

Article

Towards Environmental Sustainability: Saudi Residents' Awareness, Attitudes, and Environmental Behaviors Toward Green Projects (A Cross-Sectional Study)

Amani Mohammed Al-Hosan ¹, Muna Saad Alghamdi ^{1,*}, Amnah Aldohan ², Setah Naser Alowfi ², Ahmed M. El Kenawy ^{3,4,5}, Youssef M. Youssef ⁶ and Islam M. Gaber ⁷

¹ Department of Teaching and Learning, College of Education and Human Development, Princess Nourah bint Abdulrahman University, Riyadh 13415, Saudi Arabia

² Department of Geography, College of Humanities and Social Sciences, Princess Nourah bint Abdulrahman University, Riyadh 11671, Saudi Arabia

³ Instituto Pirenaico de Ecología, Consejo Superior de Investigaciones Científicas (IPE-CSIC), 50059 Zaragoza, Spain

⁴ Laboratorio de Climatología y Servicios Climáticos (LCSC), CSIC-University of Zaragoza, 50059 Zaragoza, Spain

⁵ Department of Geography, Mansoura University, Mansoura 35516, Egypt

⁶ Geological and Geophysical Engineering Department, Faculty of Petroleum and Mining Engineering, Suez University, Suez 43518, Egypt

⁷ Advanced Telecommunications Solutions & Services (ATSS), Riyadh 12621, Saudi Arabia

* Correspondence: msalgamdy@pnu.edu.sa

Abstract

Environmental sustainability projects are essential for preserving natural resources and enhancing quality of life for present and future generations. This cross-sectional study examined Saudi residents' knowledge and awareness of green projects, attitudes and perceptions toward them, personal environmental behavior and participation, and perceptions of institutional and societal roles. A questionnaire was administered to 1044 participants from various regions across Saudi Arabia. Descriptive statistics, including means and standard deviations, together with the Mann–Whitney U test, Kruskal–Wallis H test, and Dunn's post hoc test, were used to answer the research questions and test the hypotheses. The findings indicated generally positive responses across the four dimensions; at the item level, most items fell within the agree range, while neutral ratings appeared mainly in items related to following green-project news, reviewing related policies, using low-emission transportation, and the perceived sufficiency of institutional communication. Significant differences were observed in the overall questionnaire and several dimensions according to gender, favoring females, and according to nationality, favoring Saudi participants. Regional differences were limited to the environmental behavior and personal participation dimension, whereas educational qualification did not produce significant differences. The absence of educational differences suggests that green-project awareness and behavior may be shaped not only by formal educational level, but also by national campaigns, media exposure, and shared public discourse. The study provides a countrywide empirical baseline for green-project awareness, attitudes, and environmental behaviors in Saudi Arabia and identifies areas for more targeted communication, regional engagement, and longitudinal research.



Academic Editor: Anna Mazzi

Received: 10 June 2026

Revised: 14 July 2026

Accepted: 15 July 2026

Published: 5 August 2026

Copyright: © 2026 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and

conditions of the [Creative Commons](https://creativecommons.org/licenses/by/4.0/)

[Attribution \(CC BY\)](https://creativecommons.org/licenses/by/4.0/) license.

Keywords: environmental sustainability; Saudi Arabia; green projects; environmental awareness; environmental attitudes; pro-environmental behavior; cross-sectional study

1. Introduction

Climate change is widely regarded as one of the most pressing global challenges, placing growing pressure on the international community because of its significant risks and both immediate and long-term consequences. Its effects endanger human life and jeopardize numerous fundamental rights, including the rights to health, a clean and safe environment, adequate food, security, and ultimately the right to life itself [1].

Indeed, the 20th century witnessed major advances in technology, industry, economy, trade, and military capabilities. At the same time, it experienced intense political conflicts and world wars. However, this rapid progress, along with disasters and crises, heavily drained the environment and posed real threats to the planet. This prompted the world to pause and reassess, especially as international pressure movements and civil society organizations began playing an influential role within and across nations [2].

Also, in the 21st century, environmental issues have intensified and become a critical concern for sustaining human civilization [3,4].

Human production and consumption place heavy pressure on ecosystems, while environmental risks have become globally interconnected, and recent warming is largely accelerated by human activity [3].

Humans are considered the active agents whose activities have a significant and direct impact on the environment, whether negatively or positively, which necessitates raising their environmental awareness [4].

Current environmental changes are largely attributed to how humans interact with the environment, which depends on their awareness and behaviors toward it. Environmental experts emphasize that environmental degradation and its related problems reflect human attitudes, perceptions, and practices toward the environment. Over recent decades, environmental issues have attracted global attention across all segments of society—not only specialists—regardless of living standards or educational and cultural levels. While environmental deterioration affects everyone, not all individuals seek to address or mitigate these problems, primarily due to differences in environmental awareness and its influence on behavior [4].

Climate change, environmental degradation, resource depletion, and waste generation have become central sustainability challenges because they affect human health, food security, quality of life, and long-term development. In this context, public awareness is not limited to knowledge of environmental concepts; it also includes attitudes toward sustainability initiatives, perceived institutional support, and everyday environmental behaviors. For green projects to achieve their intended social and environmental impact, residents need to understand their purpose, perceive them as relevant to daily life, and find accessible opportunities to participate in environmentally responsible practices [1–5].

Indeed, environmental issues have become a major societal concern in recent years, prompting consumers to recognize the environmental impact of their consumption and motivating them to make more environmentally conscious purchasing decisions [5].

Awareness is a foundation for personal growth and for shaping creative, educated, and socially responsible individuals. It also serves as an indicator of societal progress, guiding judgments about individual and collective behaviors based on personal responsibility. While crucial for individual success, awareness is even more vital at the community level to advance society and overcome challenges, and it is reflected in the actions of effective administrative and social leadership, both individual and institutional [2].

Indeed, environmental sustainability has become one of the defining policy concerns of the twenty-first century because environmental degradation, resource depletion, and climate-related risks increasingly affect economic security and social wellbeing. In the Brundtland Report, sustainable development was defined as development that meets

present needs without compromising the ability of future generations to meet their own needs, and the report linked this concept directly to poverty reduction, ecological limits, and long-term human welfare [6].

In the Saudi context, the sustainability agenda is closely tied to national transformation. Saudi Vision 2030 states that the Kingdom's vision is built around three themes—a vibrant society, a thriving economy, and an ambitious nation—and describes a desirable society as one that enjoys “a good life in a beautiful environment” [7]. This policy framing is important because it places environmental quality within a broader developmental model rather than treating it as a marginal technical issue.

The growing relevance of green projects in Saudi Arabia also stems from the pressure created by rapid urbanization, infrastructure expansion, and high resource consumption. In their analysis of Jeddah's sustainability performance, Hegazy et al. reported that the city faces high per capita carbon dioxide emissions, high energy consumption, and substantial waste generation, while at the same time pursuing renewable energy policies, mass transportation initiatives, and improved waste-management strategies [8]. These conditions make public awareness especially important, because residents' perceptions of such projects can affect their adoption, legitimacy, and long-term effectiveness.

The awareness dimension is not merely informational. It also relates to whether residents understand the practical significance of environmental action and whether they are willing to support or participate in environmentally responsible behavior. Khan, Haque, and Khan found that environmental awareness in Saudi Arabia can be strengthened through awareness activities, yet only 38% of respondents in their sample reported any environmental activity in the previous year, which points to a gap between general approval of environmental protection and active engagement [9].

1.1. Theoretical Framework

This study is anchored in three complementary perspectives: Sustainable Development Theory, Environmental Awareness Theory, and the Theory of Planned Behavior. Together, these perspectives explain why awareness matters, how it develops, and how it may translate into support for green projects.

First, Sustainable Development Theory provides the broadest conceptual foundation. The Brundtland Report not only defined sustainable development, but also explained it as a process of change in which resource exploitation, investment direction, technological development, and institutional change are aligned with present and future human needs [6]. This formulation is especially relevant to Saudi Arabia because green projects are not isolated interventions; rather, they are part of a wider transformation in how development is planned and justified.

Second, the literature indicates that the relationship between environmental awareness and pro-environmental behavior is neither direct nor simple, but rather influenced by a range of interacting factors. Kollmuss and Agyeman (2010) argue that pro-environmental behavior cannot be explained through a single model, as it lies at the intersection of knowledge, awareness, values, attitudes, emotions, and structural conditions [10]. This perspective is consistent with findings from several empirical studies that highlight a gap between individuals' recognition of the importance of environmental protection and their actual engagement in environmentally responsible behavior. Accordingly, awareness of environmental initiatives or green projects should not be viewed as merely a cognitive issue; it also involves individuals' perceptions of relevance, underlying values, and the practical factors that may facilitate or hinder the adoption of environmentally responsible actions.

Third, the Theory of Planned Behavior explains how awareness may shape behavior through attitudes, subjective norms, and perceived behavioral control. Ajzen described

attitude toward the behavior, subjective norm, and perceived behavioral control as the three conceptually independent determinants of intention, and he noted that stronger positive attitudes, stronger perceived social approval, and greater behavioral control should strengthen the intention to perform a behavior [11]. In the context of green projects, this means that residents are more likely to support environmentally responsible practices when they see such practices positively, believe that important others support them, and feel capable of acting accordingly.

These three perspectives therefore complement one another. Sustainable Development Theory explains the macro-level rationale for green transformation; Environmental Awareness Theory explains the complexity of awareness and action; and the Theory of Planned Behavior explains the pathway by which environmental awareness may become behavioral intention and, potentially, actual support for green projects.

1.2. Environmental Sustainability

Reports by the United Nations indicate that humanity is facing increasing environmental challenges, including natural resource depletion and environmental degradation—such as desertification, drought, land degradation, freshwater scarcity, and biodiversity loss—which collectively exacerbate global environmental crises. In addition, climate change is considered one of the greatest challenges of our time, as its adverse impacts undermine countries' ability to achieve sustainable development. This highlights the urgent need to adopt effective strategies to address these challenges and maintain ecological balance for present and future generations [12].

And the concept of environmental sustainability is closely linked to the broader framework of sustainable development. One of the most widely cited definitions was introduced in the report of the World Commission on Environment and Development, commonly known as the Brundtland Report, which defined sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs [6]. This definition highlights the importance of balancing economic development, environmental protection, and social wellbeing.

Environmental sustainability focuses on preserving natural ecosystems and ensuring that economic and social activities do not exceed the regenerative capacity of the environment. According to Sachs et al. (2022) sustainability in the current era requires strengthened global cooperation and a firm commitment to the core principles of the Sustainable Development Goals, including social inclusion, clean energy, responsible consumption, and equitable access to public services, as these elements are essential for addressing contemporary global challenges such as security crises, pandemics, and climate change [13]. These principles are reflected in international frameworks such as the United Nations Sustainable Development Goals (SDGs), particularly Goal 13 (Climate Action), Goal 14 (Life Below Water), and Goal 15 (Life on Land) [13].

The transition toward renewable energy is a central component of environmental sustainability. According to the International Energy Agency (IEA, 2023) [14], “renewables are set to contribute 80% of new power capacity to 2030,” reflecting the growing global reliance on clean energy sources. This shift is driven by the need to reduce emissions and address climate change, as evidenced by the rapid expansion of renewable energy capacity worldwide [14].

Another important aspect of environmental sustainability involves sustainable resource management. Unsustainable human activities can push Earth systems beyond safe limits, leading to irreversible environmental change. As noted by Rockström et al. (2009), “human activities have reached a level that could damage the systems that keep Earth in

the desirable Holocene state,” and crossing critical environmental thresholds may result in severe consequences for humanity [15].

Urban sustainability is increasingly recognized as a key component of sustainable development. UN-Habitat (2020) emphasizes that sustainable urbanization contributes to economic, social, and environmental value, while rapid urban expansion places growing pressure on resources, leading to environmental degradation and increased emissions [16].

Environmental sustainability is closely linked to the concept of the green economy, which aims to achieve economic development while reducing environmental risks and ecological degradation. UNEP (2011, p. 16) defines the green economy as one that enhances human wellbeing and social equity while minimizing environmental risks [17].

In conclusion, environmental sustainability represents a fundamental principle for achieving sustainable development and ensuring the long-term stability of natural and human systems. By promoting renewable energy, sustainable resource management, green economic practices, and environmentally responsible policies, societies can address environmental challenges while supporting economic and social progress.

1.3. Concept of Green Projects

Green projects can be understood as projects intentionally designed to reduce environmental harm, improve resource efficiency, and support longer-term sustainability outcomes. In practice, they may include renewable energy systems, green buildings, environmentally sensitive urban infrastructure, sustainable transport, and improved waste- or water-management systems.

In Jeddah, Hegazy et al. described sustainability-related efforts in terms of renewable-energy policies, urban mass transportation, waste management, and the need for stronger public engagement in sustainable urban planning [8].

This means that the success of green projects depends not only on engineering or funding, but also on public understanding. If residents do not understand the environmental value of a project or do not connect it to their own quality of life, support may remain superficial. This is precisely why awareness is an important analytical variable in the present study.

1.4. Green Projects in Saudi Arabia

Saudi Arabia has witnessed a significant transformation during the past decade toward adopting principles of environmental sustainability and the green economy. This shift is largely driven by global efforts to address climate change and reduce carbon emissions. Investment in green projects is considered one of the most important mechanisms through which countries achieve sustainable development, as such projects contribute to balancing economic growth with environmental protection and improving quality of life. In this context, Saudi Arabia has adopted several sustainability-oriented strategies under Vision 2030, aiming to diversify the economy away from oil and expand renewable energy while improving environmental performance [18].

Green projects generally refer to economic activities and development initiatives that rely on environmentally friendly technologies and aim to reduce environmental degradation, limit carbon emissions, and enhance the efficient use of natural resources. These projects include renewable energy development, sustainable infrastructure, natural resource management, and technological innovation in sectors such as energy, transportation, and water management [19]. Researchers emphasize that the transition toward a green economy requires integrated governmental policies, technological innovation, and investment in sustainable sectors [19].

The literature indicates that many countries are moving toward developing new energy policies based on renewable energy systems in order to achieve sustainability and reduce the impacts of climate change. In this context, the Kingdom of Saudi Arabia is committed to transitioning toward generating power from renewable energy sources and increasing their share by 2030 [18]. This trend is supported by evidence from Saudi Arabia's energy transition strategy, where large-scale investments in renewable energy and green hydrogen projects—such as the NEOM initiative—reflect the country's commitment to sustainability and technological innovation [18]. Furthermore, the Kingdom is actively shifting toward renewable energy sources to reduce dependence on hydrocarbons, supported by policy frameworks that emphasize environmental protection, innovation, and sustainable development [18].

Governmental and regulatory institutions also play a key role in supporting green projects by developing environmental and financial policies that encourage investment in sustainable sectors. Saudi Arabia is actively integrating climate change risks and sustainability goals into its financial regulatory frameworks through green finance mechanisms, aiming to align economic policies with environmental sustainability and support the transition toward a sustainable economy, where green finance plays a central role, as it directs financial instruments, policies, and markets toward achieving environmental sustainability and promoting inclusive economic growth. Furthermore, this integration is considered essential, as incorporating climate change risks and sustainability goals into Saudi Arabia's financial regulatory frameworks constitutes a critical element in achieving the objectives of Vision 2030 [20].

Green entrepreneurship is another important driver for environmental innovation and sustainable development. Research suggests that supportive institutional frameworks and governmental policies in Saudi Arabia encourage entrepreneurs to invest in environmentally friendly projects, which contributes to sustainable economic development and job creation [19].

Saudi Arabia is actively advancing sustainable urban development as part of its Vision 2030 strategy by promoting clean energy adoption, smart city technologies, and efficient resource management. These initiatives focus on reducing reliance on fossil fuels, enhancing energy and water efficiency, and improving the overall environmental quality of urban areas. In addition, sustainable urban planning efforts—such as green infrastructure, smart systems, and renewable energy integration—contribute to lowering emissions, optimizing resource use, and strengthening cities' resilience to environmental challenges [21].

Green finance plays a significant role in supporting sustainable development initiatives in Saudi Arabia, particularly through instruments such as green municipal bonds, which are used to finance environmentally sustainable projects including renewable energy and low-carbon infrastructure. These financial mechanisms also help attract ESG-oriented investors and mobilize capital toward sustainable urban development [21].

1.5. Examples of Green Projects in Saudi Arabia

One of the most prominent examples of green development in Saudi Arabia is the NEOM project, which represents one of the largest sustainable urban development initiatives in the world. Located in the northwest of the Kingdom, the NEOM project is envisioned as a future sustainable city that integrates a variety of advanced technologies, such as green hydrogen production facilities, solar-powered desalination systems, and urban air mobility solutions. Moreover, achieving net-zero carbon emissions relies on transitioning to renewable energy sources, which involves developing offshore wind farms and solar power generation plants [22].

A major component of NEOM is the project known as ‘The Line’, a linear city designed without cars or roads and built to operate with zero carbon emissions. The project relies on smart transportation systems and sustainable infrastructure to minimize environmental impacts while improving quality of life for residents [23].

Another significant green initiative is the Red Sea Project. The Red Sea Project (TRSP) is a development that extends over more than 28,000 square kilometers along the shores of the Red Sea and aims to become a sustainable luxury tourism destination on the Western coast of the Kingdom of Saudi Arabia. The destination includes the Al Wajh Lagoon, a pristine area covering 2081 square kilometers, comprising 92 islands that host ecologically valuable habitats such as coral reefs, seagrass, and mangroves, as well as species of global conservation importance. The Red Sea Development Company, responsible for implementing the project, has committed to achieving a net-positive impact on biodiversity while developing the site for sustainable tourism. This requires attaining conservation outcomes that exceed those achievable under a “business as usual” scenario for an undeveloped site [24].

The Green Riyadh Initiative represents a major urban sustainability project aimed at improving environmental conditions in the city. The initiative focuses on expanding green spaces by planting more than 7.5 million trees across Riyadh, which contributes to improving air quality, reducing urban temperatures, and enhancing overall quality of life [25].

Overall, green projects in Saudi Arabia demonstrate a strategic shift toward a more sustainable development model based on environmental protection, technological innovation, and investment in renewable energy. These initiatives contribute to achieving sustainable development goals while strengthening the Kingdom’s position in global sustainability efforts.

1.6. Previous Studies

Previous empirical work provides a useful basis for the present study, especially where it examines environmental awareness in Saudi Arabia or closely related green-development issues.

Ajzen’s framework shows that positive attitudes, favorable social norms, and perceived control work together in forming behavioral intention [11], which is useful for interpreting residents’ likely responses to green initiatives.

At the level of educational and behavioral theory, Kollmuss and Agyeman demonstrated that pro-environmental behavior is shaped by a complex interaction of knowledge, awareness, internal motivations, and external institutional conditions [10]. Although their article is not Saudi-specific, it provides a strong explanatory base for why awareness alone may not always generate action.

Khan et al. (2020) conducted a study to assess the level of environmental sustainability awareness in Saudi Arabia and to examine the role of extracurricular activities in enhancing such awareness [9]. A questionnaire was administered to students at Prince Sattam bin Abdulaziz University and several other Saudi universities, including items related to everyday environmental conservation practices. The data were analyzed using hypothesis testing and binary logistic regression. Although most respondents acknowledged the importance of environmental protection, differences emerged among respondent groups in terms of their beliefs and engagement in environmentally responsible behavior. The findings also indicate that awareness activities within universities can enhance environmental awareness; however, only 38% of respondents reported participating in any environmental activity during the previous year, highlighting a gap between general support for environmental protection and actual participation [9].

Almulhim & Abubakar (2021): This study focused on the circular economy as a strategy for achieving sustainable development and addressing pollution and resource scarcity [26]. It aimed to assess public awareness and attitudes in Saudi Arabia through a survey of 402 participants. The results showed low awareness of the concept but positive attitudes toward waste separation and reuse. It also found that awareness is linked to education level, while pro-environmental behavior is associated with age [26].

Almulhim (2022): This study focused on the importance of renewable energy as an alternative to conventional energy sources in addressing environmental challenges [27]. It aimed to assess public awareness and attitudes in Saudi Arabia through a survey of 310 participants. The results showed a moderate level of knowledge, with high awareness of pollution risks, but high costs were identified as a major barrier to adoption. The study recommends increasing awareness and supporting the use of renewable energy to achieve Saudi Vision 2030 goals [27].

Khayat et al. examined environmental sustainability awareness in Saudi society in relation to Vision 2030 and surveyed 1446 participants. In the discussion section, the authors stated that most participants believed sustainable environmental trends include maintaining water balance, restoring biodiversity, addressing desertification, and protecting agricultural systems [28]. This study is important because it shows that environmental awareness in the Saudi context is already linked by many respondents to a broad sustainability agenda rather than to a single issue such as pollution alone.

Hegazy et al. analyzed Jeddah's environmental sustainability performance and found high carbon emissions, high energy consumption, and major challenges in water and waste management, while also highlighting local efforts in renewable energy, mass transportation, and sustainability-oriented planning [8]. The same article also states that aligning Jeddah's environmental policies with Saudi Vision 2030 is an important step toward integrating sustainability into the wider development agenda [8]. This study is relevant because it frames green projects as part of a broader urban transformation, not as isolated interventions.

Almusalami (2024): This study examined sustainability awareness among university students in the UAE through a digital educational platform designed to introduce the 17 Sustainable Development Goals [29]. The results showed that 49% of participants had no prior knowledge of the SDGs, while using the platform increased awareness among 93% of them and encouraged 75% to participate in sustainability-related activities and events [29].

Ahmed et al. (2024): This study reviews renewable energy communities in terms of their concepts, scope, benefits, progress, and associated challenges, highlighting their role in supporting the transition from centralized energy systems to decentralized systems based on local renewable resources [30]. It emphasizes that these communities contribute to reducing costs, improving energy efficiency, enhancing local resilience and energy independence, and supporting the transition toward carbon neutrality. The study also stresses the importance of citizen participation, policymakers, and professionals in developing sustainable community-driven energy models, while offering recommendations to expand renewable energy communities and address regulatory, technical, and social challenges [30].

Hussain et al. (2025): This study examines how pollution contributes to environmental and climate degradation [31]. It highlights renewable energy adoption and green innovation as key approaches to reducing the negative effects of traditional energy practices. The findings indicate that environmental awareness promotes renewable energy adoption, which mediates the relationship between environmental awareness and perceptions of climate change severity. Green innovation further strengthens the link between environmental awareness and renewable energy adoption, emphasizing the role of organizational values and beliefs in advancing sustainability [31].

Druta (2025): This study examines public perceptions, participation, and barriers related to energy communities in Romania, based on an online survey of 118 respondents from different regions [32]. The findings indicate generally positive attitudes toward energy communities, especially regarding solar energy and environmental benefits; however, financing, institutional support, and regulatory complexity remain major challenges. The study also found differences among groups, as urban respondents, women, and those already involved in such initiatives perceived both benefits and barriers more strongly. The findings emphasize the need for clearer policies, targeted communication, and awareness and educational programs to enhance public participation in the development of renewable energy systems in Romania [32].

Tsiaras (2025): This study examines the social acceptance of renewable energy sources in the region of Epirus, Greece, focusing on citizens' attitudes toward photovoltaic and wind energy projects and the factors influencing these attitudes, such as education, age, access to information, and visual exposure to installations [33]. Based on a questionnaire administered to 320 participants from urban and rural areas, the findings show that urban residents are more accepting of renewable energy projects, while rural residents, especially those living near installations, are more skeptical due to esthetic concerns and perceived lack of fairness in decision-making procedures. The study also reveals that limited knowledge and misinformation affect acceptance levels, and that younger and more educated participants are more supportive and environmentally aware. The study emphasizes the importance of education, transparent communication, and inclusive place-based policies to strengthen community acceptance of renewable energy projects [33].

Ibrahim (2025): This study examines energy consumption patterns and public awareness in large-scale residential developments in Riyadh in light of sustainable urban planning requirements and Saudi Vision 2030 [34]. It shows that rapid urban expansion and high electricity consumption, particularly for air conditioning, place significant pressure on the environment and infrastructure, as Riyadh accounts for about 28% of total residential energy consumption in Saudi Arabia. The study also reveals a gap between residents' awareness of the importance of energy conservation and their actual practices, due to social habits and weak incentives. It recommends strengthening awareness campaigns, enforcing stricter building codes, implementing smart meters, and supporting community participation in adopting energy-efficient technologies and sustainable urban planning [34].

Benhacene and Hussien (2025): This study examines the impact of adopting renewable energy sources on achieving sustainable development in Saudi Arabia within the context of Vision 2030 [35]. It employed a quantitative approach using Partial Least Squares Structural Equation Modeling (PLS-SEM) and data collected from 180 experts in energy and sustainability. The results showed that hydropower and wind energy effectively contribute to the economic, environmental, and social dimensions of sustainable development, while solar energy did not show a clear statistically significant impact despite its great potential in the Kingdom. The study emphasizes the need to adopt a balanced and diversified renewable energy strategy that considers the advantages and limitations of each source to support sustainable transformation and achieve the goals of Saudi Vision 2030 [35].

1.7. Analytical Synthesis and Research Gap

Taken together, the verified literature points to three consistent patterns. First, sustainability in Saudi Arabia is increasingly positioned as an integral component of comprehensive national development rather than being limited to environmental concerns. This perspective is reflected in Saudi Vision 2030 and the National Transformation Program, which emphasize balanced growth, socio-economic development, and the transformation of the Kingdom toward a more sustainable and diversified future [36]. Second, public

awareness is recognized as necessary, but awareness does not automatically translate into participation or sustained behavior [9,10]. Third, residents' responses to environmental initiatives can be better understood when awareness is linked to attitudes, norms, and perceived control, as suggested by the Theory of Planned Behavior [11].

The main gap, therefore, is that much of the Saudi literature either studies environmental awareness in educational samples or addresses urban sustainability and green development from a policy or planning perspective. Fewer studies directly examine the awareness level of Saudi residents regarding green projects as a broad social phenomenon. The present study addresses that gap by focusing specifically on residents' awareness of green projects in Saudi Arabia and by interpreting that awareness through an integrated theoretical lens.

1.8. The Research Objectives

The research objectives were aimed to: (1) assess Saudi residents' knowledge and awareness of green projects; (2) assess their attitudes and perceptions toward green projects; (3) examine their reported environmental behavior and personal participation; (4) examine their perceptions of the role of institutions and society; and (5) test whether these dimensions differ according to gender, nationality, region of residence, and educational qualification.

2. Materials and Methods

The research used a cross-sectional survey design. This design is appropriate for establishing a descriptive baseline of awareness, attitudes, and self-reported environmental behaviors at one point in time, but it cannot determine causal relationships or track changes in public awareness over time.

The research instrument was prepared according to the following procedures:

1. The questionnaire items were initially generated using ChatGPT 5.5, a generative artificial intelligence tool. The prompt used was: "Write statements for a questionnaire on community awareness of green projects and classify them under specific dimensions." After the initial generation process, one of the researchers reviewed the items to verify their relevance to the research topic, their clarity, and their alignment with the proposed questionnaire dimensions.
2. The questionnaire was administered to a random pilot sample of 30 participants from the study population. The internal validity of each questionnaire item was assessed by calculating the correlation coefficient between the score of each item and the total score of the section to which it belongs. One item from the fourth section was deleted because its correlation coefficient was less than 0.30. The remaining items were retained, as their correlation coefficients were greater than 0.30.
3. The reliability of the overall questionnaire and its sub-sections was assessed using Cronbach's Alpha coefficient. Table 1 presents these results, in addition to showing the distribution of questionnaire items across its section before and after deletion.

Table 1. Cronbach's Alpha reliability coefficients of the questionnaire.

Section	The Number of Items Before Deletion	The Number of Items After Deletion	Cronbach's Alpha Reliability Coefficients
Overall questionnaire	51	40	0.92
The first section	10	10	0.807
The second section	11	11	0.874
The third section	10	10	0.88
The fourth section	10	9	0.918
The fifth section	10	0	-

It is clear from Table 1 that all reliability coefficients of the questionnaire are high, which enhances confidence in the instrument and makes it suitable for application.

To facilitate the interpretation of the results, the following procedure was used to determine the response level of community awareness of green projects as measured by the research instrument. Weights were assigned to the response alternatives as follows: agree = 3, sometimes = 2, and disagree = 1. The responses were then classified into three equal-range levels using the following equation:

$$\text{Class interval length} = (\text{Highest value} - \text{Lowest value}) \div \text{Number of response alternatives.}$$

Table 2 illustrates this classification.

Table 2. Classification of response levels in the community awareness of green projects questionnaire.

Mean Range	Level
1–1.66	disagree
1.67–2.33	neutral
2.34–3	agree

3. Results

Answering the Research Questions:

The first question states: “What is the level of knowledge and awareness of green projects?” To answer this question means and standard deviations were used; Table 3 below illustrates this:

Table 3. Means and standard deviations of the research sample’s responses on the section: “Knowledge and Awareness of Green Projects”.

Items	M	SD
1. I am familiar with the concept of green projects.	2.55	0.66
2. I can distinguish between a green project and a non-sustainable project.	2.31	0.78
3. Green projects aim to reduce the environmental impact of economic activities.	2.67	0.611
4. I follow news and initiatives related to green projects through media outlets.	2.14	0.775
5. I am aware of real examples of local or international green projects.	2.34	0.748
6. I know concepts such as renewable energy, recycling, and the circular economy.	2.65	0.601
7. I have previously reviewed policies or laws that support green projects.	2.08	0.81
8. I believe that green projects represent the future of the global economy.	2.72	0.548
9. I am aware of local government initiatives in the field of green projects.	2.45	0.741
10. I believe green projects are essential for the future of coming generations.	2.85	0.423

Note. M = mean; SD = standard deviation. These abbreviations are used consistently in the remaining descriptive tables.

As shown in Table 3, all items obtained means ranging between (2.08 and 2.85), and only (3) of these items obtained means within the range of (2.08–2.31), which is classified as (neutral), While the remaining items obtained means within the range (2.34–2.85) which is classified as (agree). This indicates that most of the items in the first section were achieved at an (agree) level.

The second question states: “What is the level of attitudes and perceptions toward green projects?” To answer this question, means and standard deviations were used; Table 4 below illustrates this:

As shown in Table 4, all items obtained means ranging between (2.46 and 2.87), which indicates that all of the items in the second section were achieved at an (agree) level.

The third question states: “What is the level of environmental behavior and personal participation related to green projects?” To answer this question, means and standard deviations were used; Table 5 below illustrates this:

Table 4. Means and standard deviations of the research sample’s responses on the section: “Attitudes and Perceptions Toward Green Projects”.

Items	M	SD
1. I believe that green projects are a necessity, not a luxury.	2.84	0.431
2. Transitioning to green projects should be a development priority.	2.82	0.419
3. I am willing to support green products and services even if they cost more.	2.46	0.659
4. I prefer dealing with companies that apply environmental sustainability principles.	2.67	0.538
5. Green projects contribute to improving quality of life and public health.	2.87	0.378
6. I believe investments in green projects are promising and safe in the long term.	2.79	0.462
7. I believe green projects are necessary to protect the environment.	2.87	0.386
8. I believe supporting environmentally friendly products is an individual responsibility.	2.5	0.694
9. I support enacting laws that require companies to follow green practices.	2.77	0.471
10. Green projects achieve economic as well as environmental benefits.	2.79	0.472
11. New projects should be required to use renewable energy.	2.75	0.481

Table 5. Means and standard deviations of the research sample’s responses on the section: “Environmental Behavior and Personal Participation”.

Items	M	SD
1. I make sure to rationalize the daily consumption of electricity and water.	2.85	0.389
2. I participate in environmental activities such as tree planting or recycling.	2.45	0.69
3. I choose products with recyclable packaging.	2.53	0.648
4. I use transportation methods that reduce emissions, such as walking or cycling.	2.23	0.777
5. I spread environmental awareness through social media or conversations.	2.46	0.703
6. I consider environmental aspects when making purchasing decisions.	2.49	0.675
7. I prefer products manufactured in environmentally friendly ways.	2.67	0.583
8. I encourage others to care for the environment and support green projects.	2.74	0.524
9. I sometimes share environmental content on social media.	2.38	0.748
10. I try to reduce the use of environmentally harmful products.	2.7	0.566

As shown in Table 5, all items obtained means ranging between (2.23 and 2.85), and only one of these items obtained mean equal = 2.23 which is classified as (neutral), while the remaining items obtained means within the range (2.38–2.85) which is classified as (agree). This indicates that most of the items in the third section were achieved at an (agree) level.

The fourth question states: “What is the level of awareness of the role of institutions and society toward green projects?” To answer this question, means and standard deviations were used; Table 6 below illustrates this:

Table 6. Means and standard deviations of the research sample’s responses on the section: “Role of Institutions and Society”.

Items	M	SD
1. Educational institutions provide sufficient content about the environment and green projects.	2.28	0.756
2. Government agencies present clear initiatives to support green projects.	2.54	0.635
3. The media plays an effective role in environmental awareness.	2.46	0.698
4. The private sector clearly participates in environmental initiatives.	2.31	0.68
5. Society encourages sustainable environmental practices.	2.46	0.688
6. Awareness campaigns on green projects are sufficiently available.	2.28	0.748
7. Media outlets contribute adequately to spreading environmental awareness.	2.42	0.695
8. I acquired my knowledge about green projects from social media.	2.43	0.72
9. I encourage integrating green project concepts into school curricula.	2.76	0.517

As shown in Table 6, all items obtained means ranging between (2.28 and 2.76), and (3) of these items obtained means within the range of (2.28–2.31), which is classified as (neutral), while the remaining items obtained means within the range (2.42–2.76) which is classified as (agree). This indicates that most of the items in the fourth section were achieved at an (agree) level.

3.1. Testing the Validity of the Research Hypotheses

3.1.1. Testing the First Hypothesis

To test the validity of the first research hypothesis, which stated as (H1: There are no statistically significant differences at the significance level of $\alpha \leq 0.05$ in the mean responses of the study participants to the questionnaire measuring Saudi residents' aware-ness of green environmental projects according to gender), means and standard deviations were calculated, and the Mann–Whitney U test was used. Tables 7 and 8 below present the results of the means and standard deviations and Mann–Whitney U test for the responses of the research sample on the questionnaire measuring the awareness of Saudi Arabia's residents about green environmental projects according to gender:

Table 7. Means and standard deviation of sample responses on the overall questionnaire and its sections according to gender.

Section	Variable Category	N	Mean	Standard Deviation
Overall questionnaire	Male	195	98.81	16.47
	Female	849	103.13	13.33
The first section	Male	195	24.35	4.95
	Female	849	24.86	4.37
The second section	Male	195	29.27	4.55
	Female	849	30.31	3.43
The third section	Male	195	24.54	5.26
	Female	849	25.7	4.42
The fourth section	Male	195	20.65	5.2
	Female	849	22.26	4.59

Table 8. The results of the Mann–Whitney U test of sample responses on the overall questionnaire and its sections according to gender.

Section	Gender	N	Mean Rank	Sum of Ranks	Mann–Whitney U	Asymp. Sig. (2-Tailed)
Overall questionnaire	male	195	460.78	89,852.5	70,742.5	0.002
	female	849	536.68	455,637.5		
The first section	male	195	505.64	98,599.5	79,489.5	0.384
	female	849	526.37	446,890.5		
The second section	male	195	477.33	93,080	73,970	0.018
	female	849	532.87	452,410		
The third section	male	195	474.95	92,615	73,505	0.013
	female	849	533.42	452,875		
The fourth section	male	195	447.16	87,196.5	68,086.5	0.000
	female	849	539.8	458,293.5		

Table 8 above shows that Mann–Whitney U values equal (70,742.5, 79,489.5, 73,970, 73,505, 68,086.5) on the overall questionnaire and its sections according to gender, and they

are significant for the overall questionnaire and three of its sections according to gender in favor of female, while not significant for the first section.

3.1.2. Testing the Second Hypothesis

To test the validity of the second research hypothesis, which stated as (H2: There are no statistically significant differences at the significance level of $\alpha \leq 0.05$ in the mean responses of the study participants to the questionnaire measuring Saudi residents' aware-ness of green environmental projects according to nationality), means and standard deviations were calculated, and the Mann–Whitney U test was used. Tables 9 and 10 below present the results of the means and standard deviations and the Mann–Whitney U test for the responses of the study sample on the questionnaire measuring the awareness of Saudi Arabia's residents about green environmental projects according to nationality:

Table 9. Means and standard deviation of sample responses on the overall questionnaire and its sections according to nationality.

Section	Variable Category	N	Mean	Standard Deviation
Overall questionnaire	Saudi	970	102.77	13.51
	Non-Saudi	74	96.45	19.11
The first section	Saudi	970	24.91	4.37
	Non-Saudi	74	22.91	5.54
The second section	Saudi	970	30.22	3.5
	Non-Saudi	74	28.76	5.42
The third section	Saudi	970	25.61	4.51
	Non-Saudi	74	23.86	5.57
The fourth section	Saudi	970	22.04	4.68
	Non-Saudi	74	20.92	5.42

Table 10. The results of the Mann–Whitney U test of sample responses on the overall questionnaire and its sections according to nationality.

Section	Nationality	N	Mean Rank	Sum of Ranks	Mann–Whitney U	Asymp. Sig. (2-Tailed)
Overall questionnaire	Saudi	970	529.27	513,392	29,323	0.009
	Non-Saudi	74	433.76	32,098		
The first section	Saudi	970	530.06	514,156	28,559	0.003
	Non-Saudi	74	423.43	31,334		
The second section	Saudi	970	527.76	511,922.5	30,792.5	0.037
	Non-Saudi	74	453.61	33,567.5		
The third section	Saudi	970	529.05	513,181.5	29,533.5	0.01
	Non-Saudi	74	436.6	32,308.5		
The fourth section	Saudi	970	526.43	510,635.5	32,079.5	0.123
	Non-Saudi	74	471.01	34,854.5		

Table 10 above shows that the Mann–Whitney U values equal (29,323, 28,559, 30,792.5, 29,533.5, 32,079.5) for the overall questionnaire and its sections according to nationality, and they are significant for the overall questionnaire and three of its sections according to nationality, in favor of Saudi, while not significant for the fourth section.

3.1.3. Testing the Third Hypothesis

To test the validity of the third research hypothesis, which stated as (H3: There are no statistically significant differences at the significance level of $\alpha \leq 0.05$ in the mean responses of the study participants to the questionnaire measuring Saudi residents' awareness of green environmental projects according to region of residence), means and standard deviations were calculated, and the Kruskal–Wallis H test was used. Tables 11 and 12 below present the results of the means and standard deviations and the Kruskal–Wallis H test for the responses of the study sample on the questionnaire measuring the awareness of Saudi Arabia's residents about green environmental projects according to region of residence:

Table 11. Means and standard deviation of sample responses on the overall questionnaire and its sections according to region of residence.

Section	Variable Category	N	Mean	Standard Deviation
Overall questionnaire	Eastern	132	102.67	13.01
	Western	259	103.22	13.95
	Central	473	101.92	13.72
	Northern	104	102.85	15.48
	Southern	76	100.41	16.25
The first section	Eastern	132	24.39	4.19
	Western	259	24.91	4.63
	Central	473	24.8	4.41
	Northern	104	24.9	4.54
	Southern	76	24.51	4.95
The second section	Eastern	132	29.84	3.7
	Western	259	30.54	3.61
	Central	473	30.04	3.57
	Northern	104	30.1	3.85
	Southern	76	29.71	4.27
The third section	Eastern	132	25.65	4.23
	Western	259	26	4.41
	Central	473	25.09	4.68
	Northern	104	25.81	5.01
	Southern	76	25.45	4.78
The fourth section	Eastern	132	22.8	3.99
	Western	259	21.78	4.8
	Central	473	22	4.65
	Northern	104	22.04	5.01
	Southern	76	20.74	5.71

Table 12. The results of the Kruskal–Wallis H test of sample responses on the overall questionnaire and its sections according to region of residence.

Section	The Region of Residence	N	Mean Rank	Kruskal–Wallis H	df	Asymp. Sig.
Overall questionnaire	Eastern	132	522.64	3.371	4	0.498
	Western	259	543.75			
	Central	473	510.1			
	Northern	104	546.08			
	Southern	76	494.79			

Table 12. *Cont.*

Section	The Region of Residence	N	Mean Rank	Kruskal–Wallis H	df	Asymp. Sig.
The first section	Eastern	132	485	2.987	4	0.56
	Western	259	538.43			
	Central	473	522.54			
	Northern	104	534.51			
	Southern	76	516.64			
The second section	Eastern	132	500.1	7.588	4	0.108
	Western	259	564.49			
	Central	473	506.84			
	Northern	104	528.14			
	Southern	76	508.07			
The third section	Eastern	132	523.13	9.955	4	0.041
	Western	259	557.3			
	Central	473	493.63			
	Northern	104	563.4			
	Southern	76	526.51			
The fourth section	Eastern	132	563.58	5.304	4	0.258
	Western	259	514.36			
	Central	473	521.10			
	Northern	104	535.54			
	Southern	76	469.72			

Table 12 above shows that the Kruskal–Wallis H values equal (3.371, 2.987, 7.588, 9.955, 5.304) on the overall questionnaire and its sections according to region of residence, and they are not significant for the overall questionnaire and three of its sections according to region of residence, while significant for the third section.

The results of the Kruskal–Wallis test indicated that there were statistically significant differences in the mean ranks of participants' responses in the third section according to their region of residence. To identify the direction of these differences, Dunn's post hoc test with Bonferroni correction was applied; see Table 13:

Table 13. The results of the Bonferroni-adjusted pairwise comparisons following the Kruskal–Wallis test according to region of residence.

Comparison	Rank Difference (Rdiff)	Z	p-Value	Bonferroni p	Significance
Eastern vs. Western	34.17	1.40	0.161	1.000	Not significant
Eastern vs. Central	29.50	1.57	0.116	1.000	Not significant
Eastern vs. Northern	40.27	1.59	0.111	1.000	Not significant
Eastern vs. Southern	3.38	0.13	0.890	1.000	Not significant
Western vs. Central	63.67	3.72	0.0002	0.002	Significant
Western vs. Northern	6.10	0.24	0.807	1.000	Not significant
Western vs. Southern	30.79	1.12	0.263	1.000	Not significant
Central vs. Northern	69.77	2.80	0.005	0.050	Significant
Central vs. Southern	32.88	1.21	0.225	1.000	Not significant
Northern vs. Southern	36.89	1.50	0.133	1.000	Not significant

Table 13 above shows there is statistically significant difference between the Western region and the Central region, in favor of the Western region. Additionally, there is a statistically significant difference observed between the Northern region and the Central

region in favor of the Northern region. Meanwhile all other pairwise comparisons between regions did not show statistically significant differences.

3.1.4. Testing the Fourth Hypothesis

To test the validity of the fourth research hypothesis, which stated as (H4: There are no statistically significant differences at the significance level of $\alpha \leq 0.05$ in the mean responses of the study participants to the questionnaire measuring Saudi residents' aware-ness of green environmental projects according to educational qualification), means and standard deviations were calculated, and the Kruskal–Wallis H test was used. Tables 14 and 15 below present the results of the means and standard deviations the Kruskal–Wallis H test for the responses of the study sample on the questionnaire measuring the awareness of Saudi Arabia's residents about green environmental projects according to educational qualification:

Table 14. Means and standard deviation of sample responses on the overall questionnaire and its sections according to educational qualification.

Section	Variable Category	N	Mean	Standard Deviation
Overall questionnaire	High school and below	61	102.25	16.31
	Post-secondary (non-bachelor)	100	103.4	16.74
	Bachelor's degree and above	883	102.2	13.57
The first section	High school and below	61	24.56	4.61
	Post-secondary (non-bachelor)	100	24.98	4.97
	Bachelor's degree and above	883	24.75	4.43
The second section	High school and below	61	29.36	4.601
	Post-secondary (non-bachelor)	100	30.3	3.89
	Bachelor's degree and above	883	30.15	3.59
The third section	High school and below	61	26.33	4.38
	Post-secondary (non-bachelor)	100	25.87	5.01
	Bachelor's degree and above	883	25.38	4.57
The fourth section	High school and below	61	22	4.81
	Post-secondary (non-bachelor)	100	22.25	5.25
	Bachelor's degree and above	883	21.92	4.69

Table 15. The results of the Kruskal–Wallis H test of sample responses on the overall questionnaire and its sections according to the educational qualification.

Section	Educational Qualification	N	Mean Rank	Kruskal–Wallis H	df	Asymp. Sig.
Overall questionnaire	High school and below	61	536.75	3.54	2	0.17
	Post-secondary (non-bachelor)	100	574.25			
	Bachelor's degree and above	883	515.66			
The first section	High school and below	61	509.22	1.2	2	0.55
	Post-secondary (non-bachelor)	100	552.77			
	Bachelor's degree and above	883	519.99			
The second section	High school and below	61	471.74	2.61	2	0.27
	Post-secondary (non-bachelor)	100	548.76			
	Bachelor's degree and above	883	523.03			
The third section	High school and below	61	580.08	5.06	2	0.08
	Post-secondary (non-bachelor)	100	564.73			
	Bachelor's degree and above	883	513.74			
The fourth section	High school and below	61	527.97	1.64	2	0.44
	Post-secondary (non-bachelor)	100	558.03			
	Bachelor's degree and above	883	518.1			

Table 15 above shows that the Kruskal–Wallis H values equal (3.54, 1.2, 2.61, 5.06, 1.64) for the overall questionnaire and its sections according to educational qualification, and they are not significant for the overall questionnaire and all of its sections according to educational qualification.

4. Discussion

According to the first question which stated “What is the level of knowledge and awareness of green projects?”, the results showed that most of the items in the first section were achieved at an (agree) level.

These results align with findings from several environmental awareness studies, which consistently report that communities tend to show moderate to high levels of general environmental awareness, especially when exposed to national sustainability campaigns or governmental initiatives. Similar conclusions were reached by previous studies.

Arshad et al. (2021) found that university students possess high levels of environmental awareness [37]. Additionally, Kollmuss and Agyeman concluded that respondents were ‘Very Aware’ in environmental concepts and the state of the environment [10]. Additionally, Cvetković et al.’s 2024 study revealed that the majority of students in a sample had good environmental awareness and knowledge, as evidenced by the high mean scores of the environmental awareness variables and the widespread agreement among students on key statements related to their understanding of environmental issues [38].

Also, according to the second question, which states: “What is the level of attitudes and perceptions toward green projects?”, the results indicated that all of the items in the second section were achieved at an (agree) level.

This pattern suggests that participants expressed positive attitudes and favorable perceptions toward green projects overall. The consistency of the results across all items, with none falling into the neutral or disagree ranges, demonstrates a generally strong acceptance and supportive orientation toward the concept of green projects.

Such results imply that the respondents not only acknowledge the importance of green initiatives but also hold positive beliefs about their benefits, environmental value, and societal impact. The uniformly positive responses across all items highlight a collective

consensus within the sample, reflecting a positive mindset and readiness to support or engage with green projects.

The consistently high means can be interpreted as reflecting a growing environmental consciousness among individuals, suggesting that respondents are aware of the long-term benefits of sustainable initiatives and perceive green projects as essential for environmental protection and resource conservation. Also, the agreement level across all items indicates that green projects enjoy broad social acceptance, highlighting a readiness among participants to support or participate in such initiatives. This aligns with global trends where public awareness campaigns, governmental initiatives, and educational programs increase favorable attitudes toward sustainability. In addition, in contexts such as the Kingdom of Saudi Arabia, the result may also reflect the influence of national programs like the Saudi Green Initiative and Vision 2030, which emphasize afforestation, clean energy, and environmental stewardship—thereby shaping public attitudes positively.

Many studies have supported this finding, such as Chin et al. (2019), who found a generally positive approach towards environmental protection [39]. Also, Bozdogan et al. (2016) confirm that students exhibit favorable perceptions and attitudes toward environmental protection [40]. The findings of Naquin et al. (2011) strongly support positive environmental attitudes among students [41].

In addition, according to the third question, which states: “What is the level of environmental behavior and personal participation related to green projects?”, the results indicated that most of the items in the third section were achieved at an (agree) level.

The predominance of agreement across the items indicates that respondents are not only aware of environmental issues but are also translating this awareness into actual pro-environmental practices. Their agreement with most behavioral statements reflects a supportive orientation toward green initiatives and a readiness to participate in environmentally responsible activities.

The presence of one neutral item may point to an action that participants either engage in less frequently, find more challenging to practice, or perceive as requiring additional resources or support. Nevertheless, the overall trends confirm that the sample exhibits favorable environmental behavior and a positive level of personal participation in green projects.

These results imply that participants are moving beyond passive awareness to adopt active environmental behaviors, such as conserving resources, reducing waste, supporting green initiatives, or participating in eco-friendly activities. High agreement levels reflect an encouraging behavioral orientation that aligns with global trends showing increasing public engagement in sustainability efforts when awareness and attitudes are already positive.

The findings of the present study are consistent with previous empirical research, such as that of Bozdogan et al., who demonstrated that students actively engaged in pro-environmental behaviors such as “turning off unnecessary lights” and preferring environmentally friendly materials like glass [40]. Similarly, Naquin et al. reported that 97% of students expressed a desire to keep their environment clean, 88% regularly thought about environmental issues, and many practiced conservation behaviors such as turning off water while brushing their teeth [41]. These findings collectively reinforce that participants tend to exhibit favorable environmental behaviors and meaningful personal participation in environmental protection efforts.

Also, according to the fourth question, which states: “What is the level of awareness of the role of institutions and society toward green projects?”, the results indicated that most of the items in the fourth section were achieved at an (agree) level.

Overall, the predominance of “agree” responses indicates that respondents recognize the importance of institutional support, policies, societal engagement, and community participation in advancing green initiatives. The fact that only a few items were rated as neutral may suggest areas where the public feels less informed or where institutional roles are less visible or not clearly communicated.

These results highlight an encouraging level of public awareness regarding the shared responsibility of governmental bodies, private institutions, and society in promoting environmentally sustainable projects. The respondents appear to understand that effective green initiatives require institutional frameworks, community involvement, and societal cooperation.

The presence of three neutral items may indicate gaps in public communication or insufficient visibility of certain governmental or organizational efforts. This suggests that while general awareness is positive, there remains room for enhancing public understanding of specific institutional roles—such as regulation, funding, policy enforcement, or community outreach.

The overall results of the study indicate that awareness of the role of institutions and society in supporting green projects is generally high among the respondents, and this conclusion is strongly reinforced by prior empirical research. Cvetković et al. found that a substantial proportion of individuals are aware of the institutions responsible for environmental protection, demonstrating a solid understanding of institutional duties. Their findings also highlighted the importance of law enforcement, inspection systems, and community participation—factors that align closely with the items that received high agreement in the present study [38].

Similarly, Elmosaad et al. showed that community awareness programs strengthen environmental concern and positively shape public perceptions, supporting the idea that institutional actions directly influence societal awareness [42]. In parallel, Kollmuss and Agyeman reported that students recognize the influential roles of media, community organizations, and government programs in environmental protection, indicating a broad societal awareness of shared environmental responsibilities [10].

Taken together, these studies consistently affirm that institutional and societal awareness regarding environmental initiatives is strong, while also explaining why a few areas may show lower clarity—mirroring the neutral responses observed in this study.

Also, according to the first research hypothesis, the results shown were significant for the overall questionnaire and three of its sections according to gender in favor of female, while not significant for the first section.

This result aligns with several studies showing that women generally demonstrate stronger pro-environmental attitudes. Gökmen (2021) found that females show higher environmental sensitivity [43], and Li et al. (2022) reported greater environmental concern among women [44]. Similarly, Mandarić (2024) highlighted women’s stronger support for environmental behaviors and policies [45], and Alwakid et al. (2021) showed that female students have a higher environmental care attitude than the male students [19]. Conversely, other studies found higher awareness among males, such as Khayat (2023) [28]. These results can be interpreted as demonstrating that gender’s influence on environmental awareness is context-dependent, varying according to the measured dimension, cultural environment, and exposure to environmental information. Females often show higher emotional and cognitive engagement with environmental issues, while in some contexts both genders may perform similarly or males may show higher awareness depending on social and educational factors.

In addition, according to the second research hypothesis, the results shown were significant for the overall questionnaire and three of its sections according to nationality in favor of Saudi, while not significant for the fourth section.

A significant difference was found in several questionnaire sections according to nationality, in favor of Saudi participants, indicating that Saudi citizens possess higher levels of environmental awareness and pro-environmental attitudes. This finding aligns with previous research, such as Khan et al. (2020), which found a statistically significant difference between Saudis and expatriates in one pro-environmental behavior in favor of Saudis [9], and Khayat (2023), which indicated clear differences in the level of environmental awareness according to nationality, where the data showed that Saudi citizens possess higher levels of environmental awareness compared to non-Saudis [28]. Conversely, the section “Role of Institutions and Society” showed no statistically significant differences between Saudis and non-Saudis, reflecting a similar perception among both groups regarding the contribution of institutions and society to environmental sustainability. This is consistent with Mazhenova (2016) which showed that there were no significant differences among respondents when the attitude to environmentally friendly products was discussed [46].

Additionally, the findings of the Elamin (2025) study showed that nationality does not significantly influence the average level of SDG knowledge [47]. Collectively, these results suggest that national sustainability efforts have succeeded in elevating environmental awareness across the broader population, while some nationality-related differences remain in sections more closely associated with local policies and Vision 2030 initiatives.

Also, according to the third research hypothesis, the results shown were not significant for the overall questionnaire and three of its sections according to region of residence, while significant for the third section.

The results of the Kruskal–Wallis test indicated that there were statistically significant differences in the mean ranks of participants’ responses on the third section according to their region of residence. And Dunn’s post hoc test with Bonferroni correction showed there is a statistically significant difference between the Western region and the Central region, in favor of the Western region. Additionally, there is a statistically significant difference observed between the Northern region and the Central region in favor of the Northern region, while all other pairwise comparisons between regions did not show statistically significant differences.

This means that environmental awareness, knowledge, and perceptions of institutional and societal roles did not differ meaningfully between residents of different regions, suggesting a relatively uniform distribution of these dimensions across the Kingdom. However, the test showed a statistically significant difference in the third section, “Environmental Behavior and Personal Participation.” This indicates that while participants across regions share similar levels of environmental awareness, their actual environmental behaviors and personal engagement vary according to region. Such variation may reflect differences in local environmental initiatives, availability of recycling or waste-management infrastructure, community engagement programs, or regional opportunities that facilitate environmental participation.

Several previous studies have examined whether geographic region influences environmental awareness, and their findings provide mixed but insightful evidence. Khayat (2023) reported no significant regional differences in environmental awareness across the five major regions of Saudi Arabia, suggesting a relatively uniform national understanding shaped by centralized environmental initiatives [28]. Similarly, Chalastani et al. (2020) found no meaningful variation in environmental awareness across five rural regions in Serbia, indicating that geographic location had little impact on environmental consciousness [24]. Elmosaad et al. (2025) also observed that place of residence within Al-Ahsa, Saudi

Arabia, was not significantly associated with environmental perceptions, further supporting the view that awareness levels can remain consistent across localities [42]. In contrast, Garcia and Luansing (2016) found that residence (urban vs. rural) significantly influenced environmental awareness among college students in the Philippines, demonstrating that geographic context may affect awareness in certain settings [48]. Collectively, these studies show that while environmental awareness is often stable across regions—especially where national programs are strong—geographic differences may emerge in contexts where local environmental conditions or educational exposures vary.

The results revealed statistically significant regional differences in the dimension of environmental behavior and personal participation. This finding may be interpreted in light of regional variation across Saudi Arabia in the visibility of environmental initiatives, access to green infrastructure, and availability of local environmental activities. Although national sustainability initiatives operate within the framework of the Saudi Green Initiative, which includes programs aimed at reducing emissions, promoting afforestation, restoring land, and protecting terrestrial and marine ecosystems [49,50], residents' everyday opportunