now expect renewable sources to make up three-tenths of total power supply within the next few years. This change intends to lessen dependence on natural gas, still powering nearly all electric output today (Haddad & Boulahchiche, Solar PV development in Algeria: Status and prospects, 2026; Belkacem & Mansour, Energy transition in Algeria: Barriers and opportunities amid a gas boom, 2026, pp. 15-28). While progress unfolds, fossil fuels remain dominant across the grid.

One key shift happened in 2024 when deals were sealed for fifteen solar facilities, adding up to 3,000 megawatts through collaboration between Sonelgaz and several foreign and local firms (Haddad & Boulahchiche, Solar PV development in Algeria: Status and prospects, 2026). Not far behind, progress continues on the Solar 1,000 megawatt initiative - work on a 300 megawatt site in Oued Province expected to wrap by late 2025 or early 2026 (Sonelgaz Media Office, 2025).

By 2021, photovoltaic systems had reached a total of about 356.1 megawatts in operation; following that, expansion is expected to accelerate sharply once the large-scale deployment of 3,000 megawatts moves into its hardware installation stage around 2025 and 2026 (Haddad & Boulahchiche, Solar PV development in Algeria: Status and prospects, 2026; Market Report Analytics, 2026).

- Economic and Technical Challenges

Even so, progress runs into fixed hurdles - both organizational and mechanical

Most of the country relies on a central power network - the RIN - now struggling to handle energy flows from southern regions where solar and wind generation pop up unevenly across areas (Haddad & Boulahchiche, Solar PV development in Algeria: Status and prospects, 2026; Belkacem & Mansour, Energy transition in Algeria: Barriers and opportunities amid a gas boom, 2026). Upgrades become unavoidable once unpredictable supply patterns start testing old infrastructure limits.

Heat levels across the Sahara, often hitting 50°C, impact solar panel performance - dust settling compounds these losses. Cooling methods combined with regular maintenance help counter such drops in output. Research shows adapted systems respond better under extreme conditions (Haddoum & al, 2024).

Because domestic natural gas prices are heavily supported by subsidies, clean energy struggles to match its low costs unless ongoing policy support and legal changes remain in place (Belkacem & Mansour, Energy transition in Algeria: Barriers and opportunities amid a gas boom, 2026; Market Report Analytics, 2026).

Conclusion Of The First Chapter

This chapter explains renewable energy and why it is crucial for sustainable development, focusing especially on solar energy and what it can do. It starts by defining renewable energy and describing its environmental benefits. Then, it looks at the laws and rules that encourage investment and help countries meet their global climate goals.

Next, the chapter covers different kinds of green energy, pointing out why solar power is strong, like how it can be set up in many small places, which makes it a smart option for sustainable tourism. It also examines what mainly drives renewable energy growth, stressing that money, technology, and social aspects must work together to connect it to the main power grid effectively.

Finally, the chapter looks at solar energy in Algeria, showing how much solar energy Algeria could generate, especially in the Sahara Desert, and talks about the country's plan (2021–2026) to generate 15,000 MW by 2035. The chapter also lists the main technical and money-related problems with this shift—like limits on the power grid, tough weather,

and money given to fossil fuels—all of which need continuous legal and technical help to make the energy change successful and lasting.

CHAPTER 02: EVOLUTION OF TOURISM AND THE CONTRIBUTION OF RENEWABLE ENERGY TO SUSTAINABLE TOURISM DEVELOPMENT

SECTION 01: EVOLUTION AND SCOPE OF TOURISM

1.1. General overview of the Tourism Sector

Tourism is a complex system that includes various activities, companies, and services catering to people traveling for leisure, work, or other reasons. It links transportation, accommodations, food, activities, and other supports into a worldwide network (Bhatt, 2024; Pinhal, Estima, & Duarte, Open innovation in the tourism industry: A systematic review, 2025).It is generally considered a service-based economy, where entities like travel agencies, hotels, and destination managers coordinate to satisfy travelers' needs (Pinhal, Estima, & Duarte, Open innovation in the tourism industry: A systematic review, 2025)

In recent years, tourism has grown quickly, with nearly 1.5 billion international travelers annually before the COVID-19 pandemic. Factors like globalization, easier access to travel, and higher disposable incomes have made tourism a significant part of modern life and the global economy. Although the pandemic caused setbacks, international tourism is now recovering strongly (An Overview of Tourism Sector in the Post-Covid-19 Period and beyond among East African Countries, 2024, pp. 20-30)

The sector includes various types such as vacation, cultural, nature, and business travel, each with distinct traits and economic impacts (Pinhal, Estima, & Duarte, Open innovation in the tourism industry: A systematic review, 2025)

Recent research also stresses adopting sustainable, innovative, and technology-driven approaches, focusing on smart destinations and digital tools to stay competitive (Smart tourist destination: a literature review and future agenda, 2025)

1.1.1 Definition of The Tourism Sector

Tourism is more than just travel; it involves movement, experiences, and services, which can be studied from social, cultural, economic, and management viewpoints.

1. Tourism: A Social, Cultural, and Economic View

The United Nations World Tourism Organization (UNWTO) defines tourism as a major social, cultural, and economic phenomenon involving people traveling for different purposes beyond leisure (Amoiradis, Velissariou, & Stankova, 2021, pp. 10-21).

2. Tourism: Visitors, Destinations, and Services

Tourism also covers traveling itself, the services used, expenses made, and interactions among tourists, local communities, businesses, and authorities (Amoiradis, Velissariou, & Stankova, 2021).

3. Tourism: People and Places Interacting

Studies point out that tourism involves how tourists and locals engage with places, activities, and cultures, leading to cultural exchanges and social and economic effects (Geng, 2025).

4. Tourism in Research

Current research treats tourism as a system where people move, services are traded, and money flows, playing a role in sustainability and policymaking (ScienceDirect)

5. Movement and Temporary Stay

Tourism means traveling for a limited time for reasons like leisure, business, or health, which differs from migration (United Nations World Tourism Organization (United Nations World Tourism Organization (UNWTO, 2008).

6. Academic Literature on Tourism Definitions

Recent studies recognize tourism as a complex sector involving multiple groups and systems, including travel and related services (Ortiz & al, 2024)

1.1.2 History of the Tourism Sector

Modern Historical Development (Post-Mid-20th Century)

- **Mass Growth and Sector Transformation**

Research on tourism shows that it has grown faster than most other parts of the world economy since the mid-20th century. Protić (2025) notes that tourism is now the fastest-growing economic activity globally. It keeps expanding because of new technology, more international travel, and changes in how travel and tourism work. This growth has shifted into digital and tech expansion in the 21st century (Bratić, 2025).

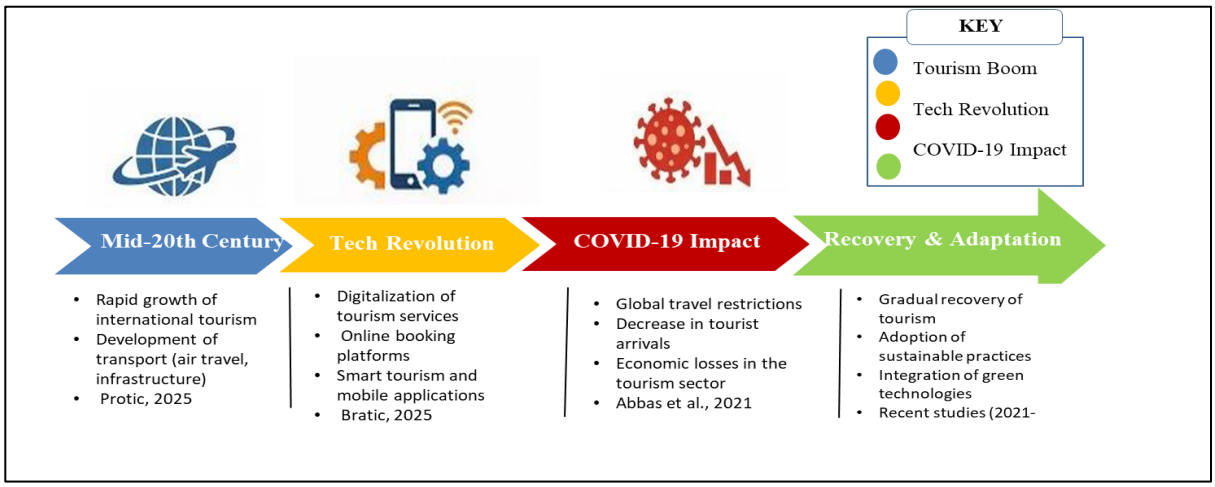
- **Influence of the Fourth Industrial Revolution**

Technological progress, like the internet, has enabled more flexible and innovative tourism models, building on the growth of international travel and air services after World War II (Bratić, 2025).

- **Recovery of the Sector After Major Events.**

Events such as the COVID-19 pandemic had a major impact on tourism, causing a sharp drop in international travel. Efforts to recover show how tourism can adapt and bounce back from challenges (Abbas & al, 2021).

Figure 2: *Modern History of the tourism sector*



Source: Prepared by us same with Excel

1.2. Types of tourism

A. Conceptual Note on Tourism Type Classification

Researchers agree that tourism can be sorted in different ways, but there's no one way that everyone uses. This is because different kinds of tourism overlap and change as society, culture, the environment, and technology change. Zhang's work (2023) looks at tourism types, using grounded theory to analyse how they are classified in academic studies. It shows that 155 different elements can be put into 22 smaller groups and 6 larger groups. This shows how complex tourism types are in modern research (López-Vera & Pelegrín-Entenza, 2025)

B. Purpose-Oriented Tourism Types

Many studies sort tourism types based on the purpose or reason for travel. These include**:**

1. Cultural Tourism

This kind of tourism is about experiencing culture, like heritage, art, history, and local customs. It's a popular area of study because it links travel to cultural experiences and the protection of culture (Su & Others, 2023).

2. Nature-Based and Ecological Tourism

This type focuses on being in nature. It includes ecotourism and outdoor activities that focus on enjoying natural places. These are being studied more for how they affect sustainability and conservation (López-Vera & Pelegrín-Entenza, 2025; Campos, 2024).

3. Sports and Event Tourism

This is when people travel to take part in or watch sports or cultural events. This includes big events like tournaments and festivals that bring in tourists looking for unique experiences, not just regular sightseeing (López-Vera & Pelegrín-Entenza, 2025).

4. Medical and Health Tourism

This kind of tourism is about travelling for health reasons, like treatments or wellness programs. Studies have looked at medical tourism as its own thing because of its economic impact and specialised services (Oborin, 2022, pp. 179-187).

5. Creative Tourism

This is a newer type that is growing fast. It focuses on creative experiences, like art, cooking, and learning new skills in a cultural setting. Creative tourism is seen as a new type that is all about experiences and often connects with nature or heritage tourism, like in parks (Sinsup & Phumsathan, 2025)

6. Rural Tourism

This involves travelling to rural areas and experiencing local life, landscapes, and farming. It relates to research on community-based and sustainable tourism in some areas (Kolotukha, 2025, pp. 3-8)

C. Experience-Driven And Emerging Tourism Types

Studies show that tourism types are also influenced by the type of experience and people's values:

1. Sustainable and Protected-Area Tourism

This focuses on using sustainable practices and protecting the environment in tourism, especially in protected natural areas. Ecosystem protection and local community involvement are part of the tourism activities (López-Vera & Pelegrín-Entenza, 2025).

2. Social Inclusion Tourism

Recent research focuses on tourism that includes different groups of people, like making things accessible, involving the community, and sharing benefits fairly. This connects with topics like social innovation and community-based tourism (Korbiel, 2025).

3. Smart and Technology-Driven Tourism Forms

This isn't exactly a type of tourism, but research is looking at how technology and digital tools affect tourism experiences. This includes things like apps and data-enhanced experiences. There is growing interest in how these shape tourism and how destinations work (Kusumawardhani, 2024).

1.3. Forms of Tourism: Categories in Current Studies

Current tourism studies identify established and newer kinds of tourism. The categories listed below are known in academic circles and come from published, peer-reviewed work from the last five years:

1. Research-Related Tourism (RrT)

One recent way to think about tourism is through Research-Related Tourism (RrT). This is seen as travel driven by a desire to learn, explore, or gain knowledge (Shah, Trupp, & Stephenson, 2022).Within RrT, there are six suggested sub-types:

- Scientific Tourism : going to places to do science work or collect info.
- Educational and Academic Tourism : trips related to school or academic

- Volunteer Tourism : traveling to take part in volunteer projects that help communities.
- Business Tourism– trips for work or conferences.
- Virtual Research Tourism : exploring places digitally for research reasons.
- Genealogy and Roots Tourism : travel to learn about family history.

This list goes beyond regular fun trips and shows how travel for knowledge affects what tourism looks like today.(Based on RrT ideas: C. Shah, Trupp & Stephenson, 2022; mentioned in academic summaries) (Shah, Trupp, & Stephenson, 2022)

2. Geographical and Spatial Forms

Tourism can also be sorted by where you go:

- Urban Tourism : going to cities and experiencing city life.
- Coastal Tourism : visiting beaches and waterfronts.
- Island Tourism : going to islands.
- Mountain Tourism : visiting mountains and natural areas.

This way of sorting tourism is used in planning for tourist spots and shows how different places create different kinds of tourism (Tourism-type ontology framework for tourism-type classification, 2023; Shah, Trupp, & Stephenson, 2022)

- **Overview**

In current tourism research (2021–2026), kinds of tourism are understood using changing academic groups that include both older groups (like business or education) and newer patterns caused by things like online interest or research-based travel. In addition, experts point out that it is still hard to make one complete list of tourism types because tourism includes many reasons, locations, and things to do (Tourism-type ontology framework for tourism-type classification, 2023)

1.4 The Role of Tourism

Tourism has become a major global industry in modern times. It affects economies, cultures, societies, and the environment, influencing communities, countries, and relations across the globe.

- **Economic Impact**

Tourism is a key part of the global economy. It creates jobs, money, and earnings from other countries, helping economies expand and diversify in both rich and poor nations. Sun et al. (2025) suggest that it greatly helps economic growth, mainly where there are effective government and investment policies (Sun, Liu, Pan, & Wang, Tourism and economic growth: The role of institutional quality, 2025)

A review of multiple studies shows that tourism is connected to local economic progress, better infrastructure, and money coming in from abroad, mainly in areas moving from economies based on resources to those focused on services (Farooq, 2025)

- **Socio-Cultural Impact**

Tourism acts as a way for cultures to interact and societies to connect. Amin and Budilestari (2025) point out that it affects cultural aspects like protecting heritage and encouraging discussions between different cultures. They also mention that it's necessary for plans and rules to involve everyone to avoid cultures from being exploited or misrepresented (Amin & Budilestari, 2025, pp. 21-37)

Travelers themselves are important in creating tourism that doesn't harm cultures. If they respect local customs and take part in cultural activities, this helps preserve these cultures (Wang & Li, 2025)

- **Environmental Impact**

The effect of tourism on the environment is being studied more and more. As tourism grows, there's more discussion about its impact on the environment. Bratić (2025) argues that technology helps make tourism sustainable by using resources better, lowering climate impacts, and improving how destinations are managed by using new methods (Li & Jiang, 2024)

Recent studies also indicate that sustainable tourism methods, supported by education, cooperation, and rules, are important for lessening damage to the environment while improving life for local communities (Sun, Liu, Pan, & Wang, Tourism and economic growth: The role of institutional quality, 2025, pp. 974-987)

- **Governance**

Strong infrastructure and institutions are part of the wider systems in which tourism exists. Munir et al. (2025) say that good infrastructure and trust in institutions greatly affect how happy tourists are and how sustainable tourism is, which aids in community growth (Wang & Li, 2025).

1.5. Importance of tourism in the economy (Global, National, and Local).

- **Global Economic Importance**

Tourism is known as a big economic force, aiding GDP, jobs, and trade across countries. On a larger scale, tourism aids the economy through visitor money and its effects on areas such as transport, hotels, and shops (Garg, 2025).Studies suggest tourism does more than just make money; it affects economic stability and trade among countries.

Tourism abroad is also key for ongoing economic growth, helping countries use what they have to offer tourists to help meet larger economic and social aims. While global GDP numbers are often shared by groups like the World Travel & Tourism Council (WTTC), research backs this up: tourism abroad is still a main part of global economic activity after COVID (Garg, 2025).

For example, when looking at ASEAN economies, data shows tourism abroad helps economic growth by increasing exports (like an invisible export), boosting trade, and making the economy better (Alsabhan, 2025).

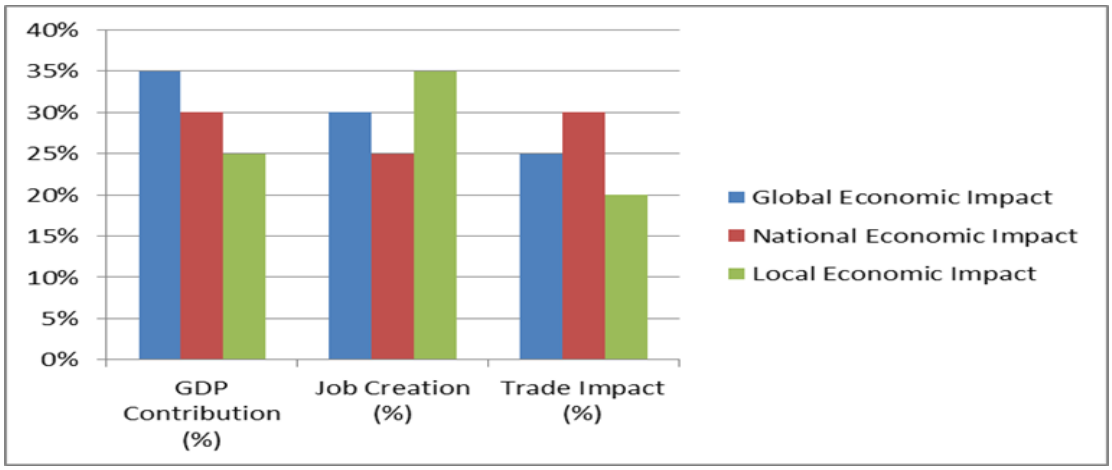
- **National Economic Importance**

Tourism helps economies grow, brings in foreign money, and adds to public money on a country level. Studies show tourism can be a big source of income and jobs, mainly in places with lots to offer tourists. For instance, research on ASEAN countries found tourism abroad greatly helps economic growth through spending, trade, and job (Alsabhan, 2025).Also, how well a country is run affects how well tourism aids economic growth. Countries with better rules and policies see better growth led by tourism (Sun, Tourism and economic growth: The role of institutional quality, 2025).This matters for economic planning and ongoing growth plans where tourism is part of making the economy more varied.

- **Local Economic Importance**

Tourism is very important in boosting regional economies and helping small businesses on a local level. Studies on local tourism plans show tourism raises local money, helps business owners, and makes jobs in local areas (Makhovka, 2025).Local tourism also pushes cultural exchange and helps protect local culture and nature, which boosts community identity and economic strength (Makhovka, 2025).The economic benefits of local tourism often spread to connected areas like local food, culture, and crafts, further aiding wider regional goals (Makhovka, 2025).

Figure 3:*Importance of tourism in the economy (Global, National, and Local).*



Source: Prepared by us same with Excel

1.6. Factors influencing Tourism

Up-to-date, peer-reviewed studies show several factors shape tourism demand, growth, and backing:

1. How People See the Outcomes and Local Backing

How locals view the effects of tourism affects their support for its expansion. When people see tourism as helpful, they tend to support it. But if they see problems, like disturbance or competition for resources, they are less likely to support it (Wang & Li, 2025)

2. Destination Image, Online Attention, and Perceived value

What people plan to do on trips is affected by the image of the place, what they find online, how they feel about it, and what value they think it has. These things work together and can either push people to visit or keep them away. This shows that what people think and what information they get are important (Li & Jiang, 2024)

3. Institutional and Policy Quality

How well things are run, like governance and tourism policies, affects how tourism growth impacts finances. Solid systems can make tourism help the economy, while weak systems can get in the way (Sun, Liu, Pan, & Wang, Tourism and economic growth: The role of institutional quality, 2025)

4. Infrastructure, Government, and Stakeholder Involvement

How tourism grows, especially in small areas like tourist towns, depends on available infrastructure, government help, and people like business owners and locals getting involved. These things together decide who comes to visit and how well the destination works (Astuti, Putranto, Agung, & Ma'rifat Aini, 2023)

5. Innovation and Technology

Tech is becoming more important in how tourism changes. New studies point out how using tech, like smart systems and online services, changes how tourists act and how well a place competes. Being digital affects how easy it is to get to a place, marketing, handling visitors, and what experiences are offered (Zhang, 2025)

6. Community Participation and Equity

When everyone gets a fair share and things seem fair, people are more likely to support tourism. How locals feel about justice affects whether they want tourism to grow more (Wang & Li, 2025)

In conclusion

Tourism is best thought of as a changing thing. Destinations change, and people act differently. Proof shows different patterns based on new ideas, going global, what people think, and how things are run. Whether you look at how places grow over time or what makes people want to travel, current research says that tourism growth is affected by things like society, money, institutions, and changing tech.

1.7. Tourism on an international scale.

International tourism involves people crossing borders for leisure, business, or other reasons. By the early 21st century, it had grown into a major global service industry, with

complex exchanges between countries. These exchanges are shaped by economic, environmental, and structural elements.

One area of tourism research examines how these movements are arranged and connected. Analysis suggests that international tourism is not evenly spread globally but is instead concentrated regionally. This means that many countries tend to exchange tourists with a specific set of partner countries (Burzynska, 2026, pp. 45-67).This situation shows that economic connections and location influence international tourism.

- ✓ **How Things Change: After COVID-19 and Structural Shifts**

Research from the 2020s points out how international tourism has changed after major global events, like the COVID-19 pandemic. These studies may not cover centuries of tourism history, but they do record important structural changes in the last decade.

International tourism saw a big drop in 2020 because of travel restrictions. Then, it started to recover. This quick return of international travel has led to questions about tourism's environmental, social, and economic effects. For example, studies suggest that growth in international tourism is tied to higher risks to natural life in destination countries, with effects that build up over time and spread to nearby areas (Chen, Wu, Zhang, & Ji, 2025, p. 113).This study used data from 155 countries from 2001 to 2019, showing that tourism's expansion has lasting environmental results.

- ✓ **What's Being Studied in Tourism**

Studies on tourism have also changed in recent years, reflecting new priorities and global goals.

A review of tourism research shows that these studies are including topics like communication, tech, and preservation. This review covers different fields of study and points to increasing interest in things that affect international tourism, like how destinations talk to visitors and how online platforms affect tourist actions across borders (Salgado Moreno, Forero, Revilla, & Moure, 2024).The article uses data to map out research topics, showing that tourism study is changing along with trends in media and tech.

- ✓ **Patterns Over Time: Summary**

Because studies from 2021 to 2026 focus on current trends rather than past history, here are some themes:

International tourism is still focused in certain regions but is globally important: travel patterns are driven by economic and location factors that continue (Burzynska, 2026).

The recovery from the pandemic has increased travel but raised worries about preservation: there is a link between the increase in tourism and risks to natural life, showing the lasting environmental effects of travel (Chen, Wu, Zhang, & Ji, 2025).

Tourism studies are changing to include technology communication, and preservation: research shows how international tourism is connected to worldwide trends in media and technology (Salgado Moreno, Forero, Revilla, & Moure, 2024).

1.8. Tourism on a national scale (Algeria).

- **Conceptual Framework and Post-Pandemic Resilience**

Most visitors come from inside the country, making homegrown trips vital when global travel slows. Experts describe it as people exploring places in their own nation without crossing borders (World Tourism Organization (UNWTO), 2023). When the coronavirus spread, movement changed fast - locals began choosing nearby spots over distant ones out of caution (Brouder, et al., 2024).

Back then, Algeria saw big changes. For years, locals with steady incomes picked spots such as Tunisia or Turkey instead of staying home. But between 2020 and 2022, things turned different - eyes shifted inward. Places like Bejaia's shores suddenly mattered again. Even remote desert stretches near Djanet drew fresh attention. Travel habits didn’t just change - they rewired (Belkacem & Mansour, The resurgence of domestic tourism in North Africa: A case study of the Algerian Sahara, 2025, pp. 88-105).

- **The Algerian Shift Toward Local Stability Amid Reduced Foreign Dependence**

Though findings from places like the Yangtze River Delta point to revival via local centers (Xu, Boonchai, & Boonlua, 2025, pp. 201-218), Algeria’s path back unfolded under the guidance of its "Destination Algeria" plan.

After the pandemic, numbers began climbing fast - Algeria's homegrown travel habits changed completely. Come 2023, vacation patterns hit new highs locally, especially when temperatures rose. Along the shorelines, foot traffic exploded; places like Tipaza and Annaba counted more than ten million arrivals in just months. That wave wasn't brief - it held strong through August (Algerian Ministry of Tourism and Handicrafts, 2024).

Money stayed home instead of flowing out, because people spent more locally - giving small hotels and handmade goods sellers a needed boost during tough times (Belkacem & Mansour, The resurgence of domestic tourism in North Africa: A case study of the Algerian Sahara, 2025) .

- **Determinants of National Tourism Growth in Algeria**

Ever since 2021, shifts in Algeria's national tourism scene trace back to just a few key forces shaping its rise - each one feeding into the next without pause

Out here, worries about world health risks mixed with tricky visa rules pushed Algerians to explore closer destinations. Moving inland became more common - quiet countryside spots, desert paths, long stays without rush (Brouder, et al., 2024).

By 2030, Algeria is pouring more funds into its Tourist Expansion Zones. Instead of going it alone, officials now team up with private players to upgrade local facilities - something that long held back growth (Algerian Ministry of Tourism and Handicrafts, 2024).

Hidden corners of Algeria are easier to find now. A new wave of young travelers shares what they see online. Websites like Vanyala help locals plan trips without confusion. More teenagers and twenty-somethings explore nearby spots because of this. Information flows faster than before. These changes came quietly, through posts, clicks, and shared routes (Rahmani, 2023, pp. 112-129).

- **Sustainability and Future Trends**

Now shaping up, national travel growth links closely with global sustainability targets. Across Algeria, a shift appears through spotlighting Sahara journeys that tread lightly on nature. Instead of old ways packed with crowds, fresh efforts guard traditions while honoring wild landscapes deep in Tassili n'Ajjer and Ahaggar. These moves reflect

quieter progress rooted in place (Belkacem & Mansour, The resurgence of domestic tourism in North Africa: A case study of the Algerian Sahara, 2025; Tourism, 2023).

SECTION 02: Contribution of Renewable Energy to the Sustainability of Tourist Establishments with a Focus on Solar Energy

Tourist establishments, particularly hotels, require substantial energy for operations like lighting, heating, cooling, and various guest amenities. This reliance on fossil fuels consequently contributes to increased environmental strain. Consequently, adopting renewable energy sources becomes crucial for mitigating carbon emissions and enhancing environmental performance within the tourism industry (Ghimire, Muneenam, & Techato, Renewable energy use in green hotels for sustainability: A systematic review, 2023; Sezenler, 2025).

Among the available options, solar energy emerges as a highly viable solution, largely owing to its widespread availability and efficiency, particularly in areas receiving significant solar irradiation. Specifically, technologies like photovoltaic panels and solar thermal systems allow hotels to generate electricity and heat water directly on their premises. This significantly diminishes their reliance on traditional energy sources and gradually reduces operational expenses (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality, 2025; Gazeloğlu & Erkılıç, 2025) .

Beyond these ecological and financial advantages, employing solar energy also positively influences the public perception of tourist businesses and addresses the increasing preference of environmentally aware travelers. This, in turn, strengthens their competitive position within sustainable tourism markets (Sezenler, 2025). Nonetheless, the widespread adoption of these technologies encounters several obstacles. These include substantial upfront investment costs, a deficit in specialized technical knowledge, and insufficient financial backing. Addressing these issues necessitates implementing suitable policies and developing robust training programs to foster broader integration (Gazeloğlu & Erkılıç, 2025).

Both the International Renewable Energy Agency (International Renewable Energy Agency, 2023) and the United Nations World Tourism Organization (United Nations

World Tourism Organization, 2022)affirm that incorporating solar energy into tourism facilities represents a potent strategy for advancing sustainability through minimized environmental footprints and enhanced energy efficiency. (Gazeloğlu & Erkılıç, 2025)

In summary, renewable energy is important for making tourist spots more sustainable by lowering environmental harm, helping them save money, and boosting their image. More research and support are needed to overcome the challenges and help renewable energy make tourism more sustainable.

2.1. The importance of applying Renewable Energies in the Tourist Establishments

Tourist spots like hotels and resorts use a lot of energy because they need constant lighting, heating, cooling, and water services. Using regular fossil fuels to power these places adds to greenhouse gases, hurts the environment, and isn't a good long-term plan (Papallou, Katafygiotou, & Dimopoulos, 2024). Using solar, wind, and other clean energy in tourist areas is now a key part of making tourism sustainable, and current studies back this up.

One big plus of using renewable energy in tourist spots is that it cuts down on carbon emissions and harm to the environment. Research says that using more renewable energy can make the environment better by cutting pollution and shrinking the footprint of tourist activities (Guo, Toward green tourism: The role of renewable energy for sustainable tourism development, 2025).For instance, studies on sustainable tourism show that renewable energy improves environmental quality by replacing or cutting the need for fossil fuel electricity, which makes tourism more able to handle environmental issues (Tverijonaite, 2024).Because of this, renewable energy helps meet general climate goals and helps tourist spots line up with global sustainability plans.

Looking at the money side, renewable energy is also good for saving on energy costs and staying strong in the long run. Putting in solar panels or other renewable systems can lower energy costs over time and protect tourist businesses from changing fossil fuel prices (Papallou, Katafygiotou, & Dimopoulos, 2024). Renewable energy investments also help places become energy independent, especially in areas where the power grid isn't reliable or is pricey. If renewable systems are part of the plan, they can make businesses run better and be more financially stable.

Studies also point out that renewable energy is important socially and for the market in tourism. Tourist spots that use renewable energy often improve their image with travelers who care about the environment, which helps them stand out and keep customers coming back (Guo, Toward green tourism: The role of renewable energy for sustainable tourism development, 2025; Papallou, Katafygiotou, & Dimopoulos, 2024).Sustainable actions like using renewable energy are becoming standard in the industry and are part of certifications, which makes guests think better of the quality and commitment to sustainability.

Even though studies say that using renewable energy in tourism is still a growing idea, they say it's important for where policies and sustainable tourism plans are headed. Evidence supports using policies, business actions, and investments in renewable energy as key ways to reach environmental, economic, and social sustainability goals in the tourism industry (Guo, Toward green tourism: The role of renewable energy for sustainable tourism development, 2025; Tverijonaite, 2024).

in this context, solar energy is considered a particularly relevant and practical renewable resource for tourist accommodations, especially in areas receiving abundant sunlight. These establishments can effectively deploy solar technologies: for example, photovoltaic panels can generate electricity, and solar thermal systems can heat water. Both applications cater to key energy requirements within the tourism sector. The International Renewable Energy Agency (International Renewable Energy Agency, 2023). highlights solar energy as one of the most accessible and rapidly expanding renewable sources globally. This offers considerable potential for both reducing greenhouse gas emissions and lowering operating costs. Furthermore, the United Nations World Tourism Organization (United Nations World Tourism Organization, 2022). emphasizes that integrating solar energy into tourism facilities enhances sustainability by improving energy efficiency and supporting environmentally responsible tourism practices.

To sum up, using renewable energies in tourist spots is important because it really lowers environmental impact, makes businesses stronger financially, and fits with the changing sustainability expectations in the tourism market. These advantages together show that renewable energy is a key part of making tourism sustainable and responsible.

2.2. Different levels of applying Renewable Energies in the Tourist Establishments

The degree to which tourist spots use renewable energy (RE) tech differs, showing steps that reflect deeper inclusion and sustainability.

At first, places use simple renewable energy along with regular energy. This often means putting solar panels on roofs or small solar heaters for water. These steps add to grid power and lower the spot's need for fossil fuels while cutting energy costs. Studies on hotel sustainability and solar panel use show that solar systems are common in tourist buildings, often with energy upgrades like LED lights and insulation to get the most out of them (Ghimire, Muneenam, & Techato, Renewable energy use in green hotels for sustainability: A systematic review, 2023; Trabelsi, 2025)

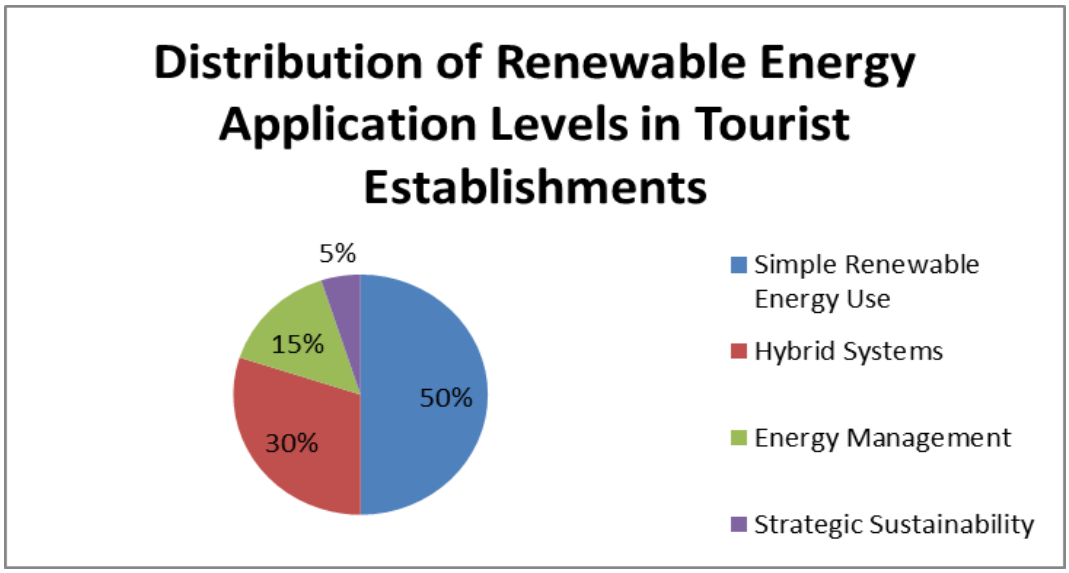
Next, there are combined or hybrid renewable systems. These use more than one renewable source, like solar panels with battery storage or small wind turbines, to even out energy supply changes. Using these setups lets spots raise the amount of clean energy made locally and keep power steady, even when one energy source stops sometimes. Research on renewable systems in buildings, tourism spots included, says that storage and mixing are key to boosting energy freedom and strength (Giedraityte & al, 2025).

A deeper step is energy management and using frameworks where renewable tech is part of bigger systems. Here, renewable energy is part of plans to control energy, storage, and use with smart controls. For example, studies on hotel energy systems with solar panels and batteries show that mixing renewables with real-time energy management can lower grid needs and better cost results across different occupancy rates (Luo & al, 2024).This level shows a change from just putting in tech to handling energy flow in the spot.

The most advanced use of renewable energy in tourist spots puts these tech in strategic sustainability plans. Here, renewable energy use is tied to group sustainability rules, reporting on the environment, involving guests, and overall environment, social, and governance (ESG) plans. Research in hospitality sustainability stresses that this mixing boosts both environmental results and how well they compete, as renewable energy steps become part of a promise to be sustainable (Shin & al, 2026).

Across these levels, from basic renewables to hybrid systems, smart use, and strategic sustainability plans, studies show that deeper use tends to give better environmental, money, and group gains. But, studies also say that wide use is still uneven because of costs, lack of tech know-how, and not enough support from policies, mainly in growing areas **For instance**, smaller and mid-sized hotels often experience challenges in integrating solar technologies. This difficulty frequently arises from the significant initial financial outlay required and an insufficient pool of in-house technical knowledge (Chamdimba, 2025). (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality: opportunities and barriers in the hotel sector, 2025, pp. 1-11; Ghimire, Muneenam, & Techato, Renewable energy use in green hotels for sustainability: A systematic review, 2023).

Figure 4: *Distribution of Renewable Energy Application Levels in Tourist Establishments*



Source: Prepared by us same with Excel

2.3. Challenges of applying Renewable Energies in the Tourist Establishments

The use of renewable energy technologies (RETs) in tourist spots can really help with being eco-friendly, saving on energy costs, and hitting those green tourism goals. Still, studies point out some consistent problems that keep these technologies from being used everywhere in the tourism and hotel business.

One big issue is the big chunk of money needed at the start for things like solar panels, wind power, energy storage, and mixed energy systems. Buying and setting up

these things can cost a lot, which might stop smaller places from investing, even if they could save money in the long run and help the environment (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality, 2025; Gupta & Singh, 2024, pp. 80-98).Also, many places can't easily get cheap loans or incentives, making it even harder to deal with those initial costs, mostly in areas where there's not much cash help for green projects (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality, 2025)

Another thing is that the people in charge at these tourist spots might not know much about the tech. Studies reveal that those managers often don't get renewable tech, what it costs or saves in the long run, or how to keep it all running. Because they don't know enough, they're not sure about investing and don't go for renewable energy projects (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality, 2025; Gupta & Singh, 2024) .

On top of that, if the area doesn't have good tech support or ways to get renewable energy—like problems with connecting to the power grid or storing energy—it's even tougher to get things going (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality, 2025).

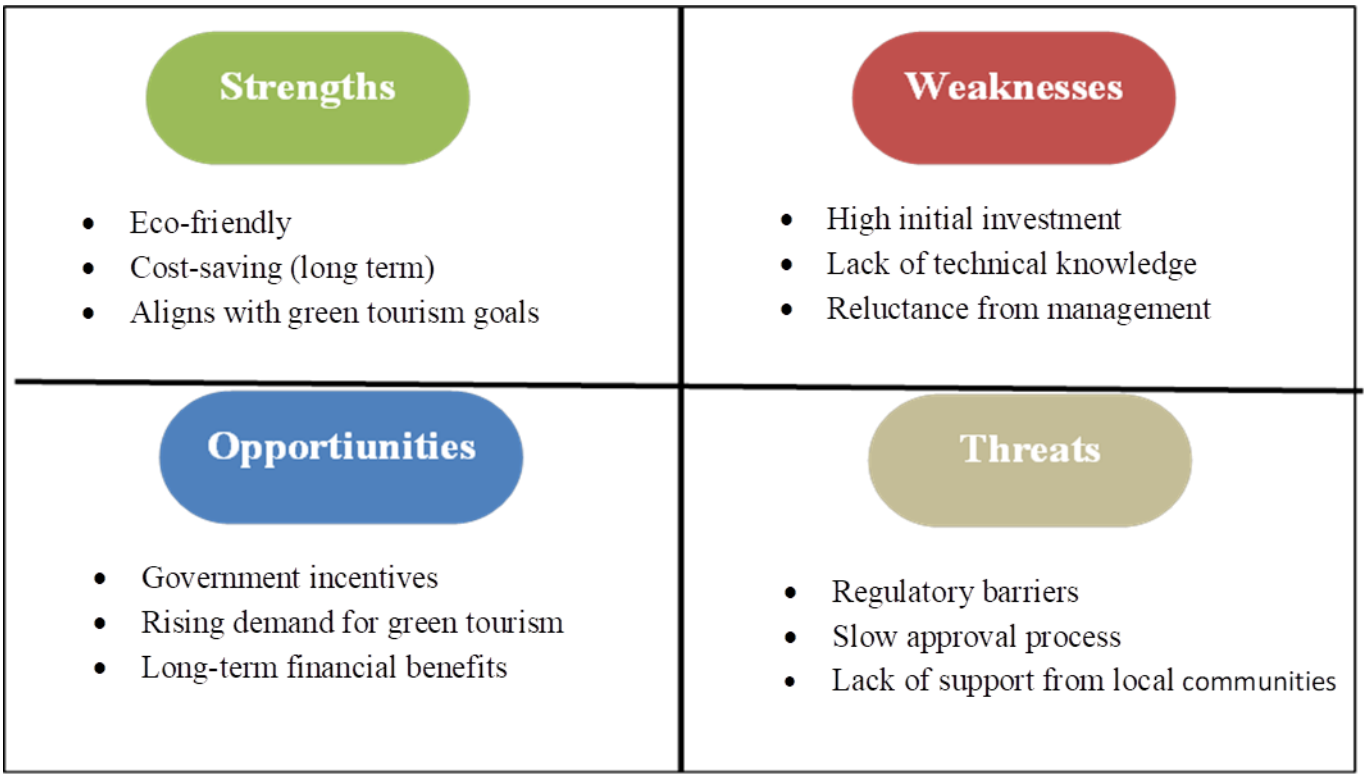
Rules and government stuff can also get in the way in lots of places. If the government doesn't give good reasons to switch, doesn't have clear rules, or changes its mind a lot, businesses won't feel like using RETs. In some areas, the rules for renewable energy don't focus on tourism, so hotels and similar places don't get enough help or information. (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality, 2025). Paperwork and slow approvals can also make things take longer (Gupta & Singh, 2024).

What the company is like and what people think also matter. If the workers and bosses don't want to change, it can slow down the move to cleaner tech. They might also be scared of trying new things and stick to the energy systems they know (Gupta & Singh, 2024).What guests and locals think can also affect decisions. If they don't see renewable energy as a good thing or don't really understand it, places might not bother investing in it (Chamdimba H. B., A review of the adoption of renewable energy technologies in hospitality, 2025).

Looking at tourism spots, solar power often runs into trouble right away. High setup costs block entry, even though long-term savings exist alongside ecological gains. Photovoltaic arrays and thermal units demand skilled handling - not always available where sun shines brightest. Efficiency dips when backup systems falter under weak grids or irregular upkeep. Stored energy becomes a puzzle, harder to solve in remote zones lacking steady connections. Money shortages shape decisions more than green promises do, IRENA notes in its 2023 report (International Renewable Energy Agency, 2023). Technical gaps follow closely behind, slowing real-world application across regions. UNWTO's findings from 2022 echo this: progress leans on clear rules, learning chances, shared understanding. Without them, change stalls - simple upgrades stay out of reach (United Nations World Tourism Organization, 2022).

Overall, these problems show that using renewable energy in tourist spots isn't just about the tech itself. It also involves money, the way things are organised, the rules, and how people act. To fix these issues, we need good ways to fund projects, clear rules that help, training for managers and staff, and plans that bring renewable energy together with bigger eco-friendly ideas in the tourism industry.

Figure 5: *SWOT analysis the challenges of applying renewable energy in tourist establishments.*



Source: Prepared by us same with Excel

2.4. Evaluation of utilization Renewable Energies in the Tourist Establishments.

To judge how tourist sites use renewable energies, one must check how much they are used and how well they work for operations and keeping things sustainable. This check includes both quality and numbers, like what tech is used, how well it cuts energy use and pollution, and how the business manages things to help renewable energy grow.

One way to do this is to look at past studies to gather proof of how hotels and similar places use renewable energy. These reviews point out how renewable energy is used and how it fits into larger sustainability efforts. They show that solar power and heat tech are used to different levels, often next to ways to save energy. Yet, there is not a lot of solid proof in tourism about how well these systems cut energy use and pollution (Ghimire, Muneenam, & Techato, 2023).

Judging also means looking at what makes it hard or easy to use renewable energy well and widely. Things that make it hard include hotel managers not knowing much about the tech, money problems, and laws that do not help use these systems well. These things are checked with surveys and talks, which show how the business's choices impact renewable energy use. For example, in Malawi's hotels, even though there are chances to help the environment and save money, managers not knowing enough stops them from using renewable tech better (Chamdimba & Banda, A review of the adoption of renewable energy technologies by hotels in Malawi: Opportunities and barriers, 2025) .

Since using renewable energy is often part of bigger sustainability plans, evaluations often look at energy use along with environmental actions. Even though directly measuring how much renewable energy is made and how well it works is not common in tourism studies yet, research on joined-up practices says that using renewable energy works best when it is matched with strong energy management. For instance, studies in Caribbean hotels show that saving energy (often with renewable energy) can lower how much energy is used overall, meaning that checking renewables should not be separate from checking how energy is used (Makoondlall-Chadee, Environmental sustainability in hotels: A review of environmental and socio-economic practices, 2024)

Another thing to check is how the business does and how it competes. While detailed studies are rare, some say that green energy actions (including renewables) can lower

running costs and make the business stand out. This means evaluations should add money and strategy results to the tech numbers (Influence of hotel green energy practices on competitive advantage).

Among renewable sources, solar power stands out when looking at how tourism businesses use clean energy - its adoption rate across the industry remains notably high. Performance of installations like photovoltaic arrays or heat-based solar units gets reviewed using metrics: output levels, cuts in grid reliance, financial impact, and lower greenhouse gas release. Technical effectiveness matters; so does alignment with broader ecological aims - a point confirmed by IRENA in 2023 (International Renewable Energy Agency, 2023). Tracking how hotels or resorts bring in sunlight-driven solutions offers insight into real-world advances, tying operational results to planetary and monetary conditions, UNWTO stated two years later (United Nations World Tourism Organization, 2022).

In short, studies look at how tourist spots use renewable energies by reviewing studies, checking problems and what helps with real examples, and studying wider sustainability actions. While there is not much clear number-based data on how well these systems cut pollution in tourism, it seems that use is shaped by management, money, laws, and fitting into wider sustainability plans.

Conclusion Of Chapter Two

This chapter looked at hotel sustainability and the move toward green hotels, seeing this as a major trend in tourism right now. It reflects how the tourism sector is responding to current environmental and economic issues. The chapter started by discussing how tourism and hospitality have developed worldwide and locally, especially in Algeria after the pandemic. It highlighted the strategic shift from traditional hotels to sustainable ones, which aim to use clean energy and reduce their carbon footprint to protect natural resources.

Next, the chapter defined green hotels and their main characteristics. It emphasized how important it is to include sustainability practices in hotel management and how this helps improve service quality and meet the expectations of environmentally conscious modern tourists. A significant part of the chapter focused on solar energy technologies as a key strategic choice. It reviewed how these technologies are applied and their environmental and economic feasibility for achieving energy efficiency, cutting operational costs, and reliably providing electricity and heating for hotels.

In the final section, the focus shifted to the technical, financial, and regulatory challenges and barriers facing this green transition and the adoption of solar energy systems in the Algerian hotel sector. This included pointing out local specifics, such as the widespread availability of traditional grid electricity and the reliance on it as an easy alternative, which shows the need for ways to encourage investment in clean energy.

The chapter concluded by stressing that investing in solar energy and adopting green hospitality standards is no longer just an option. It has become a vital necessity and a core element for building a strong, lasting tourism sector that supports sustainable development and improves the economic and environmental efficiency of hotel businesses.

CHAPTER 03:
METHODOLOGICAL AND ORGANIZATIONAL FRAMEWORK OF THE RESEARCH

This chapter explains the methodology selected for this research, describing the tools and steps taken to collect and analyze the data. It also covers how the sample was chosen.

SECTION 01: RESEARCH METHODOLOGY

Our research focuses on gathering the data needed to address the specific question about how solar technologies affect the environmental, economic, and social sustainability of hotels in Algeria, especially the Mirador Hotel in Chlef. With this goal in mind, we developed our research question. We chose a quantitative approach for data collection because the study aims to analyze the effects of adopting solar energy in the Algerian hotel industry.

Using deductive reasoning, we will draw conclusions from the data collected, which will support our set objectives. This approach is suitable because we intend to collect a substantial amount of objective and measurable data to accurately capture the impact of solar energy on the Mirador Hotel and its surrounding environment.

1. Methodological Approach

To test our hypotheses, we decided to use a quantitative method by engaging with the managers of the Mirador Hotel in Chlef during a practical internship. The primary goal was to gather a substantial amount of objective data, mainly numerical, to clearly capture the hotel managers' views and expectations about adopting solar energy. This method is called quantitative because it relies on statistical analysis to validate findings and allow for broader conclusions based on the data collected..

1.1.Data Collection Analysis Tools

A. Documentary Research: For this study, we carried out extensive research at the library of the Higher School of Management in Tlemcen. We reviewed a range of books, scientific articles, and theses focusing on the effects of renewable energy, especially solar power, on the sustainability of tourist facilities. These materials helped us build a solid theoretical foundation on current practices for adopting green energy technologies in the tourism industry.

In addition, we used various online platforms such as Google Scholar, SNDL, Research Gate, and Scribd. These sources gave us access to case studies, academic papers,

and research related to the energy transition in tourism. They broadened our understanding of the technical, economic, and environmental challenges involved in integrating solar energy into hotels.

Moreover, internal documents from the Mirador Hotel in Chlef were crucial for defining an accurate organizational framework. These documents allowed us to analyze the hotel's sustainability and energy management policies and strategies. They helped us understand the difficulties the hotel faces in using solar technology, while also showing how solar energy impacts reducing operating costs and improving the hotel's economic competitiveness.

Together, the data from documentary research and internal documents are vital for assessing how solar energy affects the environmental, economic, and social sustainability of tourist establishments in Algeria, particularly in the case of the Mirador Hotel.

B. The Questionnaire: We selected the questionnaire as the main tool for collecting quantitative data. It followed a structured set of methodological questions. To capture a broad range of opinions, we used a Likert scale. This five-point scale allows participants to indicate varying levels of agreement.

Quantitative evaluations of emotional or educational responses often rely on standardized questionnaires that convert answers into numerical values for statistical analysis. Tools like the Likert scale help in formulating questions and setting response options. This method supports standardizing results and ensures the questionnaire's validity and reliability.

The Likert scale, created by Rensis Likert in 1932, is widely used to measure attitudes or personality traits. It moves beyond simple yes/no answers and offers several response options reflecting different degrees of agreement. The scale's name depends on the number of choices provided, such as a five-point scale when five options are available (Nasseri & Cherif, 2020, pp. 145-162).

The connection between the questionnaire and our quantitative method is found in the use of the Likert scale to assess employees' views on how continuous training influences their digital skills development. Gathering quantitative data through questionnaires allows statistical analysis to highlight key training factors that enhance

digital abilities. This helps identify empirical links between variables and gives insight into the effectiveness of ongoing training in strengthening digital skills within an organization.

The results from this questionnaire offer a detailed view of respondents' opinions, which can help pinpoint the most significant factors affecting how continuing education supports digital skill growth.

Tableau 1: *Levels of agreement.*

(1)	(2)	(3)	(4)	(5)
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Source: Developed by us.

1.1.1.The Questionnaire

The questionnaire was adopted as the primary data collection tool. It was designed to measure hotel managers' and administrators' perceptions of adopting solar energy technology and its impact on hotel sustainability and market competitiveness. The instrument consists of a series of standardized questions based on a five-point Likert scale, allowing for objective quantitative data analysis and thus ensuring the accuracy of the statistical tests used. The questionnaire comprises the following sections:

- **Part One (Professional profile):** focuses on the professional background of the respondents, including their position and professional experience within the hotel.
- **Part Two (Research variables and core concepts):** divided into five main axes, structured according to the study's analytical model:
  - **Axis one (solar energy adoption):** Consists of four items, focusing on structural implementation and day-to-day use of solar energy infrastructure (such as solar water heating, lighting, and photovoltaic power generation).
  - **Axis two (environmental sustainability):** consists of five items designed to measure the environmental impact of hotel operations. These elements assess waste management and recycling efficiency, carbon emission reduction policies, water and natural resource conservation efforts, and compliance with international environmental standards.
  - **Axis three (economic sustainability):** It consists of five items that assess the financial dimensions of integrating green technology. It measures perceived operational efficiency, cost control capabilities, long-term reductions in operating and maintenance costs, facility upgrade allocations, and the ability of an environmentally friendly reputation to attract guests and drive revenue growth.
  - **Axis four (social sustainability):** This index comprises four items that assess the social, organizational, and community impacts of hotel practices. This axis

measures corporate social responsibility through local sourcing and recruitment, regular staff training on sustainability and safety protocols, aligning guest satisfaction with ethical practices, and effectively promoting environmental responsibility among guests.

- **Axis five (competitiveness & market position):** This assessment comprises three items that measure the ultimate strategic outcomes of adopting solar energy and sustainable practices. It measures the strength of the hotel's green corporate identity in attracting new customer segments, its distinct competitive advantage over its regional competitors, and its ability to attract the growing global market of environmentally conscious tourists.

To quantitatively assess responses and fully understand the range of respondents' practical insights, the questionnaire uniformly used a five-point Likert scale as its primary measurement criterion. The Likert scale is essential for accurate quantitative analysis of the collected data, as it transforms subjective perceptions into parametric or non-parametric data suitable for hypothesis testing. The scale's levels are associated with well-defined ranges of mean scores, as illustrated in the following table:

Tableau 2 : *Interpretation of average scores according to the Five-point Likert scale*

Level (Likert)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Mean Score Interval	[1 – 1.80[	[1.80 – 2.60[	[2.60 – 3.40[	[3.40 – 4.20[	[4.20- 5]
Degree of Agreement	Very Low	Low	Medium	High	Very High

Source : : Prepared by us

Validity and Reliability

Validity of the questionnaire

Before Distribution, the tool was submitted to our research supervisor for academic and expert evaluation of its clarity and consistency. Drawing on their expertise, the elements were adjusted to ensure their full alignment with the literature on the study topic and its items' comprehensibility to potential respondents.

Reliability of the questionnaire

To assess the internal reliability of our measurement instrument (questionnaire), we calculated Cronbach's alpha coefficient (α) for each one of its axes. This test ensures that all items corresponding to the study variables measure the intended concept and are collectively understood in the same way by the members of the sample.

Tableau 3: *Questionnaire's Reliability*

Items/variable	Cronbach's Alpha
Solar Eneregy Adoption	0.678
environmental sustainability	0.770
economic sustainability	0.756
social sustainability	0.758
competitiveness & market position	0.714
The Questionnaire	0.918

Source : : Prepared by us

The results presented in Table (…) above, demonstrate strong internal consistency across all measured dimensions. In social sciences, a Cronbach's alpha coefficient exceeding 0.650 is considered a globally accepted indicator of measure reliability. furthermore, the overall evaluation of the primary data collection instrument yielded a global Cronbach's alpha coefficient of 0.918. This high value confirms excellent internal consistency and demonstrates that the questionnaire possesses high reliability and stability. Therefore, the dataset is statistically sound and fully optimized for subsequent parametric analysis and hypothesis testing.

Normality of Distribution Tests

Before analyzing the hypotheses regarding the impact solar energy technology adoption on hotel sustainability and market competitiveness, and in order to determine the appropriate statistical tests for the data analysis, normality distribution tests were conducted.

Tableau 4: *Tests for Normality of Distribution*

Variables	**Kolmogorov-Smirnov**			**Shapiro-Wilk**		
	statistic	**ddl**	**Sig *(P)***	**statistic**	**ddl**	**Sig *(P)***
Solar Eneregy Adoption	0.188	52	0.000	0.914	52	0.001
environmental sustainability	0.165	52	0.001	0.913	52	0.001
economic sustainability	0.137	52	0.016	0.915	52	0.001
social sustainability	0.216	52	0.000	0.892	52	0.000

competitiveness & market position	0.279	52	0.000	0.860	52	0.000

Source : : Prepared by us

The results presented in the table above present the assessment of the assumption of normality, where Kolmogrov-Smirnov and Shapiro-Wilk tests were conducted for all primary variables. Results indicated that the distributions for all variables significantly deviated from normality, therefore, the current study relies on non-parametric tests to examine its hypotheses, namely, the Spearman's Rho coefficient and bootstrapping with 5000 resamples to ensure robust parameter estimates.

1.1.2 Population

The study focused on a representative group of managers and employees from various hotel establishments across Algeria. Data collection took place at six well-known establishments, specifically: (Mirador Hotel, Les Oranges Hotel (The Oranges), La Vallée Hotel (The Valley), Ouarsenis Hotel, El Hadef Hotel and Ibis Hotel).

1.1.3 Samplesize

A non-probability convenience sampling method was used. This approach is frequently employed in hospitality and organizational research when it is difficult to compile a comprehensive list of all individuals within a large company, and when access depends on the availability and willingness of professionals. Respondents were invited to participate via direct professional networks, which allowed for the creation of a targeted sample of 52 professionals who participated voluntarily.

2. Analytical tools and statistical techniques

Once the questionnaire was administered and the required data collected from the 53 respondents, the data was subjected to statistical analysis using IBM SPSS V.25 (Statistical Package for the Social Sciences). The following methods were selected to verify the validity of our research hypotheses:

2.1 Cronbach's Alpha Coefficient

Cronbach's alpha coefficient was used to assess the reliability of the Questionnaire and its different axes. The values obtained using this coefficient range from 0 to 1, with a value of 0.65 generally considered the minimum acceptable threshold indicating good reliability.

2.2 Frequencies and Percentages

This descriptive analysis allowed us to establish the professional profile of the sample (position and experience).

2.3 Mean and Standard deviation values

Arithmetic means were calculated to determine the overall level of each item and variable. The standard deviation was used to measure the dispersion of opinions: a low standard deviation indicates a convergence among respondents.

2.4 Normality Tests

Normality tests were performed to determine the data distribution. Given the sample size (52 respondents), the Shapiro-Wilk test was preferred, as it is more sensitive and better suited to samples of fewer than 50 to 100 individuals. These tests determine whether the data follow a normal distribution, which guides the choice between parametric and nonparametric Tests.

2.5 Bootstrapping

Given the specific sample size (52 respondents) and nature of the distribution, a non-parametric bootstrap resampling method was used. This technique involves generating a large number of resamples (5,000) from the original data to estimate the distribution of a statistic. This approach is essential to: ensure the robustness of the results with small sample sizes; provide bias-corrected and accelerated confidence intervals accurate to 95% for direct effects and validate p-values when the data does not adhere to the assumption of normality.

2.6 Linear Regression Analysis

A linear regression analysis was used to examine the impact of independent variables on dependent variables and to validate the study's main hypotheses. This method determines the extent to which changes in independent variables can predict improvements in the dependent variable the coefficient of determination (R^2) indicates the proportion of variation in the dependent variable explained by the independent predictors.

SECTION 02: PRESENTATION OF THE HOTEL

All the information in this section, about Mirador Hotel legal structure comes from internal documents provided by the hotels management in 2019 (Mirador Hotel, 2019).

2.1. Presentation Of The Hotel (Company Profile)

A hotel is defined as a commercial business that provides temporary accommodation for guests who do not consider it their permanent home. Its main function is to offer lodging along with related services (Mirador Hotel, 2019).

2.1.1. Introduction To The “Mirador” Hotel

The Mirador Hotel was founded in the Wilaya of Chlef on January 2, 2019, through a notarized contract with a capital of 1,931,000,000 DZD (Mirador Hotel, 2019).

This privately owned five-star hotel is situated at 21 Station Street in Chlef. The building has ten floors and can accommodate 119 rooms. Each room comes with a bathroom, toilet, television, air conditioning, a direct telephone line, a mini refrigerator, a wardrobe, and a bed (Mirador Hotel, 2019).

The ground floor includes a café, restaurant, shops, the lobby, reception, and administrative offices. Floors 1 to 5 are dedicated to guest rooms. The sixth floor offers a banquet hall, meeting and conference rooms, a restaurant, and a high-end reception lounge. Basement level -1 contains the supply department, meat section, fruit and vegetable section, and a gym. Basement level -2 houses the swimming pool, bath facilities, and parking area. Basement level -3 holds technical equipment (Mirador Hotel, 2019).

The hotel employs 115 staff members and emphasizes improving service quality, cleanliness, security, customer service, and guest satisfaction (Mirador Hotel, 2019).

"Mirador" collaborates with several partners, including:

A. Employee guests: staff members who stay overnight at the hotel.

B. Customers, who are categorized as:

- Foreign guests coming from outside the country.
- Corporate clients, employees sent by private or public companies, with expenses covered by their employers.
- Regular clients coming from various parts of the region.

C. Suppliers, including:

- Those providing fruits and vegetables.
- Meat suppliers.
- Cleaning product suppliers.
- Canned goods suppliers.

D. National institutions, such as the National Bank of Algeria.

E. Private institutions like private agricultural companies (e.g., those producing agricultural food) and private banks such as the Bank of Agriculture and Rural Development.

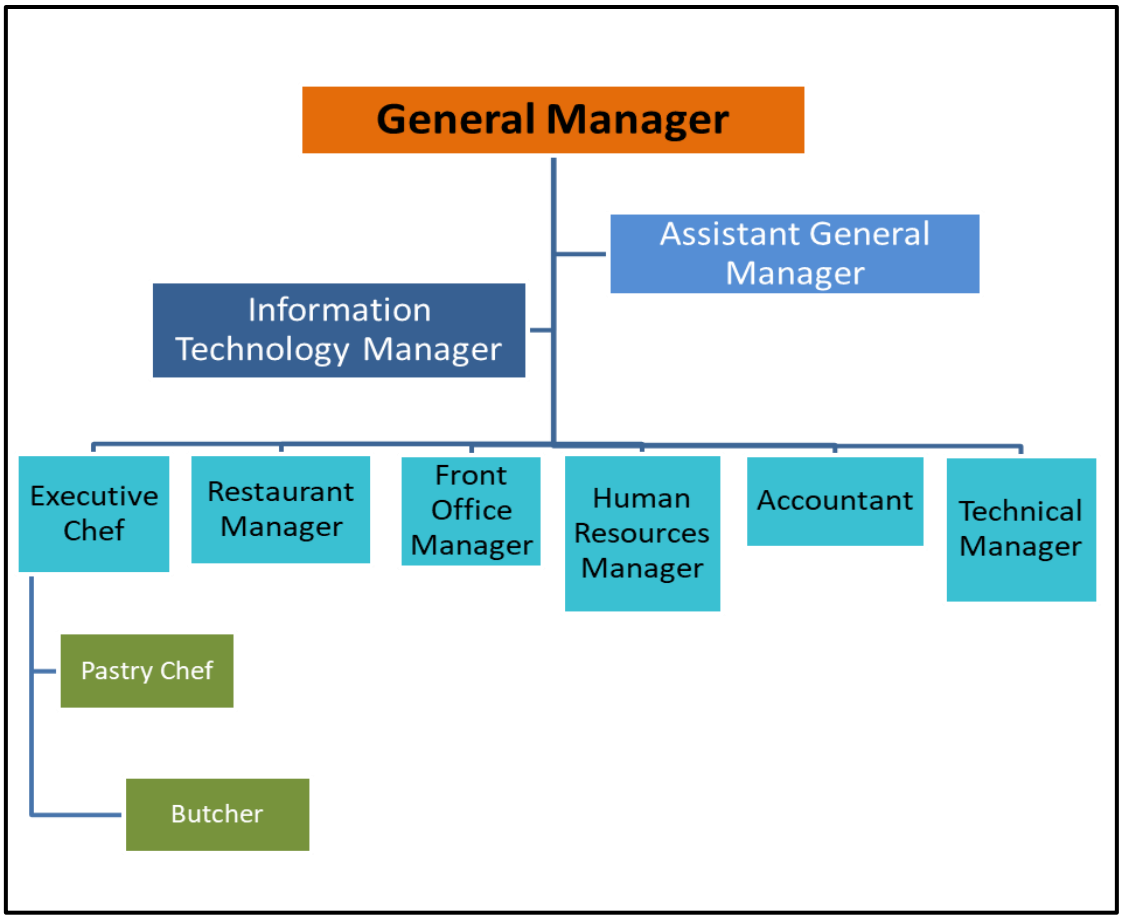
F. Police: When a guest arrives, the receptionist asks for identification. The guest fills out a form with their full name, parents' names, phone number, signature, and other details recorded by staff. At midnight, a hotel security officer delivers these forms to the police station.

2.2. Organizational Structure Of "Mirador" hotel

A. ORGANIZATIONAL CHART

The Mirador Hotel has a vertical organizational structure that shows a professional management style. The hotel owner is separate from the general manager. This structure ensures operational independence and is mainly divided into two leadership levels and six key functional departments, as shown below (Mirador Hotel, 2019):

Figure 6: *Organizational Chart Of Mirador hotel-Chlef*



Source: HR department of Mirador Hotel

SECTION 03: EMPIRICAL ANALYSIS AND RESULTS DISCUSSION

1. Analysis of the questionnaire results

This section presents the analysis of data collected from a sample of 52 hospitality professionals. The objective is to assess the impact of solar energy technology adoption on hotels sustainability and market competitiveness using quantitative indicators derived statistical processing performed with IBM SPSS.

1.2. Sample Description

In this section, we will present the results related to the participant profiles, including details from the first part of our questionnaire. The main professional profiles of our sample will be analyzed across two categories: current position and total years of hospitality work experience. This data will be presented in tables and graphs to facilitate reading and interpretation:

1.2.1. Sample Distribution by work position

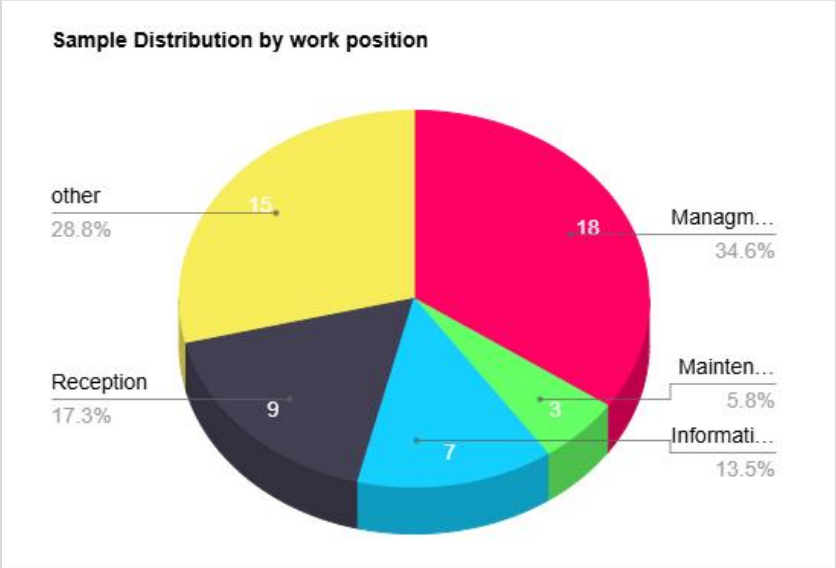
Tableau 5: *Sample Distribution by work position*

Work position		Frequency	Percent %	% valid	% Cumulative
valid	Managmenet	18	34.6	34.6	34.6
	Maintenance	3	5.8	5.8	40.4
	Information technology	7	13.5	13.5	53.8
	Reception	9	17.3	17.3	71.2
	Other	15	28.8	28.8	100.0
Total		52	100.0	100.0	

Source: Prepared by us based on SPSS V.25 results

As illustrated in Table (5), the largest proportion of respondents hold management positions, representing 34.6% of the total sample. This high concentration reflects a strong capacity for analyzing the strategic adoption of solar energy and long-term sustainability plans. Staff in the “Other” category comes in second with 28.8%, followed by reception staff 17.3%, a category of respondents directly involved in observing customer satisfaction and daily operational impacts. Information technology professionals 13.5% and maintenance personnel 5.8% comprise the other segments of the sample. The presence of these diverse technical roles, including profiles specializing in facility maintenance, reinforces the operational and technical nature of the responses concerning renewable infrastructure. All of these results are visually represented in the following figure:

Figure 7: *Sample Distribution by Work Position*



Source :Prepared by us using SPSS/Excel

1.2.4. Sample Distribution by Years of Experience

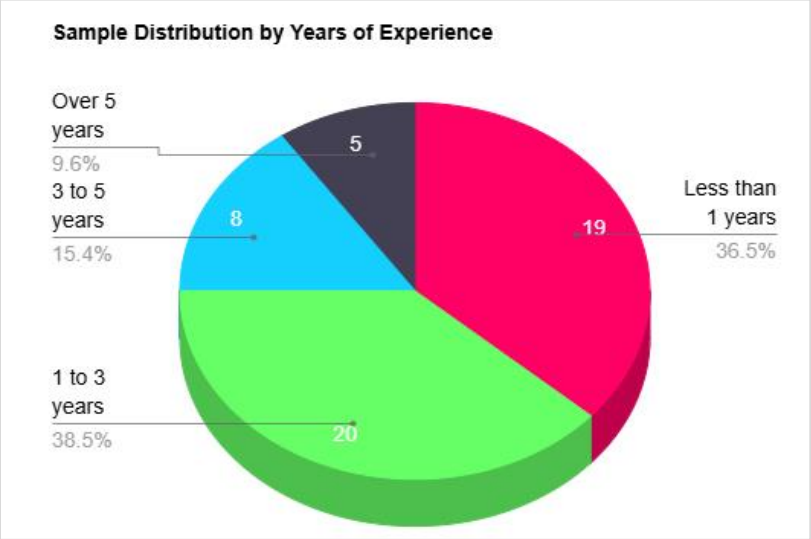
Tableau 6: *Sample Distribution by Years of Experience*

Years of Experience		Frequency	Percent %	% valid	% Cumulative
valid	Less than 1 years	19	36.5	36.5	36.5
	1 to 3 years	20	38.5	38.5	75.0
	3 to 5 years	8	15.4	15.4	90.4
	Over 5 years	5	9.6	9.6	100.0
Total		52	100.0	100.0	

Source: Prepared by us based on SPSS V.25 Output

As shown in Table (6), the data reveal that professionals with short to medium tenure make up the largest portion of the sample, with 38.5% of respondents having between one and three years of experience at the hotel. The group with less than one year of experience represents 36.5% of the sample, thus offering an active perspective on recent changes to the establishment and current operational dynamics. On the other hand, experienced professionals, with three to five years of experience, represent 15.4%, and those with more than five years of experience constitute a stable share of the sample at 9.6%. These results demonstrate that the sample is primarily composed of active operational employees and professionals in transition, combining fresh structural perspectives with established institutional knowledge. These results are summarized visually in the following figure:

Figure 8: *Sample Distribution by Years of Experience*



Source: :Prepared by us using SPSS/Excel

1.3. Descriptive Analysis

This section aims to provide descriptive analyses of the responses on the questionnaire and to determine the degree and level of agreement among the surveyed hotel professionals regarding the items representing each core construct by measuring the arithmetic means and standard deviations and comparing them to the correction key of the questionnaire (previously mentioned).

1.3.1. Solar Energy Adoption

Tableau 7: *Analysis of respondents' perceptions regarding Solar Energy Adoption*

Item	Likert Five-Point										Mean	Standard Deviation	Degree of agreement
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree				
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*			
Reliance on solar energy for water heating and lighting	2	3.8	8	15.4	15	28.8	20	38.5	7	13.5	3.4230	1.03556	High
Using PV panels to generate electricity	2	3.8	15	28.8	10	19.2	22	42.3	3	5.8	3.1730	1.04264	Medium
Budget allocation for solar systems'	5	9.6	8	15.4	12	23.1	24	46.2	3	5.8	3.2307	1.09572	Medium

maintenance and development													
Solar energy integration into the long-term energy strategy	3	5.8	6	11.5	15	28.8	24	46.2	4	7.7	3.3846	0.99318	Medium
Solar Energy Adoption											13.2115	2.972663	Medium

Source : Prepared by us based on SPSS V.25 Output

Table (7) presents a comprehensive assessment of the solar energy adoption in hotels. The results indicate relatively effective implementation of solar technologies, with an overall mean score of 13.2115 with a standard deviation of 2.97266. Notably, 38.5% of respondents consider the use of solar energy for water heating and lighting to be effective, representing the highest individual mean score of 3.4230. The low dispersion of responses regarding the integration of the long-term strategy confirms a strong professional consensus on its strategic direction. Regarding photovoltaic systems, the mean score of 3.1730 indicates that while the use of PV panels to generate electricity is generally viewed positively, 42.3% of the respondents agree, some disagreement by 28.8% is also observed. Similarly, the budget allocated to the maintenance and development of solar systems averaged 3.2307, with a significant proportion of 46.2% of the sample agreeing, while 23.1% remained neutral. Finally, the question regarding the integration of solar energy into the long-term energy strategy had an average score of 3.3846. This moderate score suggests that the majority of professionals believe strategic alignment is underway, although 11.5% disagreed and emphasized the need for further policy integration.

1.3.2. Environmental Sustainability

Tableau 8: *Analysis of respondents' perceptions regarding Environmental Sustainability*

Item	Likert Five-Point										Mean	Standard Deviation	Degree of agreement
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree				
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*			
Effective waste and recycling programs	5	9.6	5	9.6	14	26.9	22	42.3	6	11.5	3.3653	1.12072	Medium
Carbon emissions strict reduction	6	11.5	12	23.1	14	36.9	20	38.5	0	0.00	2.9230	1.04499	Medium

policy													
Water and natural resources conservation	4	7.7	9	17.3	14	26.9	21	40.4	4	7.7	3.2307	1.07767	Medium
Compliance with international environmental standards	4	7.7	6	11.5	14	26.9	20	38.5	8	15.4	3.4230	1.12626	High
Hotel operations contribution to preserving local biodiversity	5	9.6	8	15.4	15	28.8	21	40.4	3	5.8	3.1730	1.07960	Medium
	Environmental Sustainability										16.1153	3.93403	Medium

Source : Prepared by us based on SPSS V.25 Output

Table (8) presents a comprehensive assessment of the environment in terms of sustainability. The results indicate a moderately effective environmental framework, with an overall mean score of 16.1153 (standard deviation = 3.93403). Notably, 38.5% of respondents believe that compliance with international environmental standards is effective, representing the highest individual mean score of 3.4230. The low dispersion of responses regarding the policy of strict carbon emission reduction confirms a strong professional consensus on its strategic direction. Regarding environmental actions, the mean score of 3.3653 indicates that while effective waste management and recycling programs are generally viewed by 42.3% positively, a degree of neutrality by 26.9% is also observed. Similarly, the conservation of water and natural resources reached a mean of 3.2307, with a significant proportion of the sample agreeing by 40.4%, while 26.9% remained neutral. Finally, the question regarding the contribution of hotel activities to the preservation of local biodiversity yielded an average score of 3.1730. This moderate score suggests that the majority of professionals believe efforts are being made to support biodiversity, although 15.4% disagree and emphasize the need to further improve environmentally friendly operational practices.

1.3.3. Economic Sustainability

Tableau 9: *Analysis of respondents' perceptions regarding Economic Sustainability*

	Likert Five-Point										Mean	Standar	Degre

Item	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree			d Deviation	e of agreement
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*			
High operational efficiency and cost control	4	7.7	5	9.6	13	25.0	27	51.9	3	5.8	3.3846	1.01273	Medium
"Green" reputation of the hotel attracts guests and increases revenue	5	9.6	6	11.5	10	19.2	22	42.3	9	17.3	3.4615	1.19576	High
Resources allocation for continuous facility upgrading	4	7.7	5	9.6	8	15.4	28	53.8	7	13.5	3.5576	1.09210	High
Long-term financial stability focus over short-term profit	4	7.7	6	11.5	9	17.3	25	48.1	8	15.4	3.5192	1.12877	High
Continuous decrease in long-term operating and maintenance costs	3	5.8	3	5.8	22	42.3	21	40.4	3	5.8	3.3461	0.90498	Medium
	Economic Sustainability										17.2692	3.80976	High

Source : Prepared by us based on SPSS V.25 Output

Table (9) presents a comprehensive assessment of the economic sustainability environment. The results indicate a very high-performing economic framework, with an overall mean score of 17.2692 (standard deviation = 3.80976). Notably, 53.8% of respondents consider the allocation of resources for the ongoing modernization of facilities to be effective, representing the highest individual mean score of 3.5576. The low dispersion regarding the continued reduction of long-term operating and maintenance costs confirms a strong professional consensus regarding its strategic direction. Concerning financial actions, the mean score of 3.4615 indicates that while the hotel's "green" reputation, which attracts guests and increases revenue, is generally perceived positively, a

degree of neutrality by 19.2% is also observed. Similarly, high operational efficiency and good cost control averaged 3.3846, with a significant proportion of the sample agreeing by 51.9%, while 25.0% remained neutral. Finally, the question regarding the priority given to long-term financial stability over short-term profits had an average score of 3.5192. A high score suggests that the majority of professionals believe a strategic financial balance is being achieved, although 11.5% disagree and emphasize the need for further improvement in investment planning.

1.3.4. Social Sustainability

Tableau 10: *Analysis of respondents' perceptions regarding Social Sustainability*

Item	Likert Five-Point										Mean	Standard Deviation	Degree of agreement
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree				
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*			
Supporting local sourcing and community jobs	7	13.5	5	9.6	6	11.5	32	61.5	2	3.8	3.3269	1.14995	Medium
Regular staff training and safety training	5	9.6	4	7.7	9	17.3	26	50.0	8	15.4	3.5384	1.14552	High
Guest satisfaction linked to ethical practices	3	5.8	3	5.8	9	17.3	20	38.5	17	32.7	3.8653	1.12072	High
Guest environmental responsibility culture promotion	3	5.8	4	7.7	16	30.8	21	40.4	8	15.4	3.5192	1.03829	High
Social Sustainability											14.2500	3.39477	High

Source Prepared by us based on SPSS V.25 Output

Table (10) presents a comprehensive assessment of the social sustainability environment. The results indicate a very high-performing social framework, with an overall mean score of 14.2500 (standard deviation = 3.39477). Notably, 38.5% of respondents believe that customer satisfaction related to ethical practices is effective, representing the highest individual mean score of 3.8653. The low dispersion of responses regarding the promotion of a culture of environmental responsibility among customers

confirms a strong professional consensus regarding its strategic direction. Concerning actions taken with the community and staff, the mean score of 3.3269 indicates that, while support for local sourcing and local employment is generally viewed positively by 61.5% agrees, a degree of neutrality of 11.5% is also observed. Similarly, regular staff training and safety training averaged 3.5384, with a high proportion of respondents agreeing by 50.0%, while 17.3% remained neutral. Finally, the question regarding the promotion of a culture of environmental responsibility among customers received an average score of 3.5192. This high score indicates that the majority of professionals believe cultural engagement is underway, although 7.7% disagree and emphasize the need to improve awareness and communication strategies.

1.3.5. Competitiveness and Market Position

Tableau 11: *Analysis of respondents' perceptions regarding Competitiveness and Market Position*

Item	Likert Five-Point										Mean	Standard Deviation	Degree of agreement
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree				
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*			
Green Corporate identity for customer attraction	3	5.8	2	3.8	8	15.4	28	53.8	11	21.2	3.8076	1.01050	High
Distinct regional competitive advantage	6	11.5	4	7.7	9	17.3	24	46.2	9	17.3	3.5000	1.21267	High
Eco-concious tourist segment attraction	7	13.5	2	3.8	10	19.2	23	44.2	10	19.2	3.5192	1.24444	High
Competitiveness and Market Position											10.8269	2.77750	High

Source : Prepared by us based on SPSS V.25 Output

Table (11) presents a comprehensive assessment of competitiveness and market positioning. The results indicate a highly effective positioning framework, with an overall mean score of 10.8269 (standard deviation = 2.77750). Notably, 53.8% of respondents consider a green corporate identity an asset for attracting customers, representing the highest individual mean score of 3.8076. The low dispersion of responses regarding green corporate identity confirms a strong professional consensus on its strategic direction. Regarding competitive advantages and differentiation, the mean score of 3.5000 indicates

that while achieving a distinct regional competitive advantage is generally perceived as positive, a degree of neutrality by 17.3% is also observed. Similarly, the appeal of the eco-responsible tourism segment averaged 3.5192, with a significant proportion of the sample agreeing by 44.2%, while 19.2% remained neutral. Finally, the question regarding a distinct regional competitive advantage received an average score of 3.5. This high score suggests that the majority of professionals believe strategic market differentiation is underway, although 7.7% disagree and feel that further improvements in regional marketing and brand positioning are needed.

1.4. Hypotheses Analysis

1.4.1 Hypothesis 1:

« The adoption of solar technologies has a significant and positive impact on the environmental sustainability of hotels»

To examine the impact of the independent variable, the adoption of solar technologies, on the dependent variable, the environmental sustainability of hotels, a simple linear regression model was utilized. To ensure the stability and reliability of these results, a Bootstrap procedure was performed with 5000 samples and a 95% Bias-Corrected and accelerated (BCa) confidence interval. This method provides a more rigorous test of the relationship by not relying solely on traditional normality assumptions. To consider the model significant, we primarily rely on the model's F statistic P (sig) value (Probability); if this value is less than α=0.05, the model is considered statistically significant.

Tableau 12: *Simple Linear regression model and Bootstrap results (H1)*

Variables		Explanatory Power		Overall significance of the ANOVA regression model		Signification partielle des coefficients de régression				BootStrap for coefficients	
Dependant	Predictor	r	r^2	F	Sig	model	β	t	Sig	SE	95% CL [LL,UL]
Environmental sustainability	Solar energy adoption	0.486	0.236	15.444	0.000	Constant	7.622	3.442	0.001	2.323	[3.236;12.674]
						I.V	0.643	3.930	0.000	0.164	[0.296;0.942]

Source: Prepared by us based on SPSS V.25 Output

The results presented in Table (12) above confirm the existence of a statistically significant correlation between adoption of solar technologies and the environmental sustainability of hotels. The Pearson correlation coefficient reached r=0.486, indicating a moderate to strong positive correlation. Furthermore, the simple linear regression model is statistically significant, as evidenced by the F-value of 15.444, with a statistical

significance (probability value) of p=0.000 < α=0.05. Moreover, the results suggest that there is a positive and significant effect of solar energy adoption on the environmental sustainability of hotels. The coefficient of determination r^2=0.236 indicates that 23.6% of the observed variation in the environmental sustainability of hotels is explained by the level of their solar technology adoption, while the remaining 76.4% can be attributed to other factors not included in the model.

The unstandardized beta value for the independent variable is 0.643, indicating a positive influence on the environmental sustainability. This relationship is statistically significant with a t-value of 3.930 (p = 0.000). Moreover, the bootstrap results reinforce the stability of this effect, as the 95% BCa confidence interval [0.296;0.942] does not include zero. The simple linear regression model equation is as follows:

The environmental sustainability of hotels = *8.638 + (0.427 x Solar Energy Technologies Adoption)*

This equation signifies that, ceteris paribus (all other things being equal), for every one-unit increase in the level of solar energy adoption, the environmental sustainability of hotels improves by 0.427 units. These results allow for the validation of the first hypothesis of the study.

1.4.2 Hypothesis 2:

« The adoption of solar technologies has a significant and positive impact on the economic sustainability of hotels »

To examine the impact of the independent variable, the adoption of solar technologies, on the dependent variable, economic sustainability of hotels, a simple linear regression model was utilized. To ensure the stability and reliability of these results, a Bootstrap procedure was performed with 5000 samples and a 95% Bias-Corrected and accelerated (BCa) confidence interval. This method provides a more rigorous test of the relationship by not relying solely on traditional normality assumptions. To consider the model significant, we primarily rely on the model's F statistic P (sig) value (Probability); if this value is less than α=0.05, the model is considered statistically significant.

Tableau 13: *Simple Linear regression model and Bootstrap results (H2)*

Variables		Explanatory Power		Overall significance of the ANOVA regression model		Signification partielle des coefficients de régression				BootStrap for coefficients	
Dependant	Predictor	r	r^2	F	Sig	model	β	t	Sig	SE	95% CL [LL,UL]
economic	Solar energy	0.343	0.118	6.661	0.013	Constant	11.464	4.974	0.000	2.274	[6.501;15.967]

sustainability	adoption		I.V	0.439	2.581	0.013	0.159	[0.137;0.763]

Source Prepared by us based on SPSS V.25 Output

The results presented in Table (13) above confirm the existence of a statistically significant correlation between adoption of solar technologies and the economic sustainability of hotels. The Pearson correlation coefficient reached r=0.343, indicating a moderate to strong positive correlation. Furthermore, the simple linear regression model is statistically significant, as evidenced by the F-value of 6.661, with a statistical significance (probability value) of $p=0.013 < \alpha=0.05$. Moreover, the results suggest that there is a positive and significant effect of solar energy adoption on the economic sustainability of hotels. The coefficient of determination $r^2=0.118$ indicates that 11.8% of the observed variation in the economic sustainability of hotels is explained by the level of their solar technology adoption, while the remaining 88.2% can be attributed to other factors not included in the model.

The unstandardized beta value for the independent variable is 0.439, indicating a positive influence on the economic sustainability. This relationship is statistically significant with a t-value of 2.581 (p = 0.013). Moreover, the bootstrap results reinforce the stability of this effect, as the 95% BCa confidence interval [0.137;0.763] does not include zero. The simple linear regression model equation is as follows:

The economic sustainability of hotels *= 11.464 + (0.439 x Solar Energy Technologies Adoption)*

This equation signifies that, ceteris paribus (all other things being equal), for every one-unit increase in the level of solar energy adoption, the economic sustainability of hotels improves by 0.439 units. These results allow for the validation of the second hypothesis of the study.

1.4.3 Hypothesis 3:

« The adoption of solar technologies has a significant and positive impact on the social sustainability of hotels»

To examine the impact of the independent variable, The adoption of solar technologies, on the dependent variable, he social sustainability of hotels, a simple linear regression model was utilized. To ensure the stability and reliability of these results, a Bootstrap procedure was performed with 5000 samples and a 95% Bias-Corrected and accelerated (BCa) confidence interval. This method provides a more rigorous test of the relationship by not relying solely on traditional normality assumptions. To consider the model significant, we primarily rely on the model's F statistic P (sig) value (Probability); if this value is less than $\alpha=0.05$, the model is considered statistically significant.

Tableau 14: *Simple Linear regression model and Bootstrap results (H3)*

Variables		Explanatory Power		Overall significance of the ANOVA regression model		Signification partielle des coefficients de régression				BootStrap for coefficients	
Dependant	Predictor	r	r^2	F	Sig	model	β	t	Sig	SE	95% CL [LL,UL]
Social sustainability	Solar energy adoption	0.445	0.198	12.376	0.001	Constant	7.530	3.847	0.000	2.142	[3.155;11.380]
						I.V	0.509	3.518	0.001	0.142	[0.238;0.817]

Source: Prepared by us based on SPSS V.25 Output

The results presented in Table (14) above confirm the existence of a statistically significant correlation between adoption of solar technologies and the social sustainability of hotels. The Pearson correlation coefficient reached r=0.445, indicating a moderate to strong positive correlation. Furthermore, the simple linear regression model is statistically significant, as evidenced by the F-value of 12.376, with a statistical significance (probability value) of $p=0.001 < \alpha=0.05$. Moreover, the results suggest that there is a positive and significant effect of solar energy adoption on the social sustainability of hotels. The coefficient of determination $r^2=0.198$ indicates that 19.8% of the observed variation in the social sustainability of hotels is explained by the level of their solar technology adoption, while the remaining 80.2% can be attributed to other factors not included in the model.

The unstandardized beta value for the independent variable is 0.509, indicating a positive influence on the social sustainability. This relationship is statistically significant with a t-value of 3.518 (p = 0.001). Moreover, the bootstrap results reinforce the stability of this effect, as the 95% BCa confidence interval [0.238;0.817] does not include zero. The simple linear regression model equation is as follows:

The social sustainability of hotels = *7.530 + (0.509 x Solar Energy Technologies Adoption)*

This equation signifies that, ceteris paribus (all other things being equal), for every one-unit increase in the level of solar energy adoption, the social sustainability of hotels improves by 0.509 units. These results allow for the validation of the third hypothesis of the study.

1.4.4 Hypothesis 4:

« The adoption of solar technologies has a significant and positive impact on the market competitiveness of hotels»

To examine the impact of the independent variable, solar energy adoption, on the dependent variable, the market competitiveness of hotels, a simple linear regression model was utilized. To ensure the stability and reliability of these results, a Bootstrap procedure was performed with 5000 samples and a 95% Bias-Corrected and accelerated (BCa) confidence interval. This method provides a more rigorous test of the relationship by not relying solely on traditional normality assumptions. To consider the model significant, we primarily rely on the model's F statistic P (sig) value (Probability); if this value is less than α=0.05, the model is considered statistically significant

Tableau 15: *Simple Linear regression model and Bootstrap results (H4)*

Variables		Explanatory Power		Overall significance of the ANOVA regression model		Signification partielle des coefficients de régression				BootStrap for coefficients	
Dependant	Predictor	r	r^2	F	Sig	model	β	t	Sig	SE	95% CL [LL,UL]
Market competitiveness	Solar energy adoption	0.437	0.191	11.785	0.001	Constant	5.436	3.378	0.001	1.641	[1.978;8.499]
						I.V	0.408	3.433	0.001	0.107	[0.211;0.634]

Source Prepared by us based on SPSS V.25 Output

The results presented in Table (15) above confirm the existence of a statistically significant correlation between adoption of solar technologies and the market competitiveness of hotels. The Pearson correlation coefficient reached r=0.437, indicating a moderate to strong positive correlation. Furthermore, the simple linear regression model is statistically significant, as evidenced by the F-value of 11.785, with a statistical significance (probability value) of p=0.001 < α=0.05. Moreover, the results suggest that there is a positive and significant effect of solar energy adoption on the market competitiveness of hotels. The coefficient of determination r^2=0.191 indicates that 19.8% of the observed variation in the market competitiveness of hotels is explained by the level of their solar technology adoption, while the remaining 80.9% can be attributed to other factors not included in the model.

The unstandardized beta value for the independent variable is 0.408, indicating a positive influence on the market competitiveness of hotels. This relationship is statistically significant with a t-value of 3.433 (p = 0.001). Moreover, the bootstrap results reinforce the stability of this effect, as the 95% BCa confidence interval [0.211;0.634] does not include zero. The simple linear regression model equation is as follows:

The market competitiveness of hotels = *5.436+ (0.408 x Solar Energy Technologies Adoption)*

This equation signifies that, ceteris paribus (all other things being equal), for every one-unit increase in the level of solar energy adoption, the market competitiveness of hotels improves by 0.408 units. These results allow for the validation of the fourth hypothesis of the study.

1.4.5 General Hypothesis:

« The adoption of solar technologies has a significant and positive impact on the environmental, economic, and social sustainability of hotels, leading to enhancing their competitive position and improving the overall performance of Algerian hotels»

To examine the impact of the independent variable, the adoption of solar technologies, on the dependent variable, overall performance, a simple linear regression model was utilized. To ensure the stability and reliability of these results, a Bootstrap procedure was performed with 5000 samples and a 95% Bias-Corrected and accelerated (BCa) confidence interval. This method provides a more rigorous test of the relationship by not relying solely on traditional normality assumptions. To consider the model significant, we primarily rely on the model's F statistic P (sig) value (Probability); if this value is less than α=0.05, the model is considered statistically significant.

Tableau 16: *Simple Linear regression model and Bootstrap results (General Hypothesis)*

Variables		Explanatory Power		Overall significance of the ANOVA regression model		Signification partielle des coefficients de régression				BootStrap for coefficients	
Dependant	Predictor	r	r^2	F	Sig	model	β	t	Sig	SE	95% CL [LL,UL]
Overall performance	Solar energy adoption	0.478	0.229	14.840	0.000	Constant	32.051	4.563	0.000	6.928	[18.384; 44.359]
						I.V	1.999	3.852	0.000	0.460	[1.081;2.993]

Source: Prepared by us based on SPSS V.25 Output

The results presented in Table (16) above confirm the existence of a statistically significant correlation between adoption of solar technologies and the overall performance of hotels (measured by levels of sustainability and market competitiveness). The Pearson correlation coefficient reached r=0.478, indicating a moderate to strong positive correlation. Furthermore, the simple linear regression model is statistically significant, as evidenced by the F-value of 14.840, with a statistical significance (probability value) of p=0.000 < α=0.05. Moreover, the results suggest that there is a positive and significant effect of solar energy adoption on the overall performance of hotels. The coefficient of determination r^2=0.229 indicates that 22.9% of the observed variation in the overall

performance of hotels is explained by the level of their solar technology adoption, while the remaining 77.1% can be attributed to other factors not included in the model.

The unstandardized beta value for the independent variable is 1.999, indicating a positive influence on the overall performance of hotels. This relationship is statistically significant with a t-value of 3.852 (p = 0.000). Moreover, the bootstrap results reinforce the stability of this effect, as the 95% BCa confidence interval [1.081;2.993] does not include zero. The simple linear regression model equation is as follows:

The overall performance of hotels= 5.436+ (0.408 x Solar Energy Technologies Adoption)

This equation signifies that, ceteris paribus (all other things being equal), for every one-unit increase in the level of solar energy adoption, the overall performance of hotels improves by 0.408 units. These results allow for the validation of the general hypothesis of the study.

Conclusion Of Chapter Three

This chapter applied the study's theoretical ideas to a real-world setting by looking at several hotels in Algeria, including Mirador Hotel, Les Oranges Hotel, La Vallée Hotel, Ouarsenis Hotel, El Hadef Hotel, and Ibis Hotel. The main purpose was to see how using solar energy technologies affected sustainability and competitiveness within the hospitality sector. The chapter covered three main parts: introducing the Mirador Hotel as a case study, describing the research methods and the questionnaire used, and then analyzing the results statistically with SPSS software and discussing what they meant.

The statistical analysis showed a clear positive effect of using solar energy. It improved environmental, economic, and social sustainability, and also made the surveyed hotels more competitive and better positioned in the market. Furthermore, the data analysis and linear regression models, especially when strengthened by bootstrapping, confirmed that moving towards clean energy helps improve the overall performance of hotel businesses.

The study concluded that putting money into solar energy technologies is crucial for hotels to achieve sustainable development and stand out competitively. It recommended raising awareness about how important renewable energy is and helping hotels move away from relying only on traditional grid electricity. This could be done by offering incentives and support to help hotels make this green transition.

CONCLUSION

CONCLUSION

The professional landscape is quickly shifting, with a growing emphasis on environmental and energy changes. For hotels to remain competitive and adaptable in the face of new environmental challenges, using green technologies is essential. Our analysis of the hypotheses and statistical tests, carried out with SPSS software, highlights the critical role of solar energy technologies for hotels in Algeria. Embracing these technologies significantly boosts their overall sustainability across environmental, economic, and social aspects, while also enhancing their market performance.

Theoretical Contributions of the Study

Academic literature has long acknowledged that green technological innovations are vital for strengthening sustainable development. Our study contributes significantly by showing that incorporating solar energy technologies, such as photovoltaic systems and solar thermal collectors, plays a decisive role in lowering carbon footprints and reducing reliance on conventional energy. Previous research, for example by Guo (2025), Suryawan (2025), and Xia & He (2024), also indicates that using renewable energy can improve the environment's ability to handle stress, protect delicate ecosystems – especially desert springs and highland areas in Algeria – and boost a tourist destination's "Eco-friendly" brand image (Guo, Toward green tourism: The role of renewable energy for environmental quality in tourism systems, 2025; Suryawan, 2025; Xia & He, Sustainable heritage tourism: Integrating solar energy systems, 2024).

Practical Contributions of the Study

Analyzing the empirical data we collected from 52 hotel managers and employees revealed several interesting points about the direct impact of solar energy:

- **On the Environmental Dimension:** For the environmental aspect, we confirmed a significant positive relationship (**R^2 = 0.236**). This means that simply adopting solar energy accounts for 23.6% of the improved environmental sustainability in hotels, largely by cutting down greenhouse gas emissions.
- **On the Economic Dimension:** Regarding economic aspects, the findings indicated that solar energy use leads to financial efficiency. It reduces operational and conventional electricity expenses by nearly 40% **(R^2= 0.4)** which significantly improves profitability and generates a positive Net Present Value.

- **On the Social and Competitive Dimension:** From a social and competitive standpoint, the study confirmed a positive impact on social responsibility towards local communities. It also showed a clear increase in market competitiveness (**R^2= 0.191**), helping hotels gain a stronger market position and attract environmentally conscious travelers.

Practical Suggestions

Given these empirical results and the real-world challenges facing the Algerian hospitality sector, we offer targeted, practical recommendations for different stakeholders:

For Investors and Hotel Owners:

- **Adopt a Phased Solar Investment:** Instead of full-scale immediate adoption, investors should transition gradually by implementing hybrid systems. Prioritizing solar thermal collectors for water and pool heating offers a faster return on investment (ROI) before expanding into high-capacity photovoltaic (PV) systems.
- **Leverage Green Marketing:** Hotels should actively utilize their solar transition to target domestic and international eco-conscious travelers. Acquiring local or international eco-labels can serve as a powerful competitive advantage, especially when bidding for contracts with multinational corporations operating in Algeria that mandate sustainable lodging.

For Decision Makers and Policymakers:

- **Implement Financial and Tax Incentives:** The Ministry of Tourism, in coordination with the Ministry of Energy and APRUE, should introduce tax exemptions or customs reductions on imported solar equipment dedicated to certified hospitality establishments.
- **Facilitate Green Financing:** Public and private banks should introduce specialized "Green Credits" with subsidized, low-interest rates to alleviate the burden of high upfront installation costs for hotel operators.
- **Foster Energy-Hospitality Networks:** Establish regular collaborative platforms and forums connecting local green tech startups, research centers (such as CDER), and hotel executives to share success stories and bridge the technical knowledge gap.

Orientations for Future Research

Based on the constraints and findings of this study, future research should explore the following directions:

- **Adopt Mixed-Method Approaches:** Future studies should complement quantitative surveys with qualitative methods, such as in-depth interviews with executive managers, to overcome survey bias and gain deeper insight into managerial perceptions.
- **Investigate Barriers to Adoption:** Researchers should shift focus toward identifying the specific behavioral, administrative, and financial barriers causing the low adoption rate of renewable energy in the Algerian hospitality sector.
- **Conduct Regional Comparative ROI Studies:** There is a critical need for comparative financial feasibility studies that measure the exact payback period of solar systems across different Algerian microclimates—specifically contrasting northern coastal hotels with southern desert resorts.

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Appendices

People's Democratic Republic Of Algeria

Ministry Of Higher Education And Scientific Research

Higher School Of Management_Tlemcen_

استبيان مذكرة الماستر في إدارة المنشآت السياحية

Master's Thesis Questionnaire in Tourism Establishments Management Specialization

Contribution Of Green Technological Innovations To The Sustainability Of Tourist Destinations

The impact of green technological innovations, particularly solar energy technologies, on the sustainability of tourist destinations: A Case Study of Hotels in Algeria.

Prepared by :

Kada Rahma

Boughari Rahil

Supervised by:

Dr.Korso

Academic year 2025/2026

The academic inquiry الاستبيان الأكاديمي

Section 1: Basic Information القسم 1: المعلومات الأساسية

- **Position:** المنصب

- ○ Management
  الإدارة
- ○ Maintenance
  الصيانة
- ○ Information Technology
  تكنولوجيا المعلومات
- ○ Reception
  الاستقبال
- ○ Other (please specify): _____
  أخرى (يرجى التحديد): _____

- **Hotel work experience: مدة العمل في الفندق**

- ○ Less than one year
  أقل من سنة
- ○ 1–3 years
  من 1 إلى 3 سنوات
- ○ 3–5 years
  من 3 إلى 5 سنوات
- ○ More than 5 years
  أكثر من 5 سنوات

Section 1: Basic Information

مقياس ليكرت الخماسي :

(1)غير موافق بشدة | (2) غير موافق | (3) محايد | (4) موافق | (5) موافق بشدة

5-Point Likert Scale:

(1) Strongly Disagree | (2) Disagree | (3) Neutral | (4) Agree | (5) Strongly Agree

Axis 1: Solar Energy المحور الأول: تبني تقنيات الطاقة الشمسية Adoption

	Statement / العبارة	1	2	3	4	5
1	The hotel relies on solar energy for water heating and lighting. يعتمد الفندق على الطاقة الشمسية في تسخين المياه والإضاءة					
2	The hotel utilizes photovoltaic (PV) panels to generate electricity for its facilities. يستخدم الفندق الألواح الكهروضوئية (PV) لتوليد الكهرباء لمرافقه.					
3	The administration allocates a specific budget for the maintenance and development of solar systems. تخصص الإدارة ميزانية محددة لصيانة وتطوير الأنظمة الشمسية.					
4	Solar energy is integrated into hotel's long-term energy strategy. يتم دمج الطاقة الشمسية ضمن الاستراتيجية طويلة المدى للفندق					

Axis 2: Environmental Sustainability المحور الثاني: الاستدامة البيئية

	Statement / العبارة	1	2	3	4	5
1	The hotel effectively manages its waste and recycling programs يدير الفندق بشكل فعال برامج النفايات وإعادة التدوير.					
2	There is a strict policy to reduce overall carbon emissions. توجد سياسة صارمة لتقليل انبعاثات الكربون.					
3	The hotel actively works on conserving water and natural resources. يعمل الفندق على ترشيد استهلاك المياه والموارد الطبيعية.					
4	The hotel complies with international environmental standards. يلتزم الفندق بالمعايير البيئية الدولية.					
5	Hotel operations contribute to preserving local biodiversity. تساهم عمليات الفندق في الحفاظ على التنوع البيولوجي المحلي.					

Axis 3: Economic Sustainability المحور الثالث: الاستدامة الاقتصادية

	Statement / العبارة	1	2	3	4	5
1	The hotel achieves high operational efficiency and cost control. حقق الفندق كفاءة تشغيلية عالية وتحكمًا في التكاليف.					
2	The hotel's "Green" reputation attracts more guests and increases revenue السمعة البيئية للفندق تجذب المزيد من النزلاء وتزيد الإيرادات.					

3	Financial resources are allocated for continuous facility upgrading. يتم تخصيص موارد مالية لتحديث المرافق بشكل مستمر.	

	Statement / العبارة	1	2	3	4	5
1	The hotel supports the local community through jobs					

4	The hotel focuses on long-term financial stability over short-term profit. يركز الفندق على الاستقرار المالي طويل المدى بدل الأرباح قصيرة المدى.	
5	The facility has experienced a continuous decrease in long-term operating and maintenance costs. شهدت المنشأة انخفاضًا مستمرًا في تكاليف التشغيل والصيانة على المدى الطويل.	

	and local sourcing. يدعم الفندق المجتمع المحلي من خلال التوظيف والمصادر المحلية.					
2	Staff members receive regular training on sustainability and safety. يتلقى الموظفون تدريبًا منتظمًا حول الاستدامة والسلامة.					
3	Guest satisfaction is linked to ethical and social practices. يرتبط رضا النزلاء بالممارسات الأخلاقية والاجتماعية.					
4	The hotel promotes a culture of environmental responsibility among guests. يعزز الفندق ثقافة المسؤولية البيئية لدى النزلاء.					

Axis 4: Social Sustainability المحور الرابع: الاستدامة الاجتماعي

Axis 5 : competitiveneness & Market position المحور الخامس :التنافسية و المكانة السوقية

	Statement / العبارة	1	2	3	4	5
1	The hotel's corporate identity is a key factor in attracting new customers. تُعد الهوية المؤسسية للفندق عامل جذب رئيسي للعملاء الجدد.					
2	The hotel has a distinct competitive advantage over other hotels in the region. يتمتع الفندق بميزة تنافسية واضحة مقارنة بالفنادق الأخرى في المنطقة.					
3	The hotel's commitment to sustainability attracts a larger segment of eco-conscious tourists إلتزام الفندق بالاستدامة يجذب شريحة أكبر من السياح المهتمين بالبيئة.					

SPSS V.25 APPENDIX

RELIABILITY

Reliability

Scale: Alpha Solar Energy Adoption

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.678	4

Reliability

Scale: Alpha Environmental Sustainability

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.770	5

Reliability

Scale: Alpha Economic Sustainability

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.756	5

Reliability

Scale: Alpha Social Sustainability

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.758	4

Reliability

Scale: Alpha competitiveneness & Market position

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.714	3

Reliability

Scale: Alpha questionnaire

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.918	21

NORMALITY TESTS

Explore

Notes

Output Created		14-MAY-2026 14:59:25
Comments		
Input	Data	C:\Users\LENOVO\Desktop\statistica\2026\Rachel (green technological)\data green technology.sav
	Active Dataset	DataSet0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	52

Missing Value Handling	Definition of Missing	User-defined missing values for dependent variables are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=Solar_Energy_Adoption Environmental_Sustainability Economic_Sustainability Social_Sustainability Competitivness_market_position /PLOT BOXPLOT STEMLEAF NPPLOT /COMPARE GROUPS /STATISTICS DESCRIPTIVES /CINTERVAL 95 /MISSING LISTWISE /NOTOTAL.
Resources	Processor Time	00:00:03.09
	Elapsed Time	00:00:03.88

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Solar_Energy_Adoption	52	100.0%	0	0.0%	52	100.0%
Environmental_Sustainability	52	100.0%	0	0.0%	52	100.0%
Economic_Sustainability	52	100.0%	0	0.0%	52	100.0%
Social_Sustainability	52	100.0%	0	0.0%	52	100.0%
Competitivness_market_position	52	100.0%	0	0.0%	52	100.0%

Descriptives

	Statistic	Std. Error

Solar_Energy_Adoption	Mean		13.2115	.41223
	95% Confidence Interval for Mean	Lower Bound	12.3839	
		Upper Bound	14.0391	
	5% Trimmed Mean		13.2906	
	Median		14.0000	
	Variance		8.837	
	Std. Deviation		2.97266	
	Minimum		7.00	
	Maximum		18.00	
	Range		11.00	
	Interquartile Range		5.00	
	Skewness		-.400	.330
	Kurtosis		-1.056	.650
Environmental_Sustainability	Mean		16.1154	.54555
	95% Confidence Interval for Mean	Lower Bound	15.0201	
		Upper Bound	17.2106	
	5% Trimmed Mean		16.3889	
	Median		17.0000	
	Variance		15.477	
	Std. Deviation		3.93403	
	Minimum		5.00	
	Maximum		22.00	
	Range		17.00	
	Interquartile Range		5.00	
	Skewness		-.998	.330
	Kurtosis		.797	.650
Economic_Sustainability	Mean		17.2692	.52832
	95% Confidence Interval for Mean	Lower Bound	16.2086	
		Upper Bound	18.3299	
	5% Trimmed Mean		17.5385	
	Median		18.0000	
	Variance		14.514	
	Std. Deviation		3.80977	
	Minimum		5.00	
	Maximum		23.00	
	Range		18.00	
	Interquartile Range		5.00	
	Skewness		-1.076	.330
	Kurtosis		1.238	.650
Social_Sustainability	Mean		14.2500	.47077
	95% Confidence Interval for	Lower Bound	13.3049	

	Mean	Upper Bound	15.1951	
	5% Trimmed Mean		14.4829	
	Median		16.0000	
	Variance		11.525	
	Std. Deviation		3.39478	
	Minimum		4.00	
	Maximum		20.00	
	Range		16.00	
	Interquartile Range		4.00	
	Skewness		-1.168	.330
	Kurtosis		1.529	.650
Competitivness_market_position	Mean		10.8269	.38517
	95% Confidence Interval for Mean	Lower Bound	10.0537	
		Upper Bound	11.6002	
	5% Trimmed Mean		11.0171	
	Median		12.0000	
	Variance		7.715	
	Std. Deviation		2.77751	
	Minimum		3.00	
	Maximum		15.00	
	Range		12.00	
	Interquartile Range		3.00	
	Skewness		-1.196	.330
	Kurtosis		1.096	.650

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Solar_Energy_Adoption	.188	52	.000	.914	52	.001
Environmental_Sustainability	.165	52	.001	.913	52	.001
Economic_Sustainability	.137	52	.016	.915	52	.001
Social_Sustainability	.216	52	.000	.892	52	.000
Competitivness_market_position	.279	52	.000	.860	52	.000

a. Lilliefors Significance Correction

Solar_Energy_Adoption

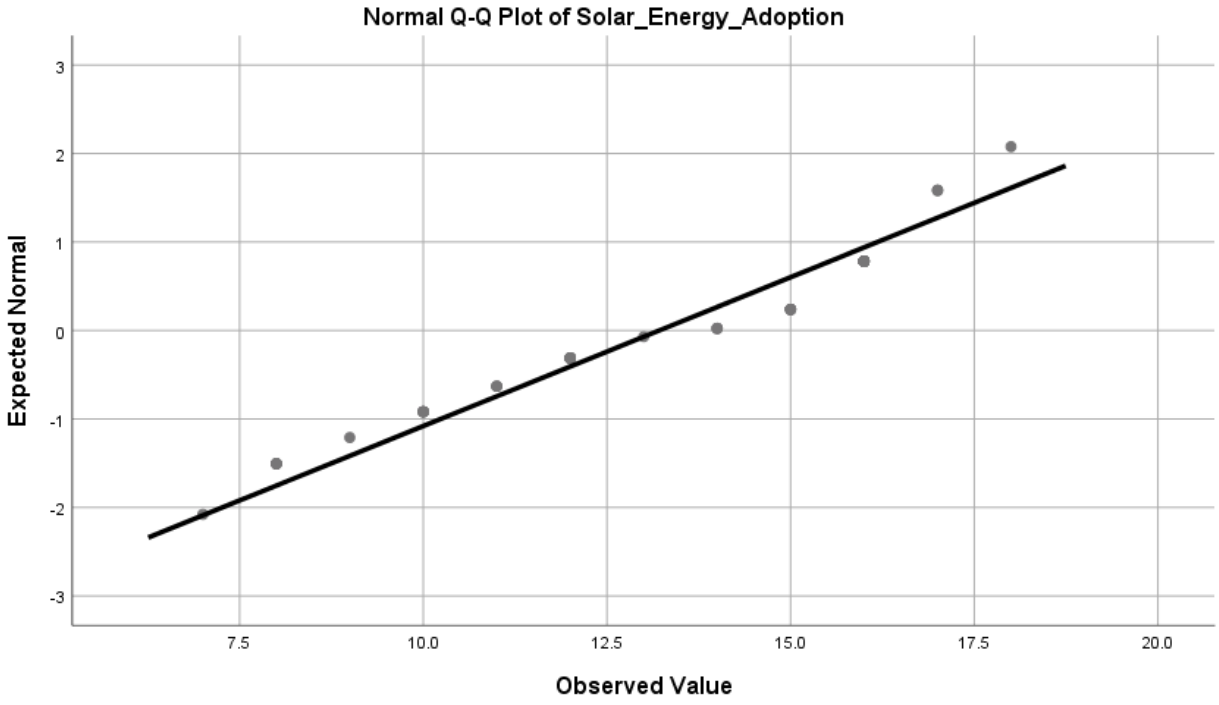
```
Solar_Energy_Adoption Stem-and-Leaf Plot

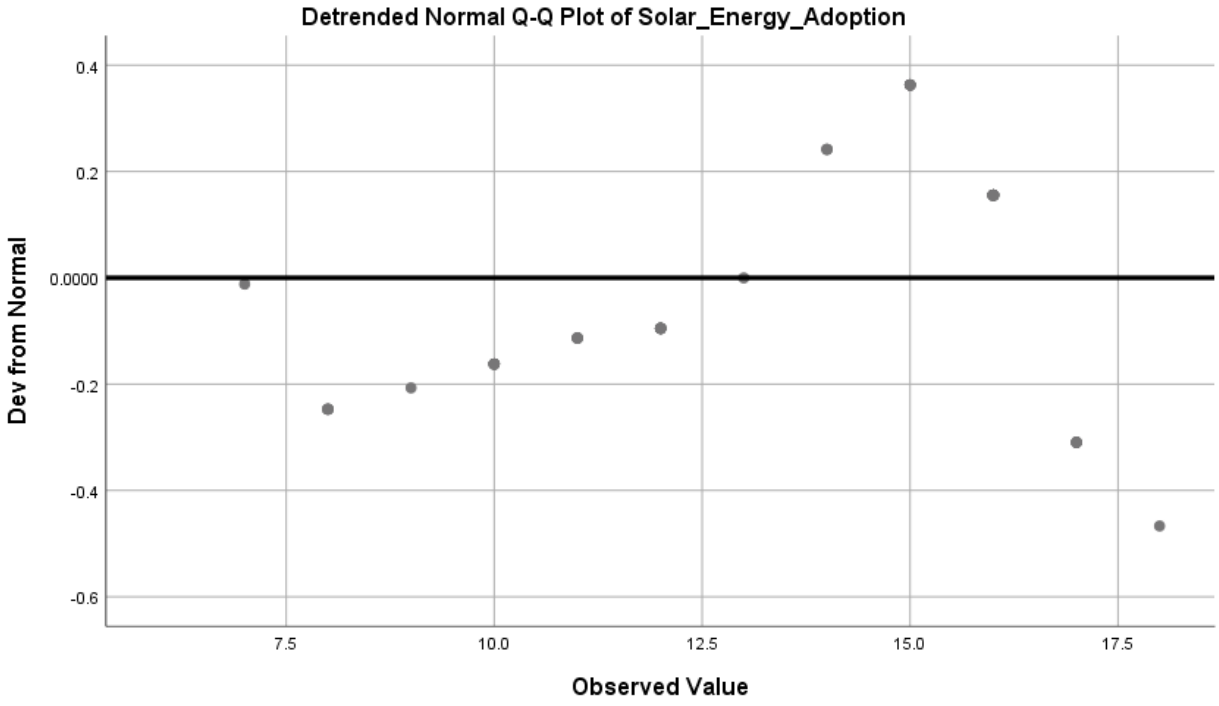
 Frequency     Stem &  Leaf

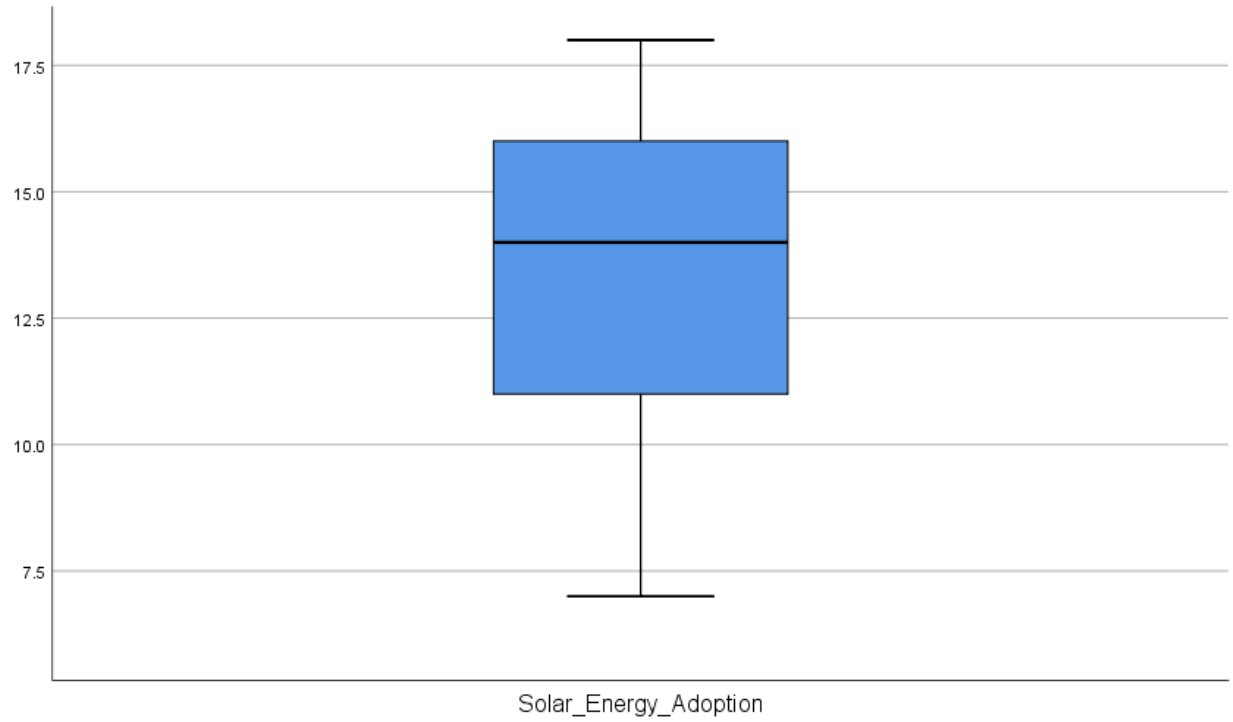
     1.00        0 .  7
```

```
    5.00        0 .  88889
    9.00        1 .  000000111
   10.00        1 .  2222222223
    9.00        1 .  444555555
   17.00        1 .  66666666666666777
    1.00        1 .  8

Stem width:     10.00
Each leaf:       1 case(s)
```







Environmental_Sustainability

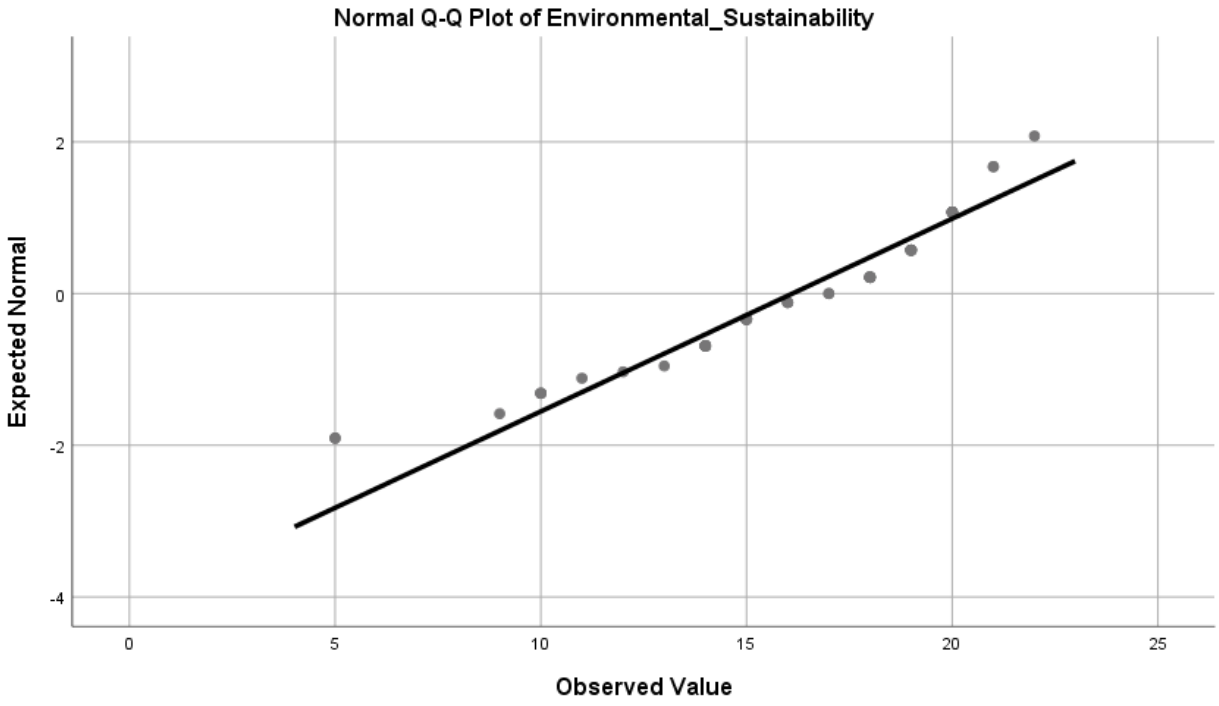
```
Environmental_Sustainability Stem-and-Leaf Plot

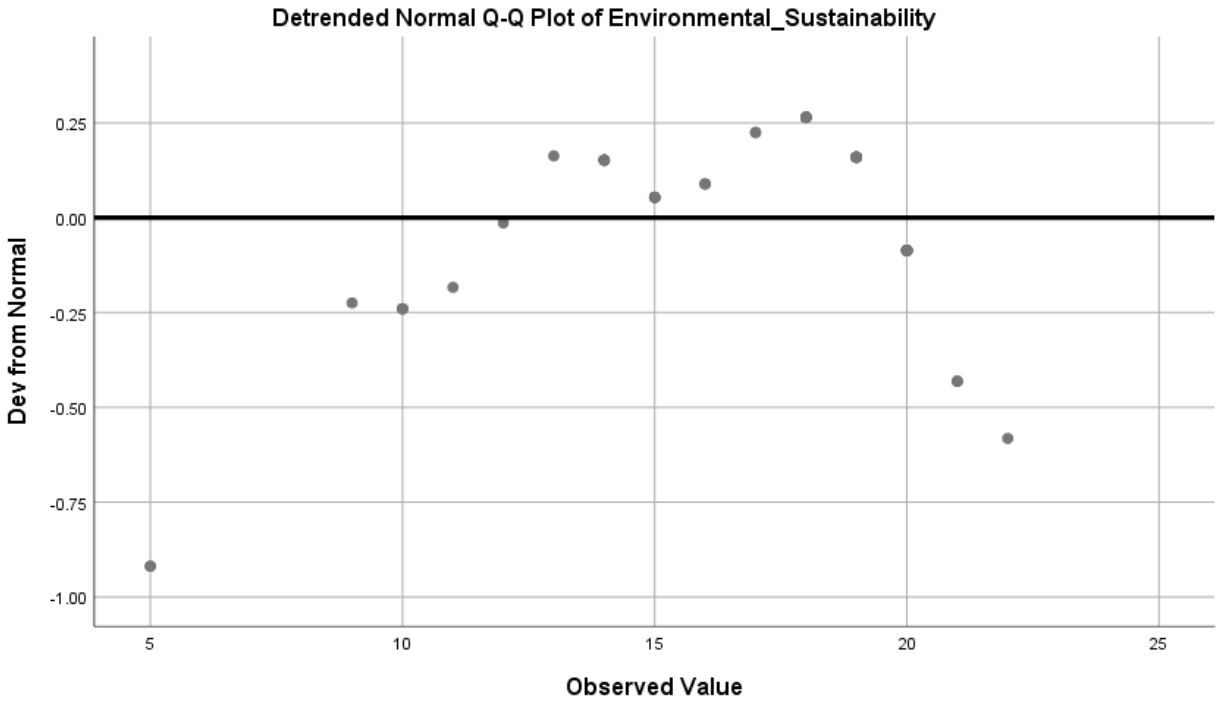
 Frequency    Stem &  Leaf

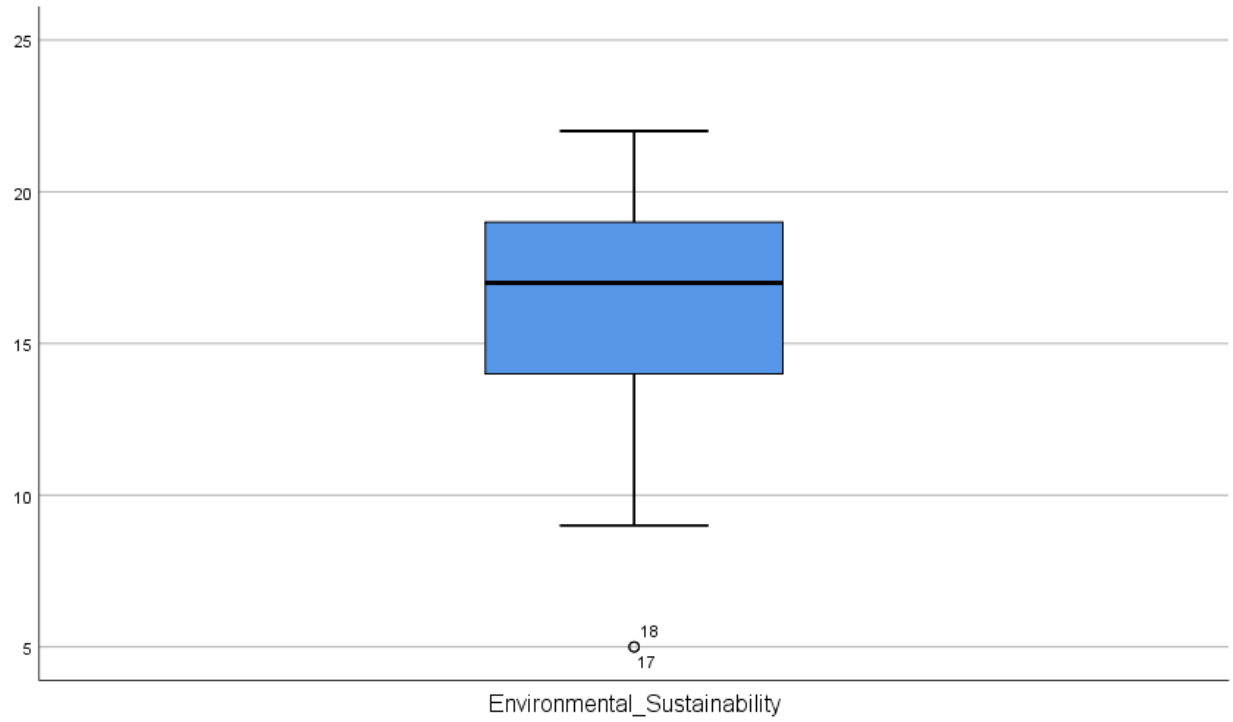
     2.00 Extremes    (=<5)
     1.00        0 .  9
    13.00        1 .  0001234444444
    25.00        1 .  55555566677888888889999999
    11.00        2 .  00000000112

 Stem width:     10.00
 Each leaf:       1 case(s)
```

APPENDICES


Normal Q-Q Plot of Environmental_Sustainability
Expected Normal
2
0
-2
-4
0
5
10
15
20
25
Observed Value


Detrended Normal Q-Q Plot of Environmental_Sustainability
Dev from Normal
0.25
0.00
-0.25
-0.50
-0.75
-1.00
5
10
15
20
25
Observed Value



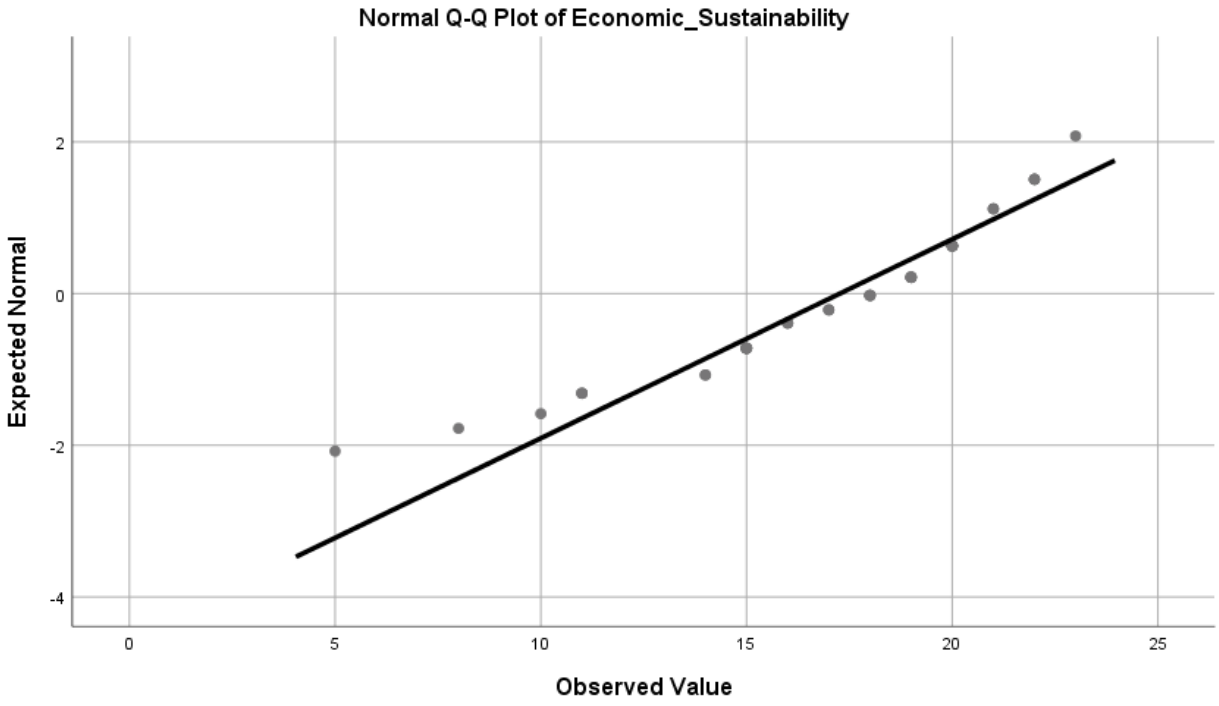
Economic_Sustainability

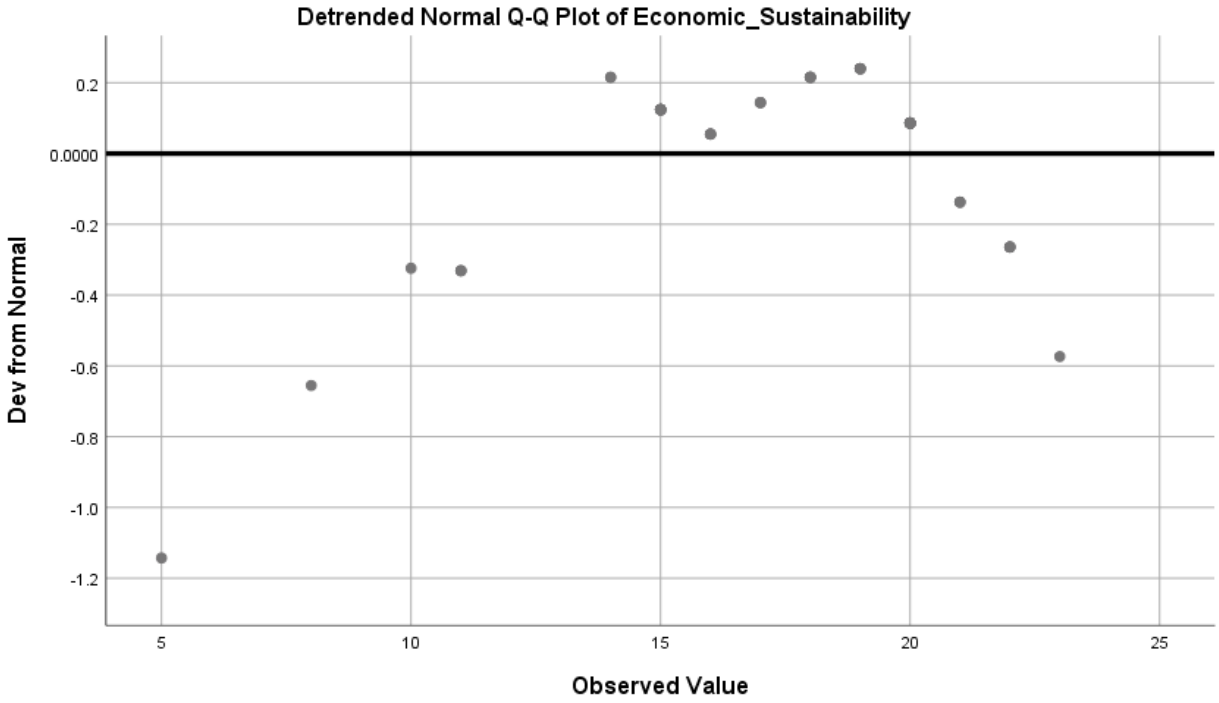
```
Economic_Sustainability Stem-and-Leaf Plot

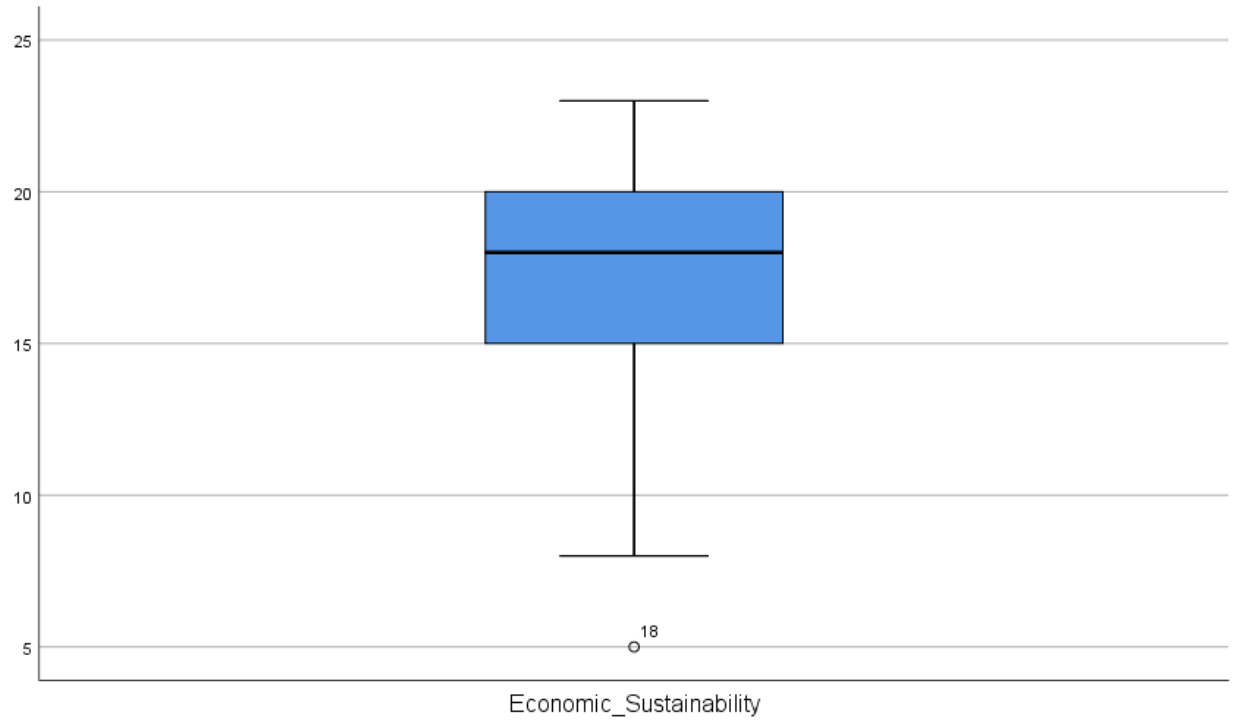
 Frequency    Stem &  Leaf

     1.00 Extremes    (=<5)
     1.00         0 .  8
     6.00         1 .  011144
    25.00         1 .  55555555666677788888999999
    19.00         2 .  0000000000011122223

 Stem width:     10.00
 Each leaf:        1 case(s)
```


Normal Q-Q Plot of Economic_Sustainability
Expected Normal
2
0
-2
-4
0
5
10
15
20
25
Observed Value


Detrended Normal Q-Q Plot of Economic_Sustainability
Dev from Normal
0.2
0.0000
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
5
10
15
20
25
Observed Value



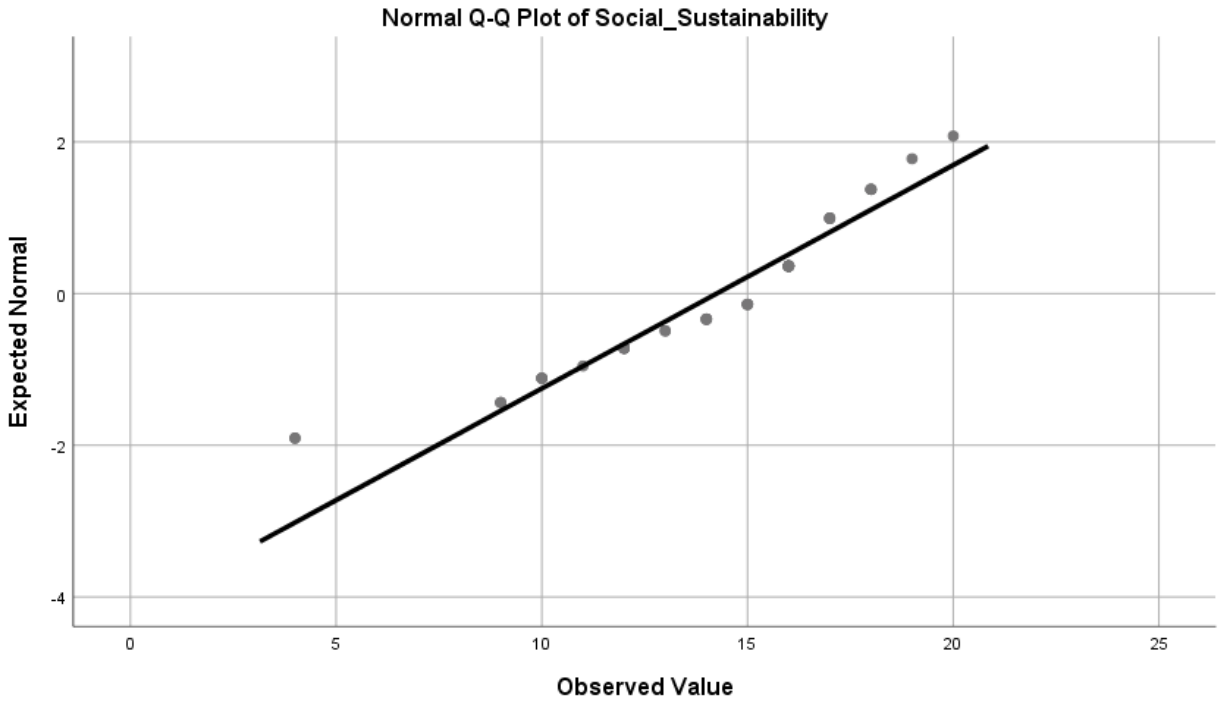
Social_Sustainability

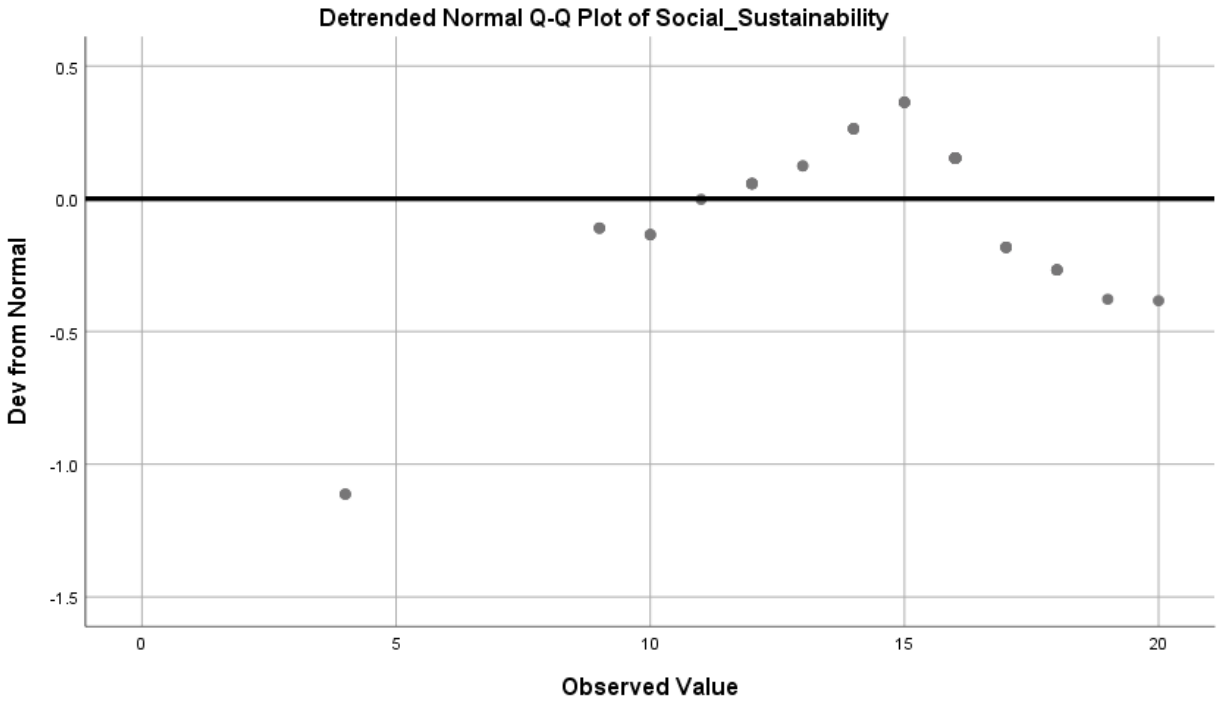
```
Social_Sustainability Stem-and-Leaf Plot

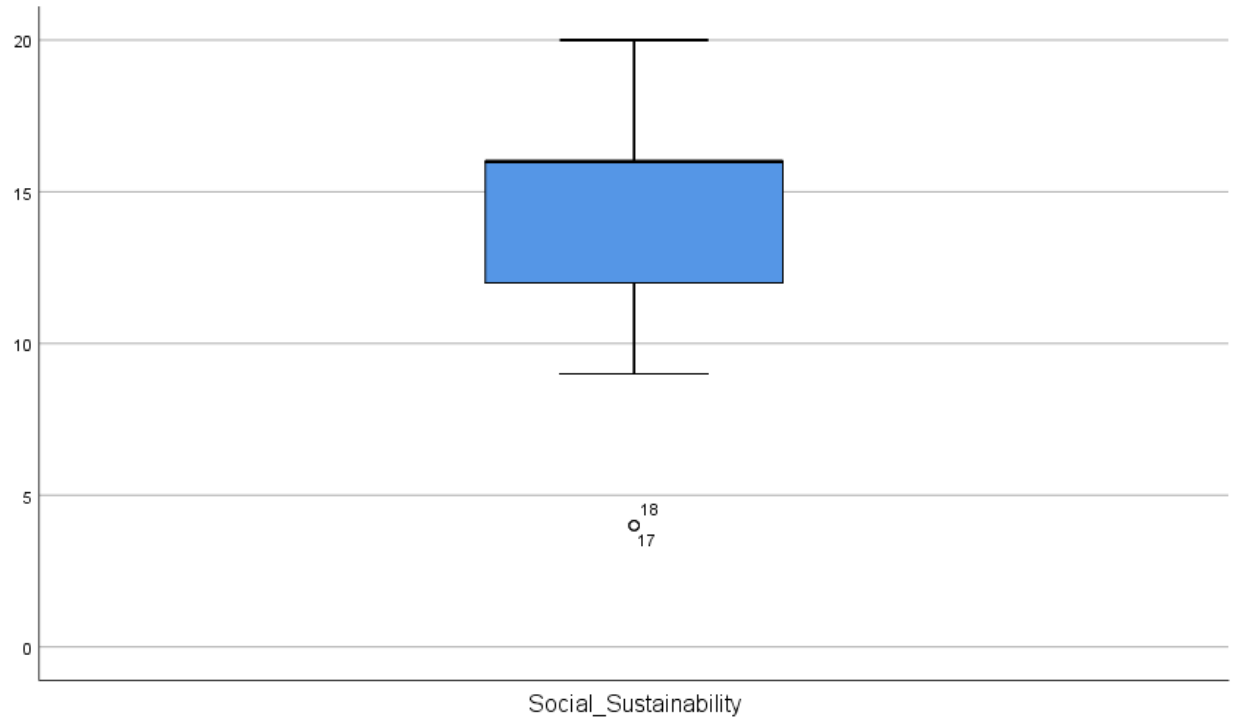
 Frequency    Stem &  Leaf

     2.00 Extremes    (=<4)
     3.00        0 .  999
    16.00        1 .  0001222222334444
    30.00        1 .  55556666666666666666777788889
     1.00        2 .  0

 Stem width:     10.00
 Each leaf:       1 case(s)
```


Normal Q-Q Plot of Social_Sustainability
Expected Normal
2
0
-2
-4
0
5
10
15
20
25
Observed Value


Detrended Normal Q-Q Plot of Social_Sustainability
Dev from Normal
0.5
0.0
-0.5
-1.0
-1.5
0
5
10
15
20
Observed Value



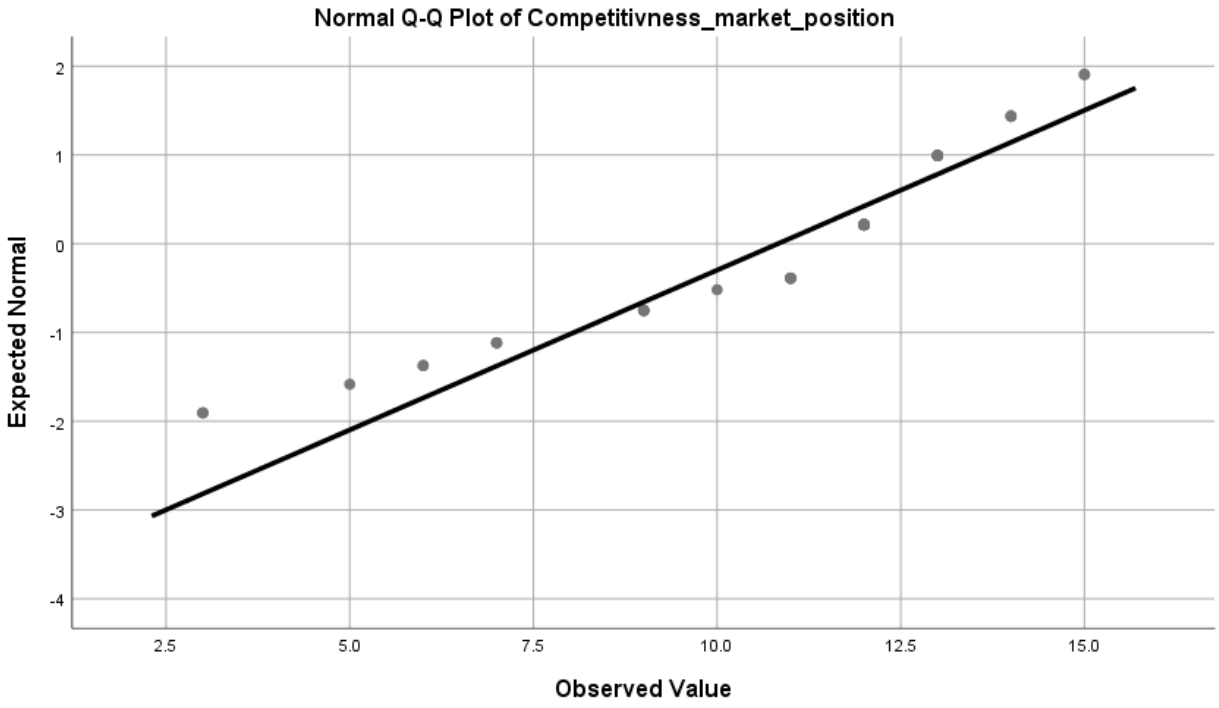
Competitivness_market_position

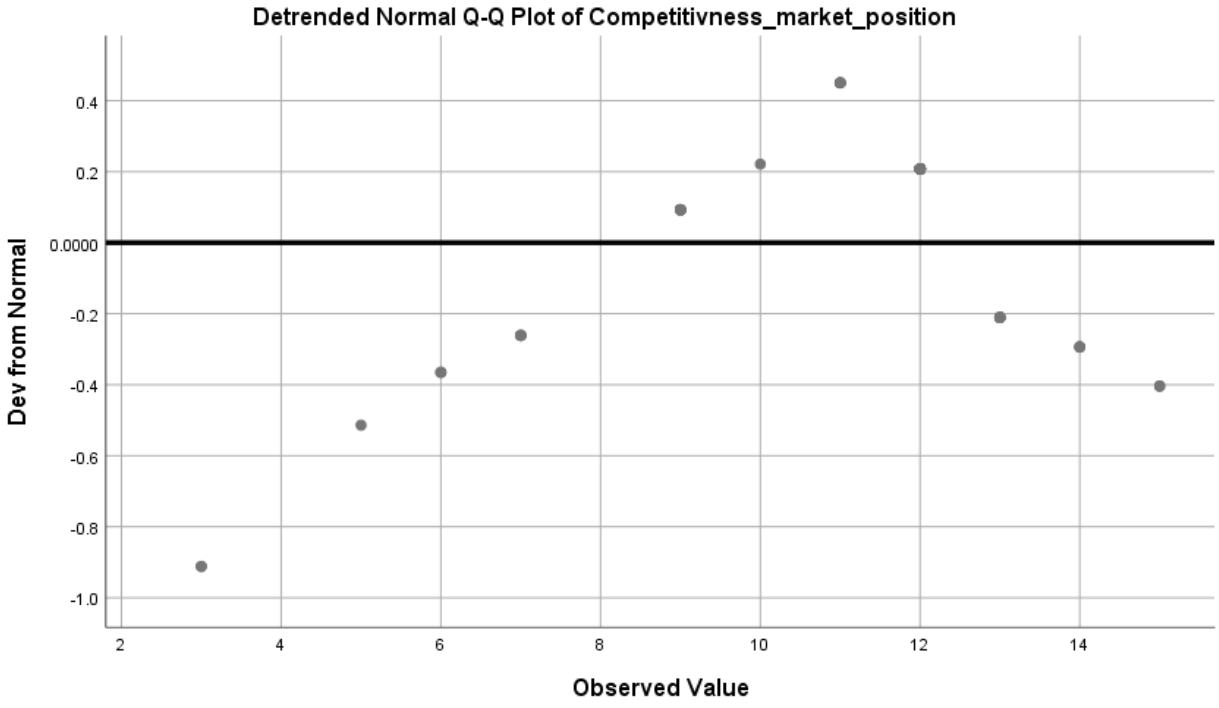
```
Competitivness_market_position Stem-and-Leaf Plot

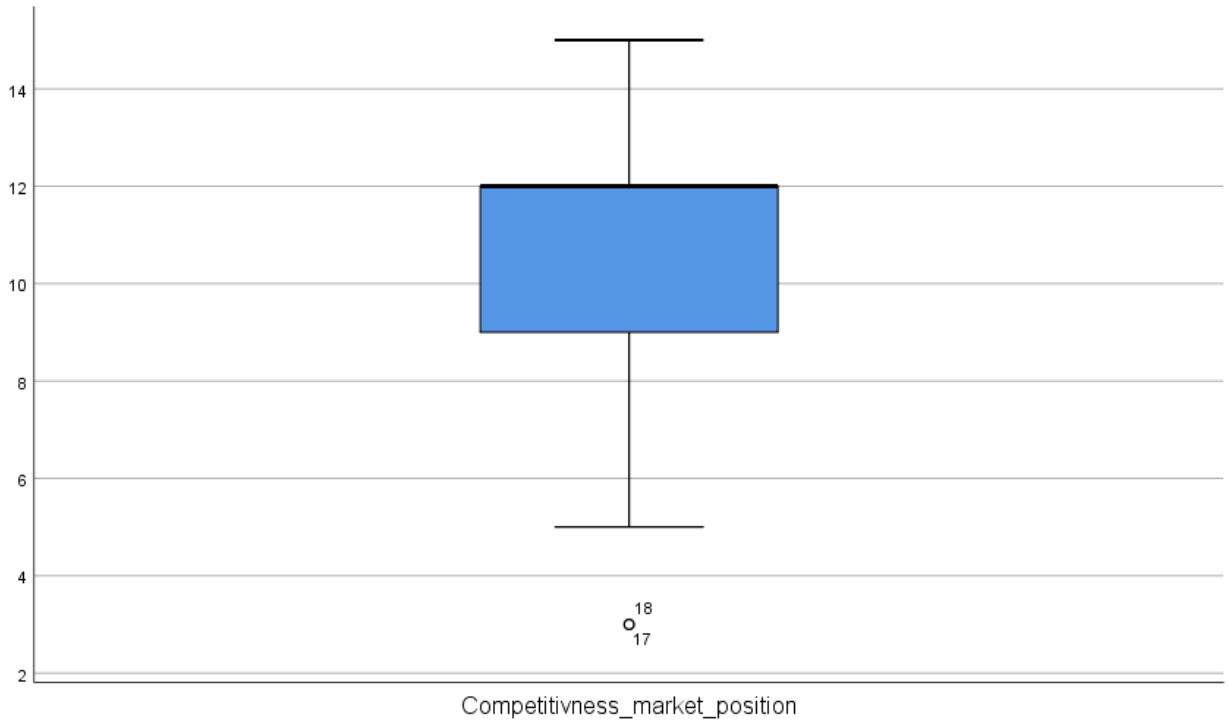
 Frequency    Stem &  Leaf

     2.00 Extremes    (=<3)
     1.00         0 .  5
     5.00         0 .  66777
     7.00         0 .  9999999
     5.00         1 .  01111
    27.00         1 .  222222222222222222222333333
     5.00         1 .  44455

 Stem width:     10.00
 Each leaf:        1 case(s)
```


Normal Q-Q Plot of Competitivness_market_position
Expected Normal
Observed Value
2
1
0
-1
-2
-3
-4
2.5
5.0
7.5
10.0
12.5
15.0


Detrended Normal Q-Q Plot of Competitivness_market_position
Dev from Normal
Observed Value
0.4
0.2
0.0000
-0.2
-0.4
-0.6
-0.8
-1.0
2
4
6
8
10
12
14



SAMPLE DISTRIBUTION

Frequencies

Statistics

		Position	Work_experience
N	Valid	52	52
	Missing	0	0

Frequency Table

Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Management	18	34.6	34.6	34.6
	Maintenance	3	5.8	5.8	40.4
	Information Technology	7	13.5	13.5	53.8
	Reception	9	17.3	17.3	71.2
	Other (please specify)	15	28.8	28.8	100.0
	Total	52	100.0	100.0	

Work_experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than one year	19	36.5	36.5	36.5
	1–3 years	20	38.5	38.5	75.0
	3–5 years	8	15.4	15.4	90.4
	More than 5 years	5	9.6	9.6	100.0
	Total	52	100.0	100.0	

DESCRIPTIVE ANALYSIS

Frequencies

Notes

Output Created		17-MAY-2026 23:49:22
Comments		
Input	Data	C:\Users\LENOVO\Desktop\statistica\2026\Rachel (green technological)\data green technology.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	52
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=item1 item2 item3 item4 item5 item6 item7 item8 item9 item10 item11 item12 item13 item14 item15 item16 item17 item18 item19 item20 item21 /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.02

[DataSet1] C:\Users\LENOVO\Desktop\statistica\2026\Rachel (green technological)\data green technology.sav

		item1	item2	item3	item4	item5	item6	item7
N	Valid	52	52	52	52	52	52	52
	Missing	0	0	0	0	0	0	0

Frequency Table

item1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	3.8	3.8	3.8
	Disagree	8	15.4	15.4	19.2
	Neutral	15	28.8	28.8	48.1
	Agree	20	38.5	38.5	86.5
	Strongly Agree	7	13.5	13.5	100.0
	Total	52	100.0	100.0	

item2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	3.8	3.8	3.8
	Disagree	15	28.8	28.8	32.7
	Neutral	10	19.2	19.2	51.9
	Agree	22	42.3	42.3	94.2
	Strongly Agree	3	5.8	5.8	100.0
	Total	52	100.0	100.0	

item3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	9.6	9.6	9.6
	Disagree	8	15.4	15.4	25.0
	Neutral	12	23.1	23.1	48.1
	Agree	24	46.2	46.2	94.2
	Strongly Agree	3	5.8	5.8	100.0
	Total	52	100.0	100.0	

item4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	5.8	5.8	5.8
	Disagree	6	11.5	11.5	17.3
	Neutral	15	28.8	28.8	46.2
	Agree	24	46.2	46.2	92.3
	Strongly Agree	4	7.7	7.7	100.0
	Total	52	100.0	100.0	

item5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	9.6	9.6	9.6
	Disagree	5	9.6	9.6	19.2
	Neutral	14	26.9	26.9	46.2
	Agree	22	42.3	42.3	88.5
	Strongly Agree	6	11.5	11.5	100.0
	Total	52	100.0	100.0	

item6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	11.5	11.5	11.5
	Disagree	12	23.1	23.1	34.6
	Neutral	14	26.9	26.9	61.5
	Agree	20	38.5	38.5	100.0
	Total	52	100.0	100.0	

item7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	7.7	7.7	7.7
	Disagree	9	17.3	17.3	25.0
	Neutral	14	26.9	26.9	51.9
	Agree	21	40.4	40.4	92.3
	Strongly Agree	4	7.7	7.7	100.0
	Total	52	100.0	100.0	

item8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	7.7	7.7	7.7
	Disagree	6	11.5	11.5	19.2
	Neutral	14	26.9	26.9	46.2
	Agree	20	38.5	38.5	84.6
	Strongly Agree	8	15.4	15.4	100.0
	Total	52	100.0	100.0	

item9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	9.6	9.6	9.6
	Disagree	8	15.4	15.4	25.0

	Neutral	15	28.8	28.8	53.8
	Agree	21	40.4	40.4	94.2
	Strongly Agree	3	5.8	5.8	100.0
	Total	52	100.0	100.0	

item10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	7.7	7.7	7.7
	Disagree	5	9.6	9.6	17.3
	Neutral	13	25.0	25.0	42.3
	Agree	27	51.9	51.9	94.2
	Strongly Agree	3	5.8	5.8	100.0
	Total	52	100.0	100.0	

item11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	9.6	9.6	9.6
	Disagree	6	11.5	11.5	21.2
	Neutral	10	19.2	19.2	40.4
	Agree	22	42.3	42.3	82.7
	Strongly Agree	9	17.3	17.3	100.0
	Total	52	100.0	100.0	

item12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	7.7	7.7	7.7
	Disagree	5	9.6	9.6	17.3
	Neutral	8	15.4	15.4	32.7
	Agree	28	53.8	53.8	86.5
	Strongly Agree	7	13.5	13.5	100.0
	Total	52	100.0	100.0	

item13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	7.7	7.7	7.7
	Disagree	6	11.5	11.5	19.2
	Neutral	9	17.3	17.3	36.5
	Agree	25	48.1	48.1	84.6
	Strongly Agree	8	15.4	15.4	100.0
	Total	52	100.0	100.0	

item14

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	5.8	5.8	5.8
	Disagree	3	5.8	5.8	11.5
	Neutral	22	42.3	42.3	53.8
	Agree	21	40.4	40.4	94.2
	Strongly Agree	3	5.8	5.8	100.0
	Total	52	100.0	100.0	

item15

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	13.5	13.5	13.5
	Disagree	5	9.6	9.6	23.1
	Neutral	6	11.5	11.5	34.6
	Agree	32	61.5	61.5	96.2
	Strongly Agree	2	3.8	3.8	100.0
	Total	52	100.0	100.0	

item16

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	9.6	9.6	9.6
	Disagree	4	7.7	7.7	17.3
	Neutral	9	17.3	17.3	34.6
	Agree	26	50.0	50.0	84.6
	Strongly Agree	8	15.4	15.4	100.0
	Total	52	100.0	100.0	

item17

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	5.8	5.8	5.8
	Disagree	3	5.8	5.8	11.5
	Neutral	9	17.3	17.3	28.8
	Agree	20	38.5	38.5	67.3
	Strongly Agree	17	32.7	32.7	100.0
	Total	52	100.0	100.0	

item18

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	5.8	5.8	5.8

	Disagree	4	7.7	7.7	13.5
	Neutral	16	30.8	30.8	44.2
	Agree	21	40.4	40.4	84.6
	Strongly Agree	8	15.4	15.4	100.0
	Total	52	100.0	100.0	

item19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	5.8	5.8	5.8
	Disagree	2	3.8	3.8	9.6
	Neutral	8	15.4	15.4	25.0
	Agree	28	53.8	53.8	78.8
	Strongly Agree	11	21.2	21.2	100.0
	Total	52	100.0	100.0	

item20

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	11.5	11.5	11.5
	Disagree	4	7.7	7.7	19.2
	Neutral	9	17.3	17.3	36.5
	Agree	24	46.2	46.2	82.7
	Strongly Agree	9	17.3	17.3	100.0
	Total	52	100.0	100.0	

item21

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	13.5	13.5	13.5
	Disagree	2	3.8	3.8	17.3
	Neutral	10	19.2	19.2	36.5
	Agree	23	44.2	44.2	80.8
	Strongly Agree	10	19.2	19.2	100.0
	Total	52	100.0	100.0	

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
item1	52	1.00	5.00	3.4231	1.03557
item2	52	1.00	5.00	3.1731	1.04264
item3	52	1.00	5.00	3.2308	1.09572
item4	52	1.00	5.00	3.3846	.99319
Solar_Energy_Adoption	52	7.00	18.00	13.2115	2.97266

Valid N (listwise)	52				

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
item5	52	1.00	5.00	3.3654	1.12073
item6	52	1.00	4.00	2.9231	1.04499
item7	52	1.00	5.00	3.2308	1.07768
item8	52	1.00	5.00	3.4231	1.12627
item9	52	1.00	5.00	3.1731	1.07960
Environmental_Sustainability	52	5.00	22.00	16.1154	3.93403
Valid N (listwise)	52				

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
item10	52	1.00	5.00	3.3846	1.01274
item11	52	1.00	5.00	3.4615	1.19577
item12	52	1.00	5.00	3.5577	1.09210
item13	52	1.00	5.00	3.5192	1.12877
item14	52	1.00	5.00	3.3462	.90499
Economic_Sustainability	52	5.00	23.00	17.2692	3.80977
Valid N (listwise)	52				

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
item15	52	1.00	5.00	3.3269	1.14996
item16	52	1.00	5.00	3.5385	1.14552
item17	52	1.00	5.00	3.8654	1.12073
item18	52	1.00	5.00	3.5192	1.03829
Social_Sustainability	52	4.00	20.00	14.2500	3.39478
Valid N (listwise)	52				

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
item19	52	1.00	5.00	3.8077	1.01050
item20	52	1.00	5.00	3.5000	1.21268
item21	52	1.00	5.00	3.5192	1.24444

Competitivness_market_position	52	3.00	15.00	10.8269	2.77751
Valid N (listwise)	52				

HYPOTHESIS1

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Environmental_Sustainability
  /METHOD=ENTER Solar_Energy_Adoption.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Solar_Energy_Adoption[b]	.	Enter

a. Dependent Variable: Environmental_Sustainability

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.486[a]	.236	.221	3.47288

a. Predictors: (Constant), Solar_Energy_Adoption

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	186.263	1	186.263	15.444	.000[b]
	Residual	603.044	50	12.061		
	Total	789.308	51			

a. Dependent Variable: Environmental_Sustainability

b. Predictors: (Constant), Solar_Energy_Adoption

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7.622	2.214		3.442	.001
	Solar_Energy_Adoption	.643	.164	.486	3.930	.000

a. Dependent Variable: Environmental_Sustainability

Bootstrap for Coefficients

Model		B	Bootstrap[a]			
			Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confiden Lower
1	(Constant)	7.622	.054	2.323	.002	3.236
	Solar_Energy_Adoption	.643	-.004	.164	.000	.296

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

HYPOTHESIS2

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Economic_Sustainability
  /METHOD=ENTER Solar_Energy_Adoption.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Solar_Energy_Adoption[b]	.	Enter

a. Dependent Variable: Economic_Sustainability

b. All requested variables entered.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	87.024	1	87.024	6.661	.013[b]
	Residual	653.207	50	13.064		
	Total	740.231	51			

a. Dependent Variable: Economic_Sustainability

b. Predictors: (Constant), Solar_Energy_Adoption

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.464	2.305		4.974	.000
	Solar_Energy_Adoption	.439	.170	.343	2.581	.013

a. Dependent Variable: Economic_Sustainability

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Lower	U
1	(Constant)	11.464	-.022	2.274	.000	6.501	
	Solar_Energy_Adoption	.439	.001	.159	.010	.137	

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

HYPOTHESIS3

```
BOOTSTRAP
  /SAMPLING METHOD=SIMPLE
  /VARIABLES TARGET=Social_Sustainability INPUT=Solar_Energy_Adoption
  /CRITERIA CILEVEL=95 CITYPE=BCA NSAMPLES=5000.
```

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Social_Sustainability
  /METHOD=ENTER Solar_Energy_Adoption.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Solar_Energy_Adoption[b]	.	Enter

a. Dependent Variable: Social_Sustainability

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.445[a]	.198	.182	3.06964

a. Predictors: (Constant), Solar_Energy_Adoption

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	116.616	1	116.616	12.376	.001[b]
	Residual	471.134	50	9.423		
	Total	587.750	51			

a. Dependent Variable: Social_Sustainability

b. Predictors: (Constant), Solar_Energy_Adoption

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7.530	1.957		3.847	.000
	Solar_Energy_Adoption	.509	.145	.445	3.518	.001

a. Dependent Variable: Social_Sustainability

Bootstrap for Coefficients

Model		Bootstrap[a]					
						BCa 95% Confidence	
		B	Bias	Std. Error	Sig. (2-tailed)	Lower	U
1	(Constant)	7.530	-.055	2.142	.001	3.155	

	Solar_Energy_Adoption	.509	.004	.142	.001	.238

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

HYPOTHESIS4

```
NEW FILE.
DATASET NAME DataSet1 WINDOW=FRONT.
DATASET ACTIVATE DataSet0.
DATASET CLOSE DataSet1.
BOOTSTRAP
  /SAMPLING METHOD=SIMPLE
  /VARIABLES TARGET=Competitiveness_market_position
INPUT=Solar_Energy_Adoption
  /CRITERIA CILEVEL=95 CITYPE=BCA NSAMPLES=5000.
```

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Competitivness_market_position
  /METHOD=ENTER Solar_Energy_Adoption.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Solar_Energy_Adoption[b]	.	Enter

a. Dependent Variable: Competitivness_market_position

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.437[a]	.191	.175	2.52348

a. Predictors: (Constant), Solar_Energy_Adoption

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	75.045	1	75.045	11.785	.001[b]
	Residual	318.398	50	6.368		
	Total	393.442	51			

a. Dependent Variable: Competitivness_market_position

b. Predictors: (Constant), Solar_Energy_Adoption

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	5.436	1.609		3.378	.001
	Solar_Energy_Adoption	.408	.119	.437	3.433	.001

a. Dependent Variable: Competitivness_market_position

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Lower	U
1	(Constant)	5.436	-.041	1.641	.004	1.978	
	Solar_Energy_Adoption	.408	.003	.107	.002	.211	

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

GNEREAL HYPOTHESIS

Bootstrap

Bootstrap Specifications

Sampling Method	Simple
Number of Samples	5000
Confidence Interval Level	95.0%
Confidence Interval Type	Bias-corrected and accelerated (BCa)

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Overall_Performance
  /METHOD=ENTER Solar_Energy_Adoption.
```

Regression

APPENDICES

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Solar_Energy_Adoption[b]	.	Enter

a. Dependent Variable: Overall_Performance

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.478[a]	.229	.213	11.01628

a. Predictors: (Constant), Solar_Energy_Adoption

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1801.000	1	1801.000	14.840	.000[b]
	Residual	6067.923	50	121.358		
	Total	7868.923	51			

a. Dependent Variable: Overall_Performance

b. Predictors: (Constant), Solar_Energy_Adoption

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	32.051	7.024		4.563	.000
	Solar_Energy_Adoption	1.999	.519	.478	3.852	.000

a. Dependent Variable: Overall_Performance

Bootstrap for Coefficients

Model		B	Bootstrap[a] Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Lower	U
1	(Constant)	32.051	-.277	6.928	.001	18.384	
	Solar_Energy_Adoption	1.999	.019	.460	.001	1.081	

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples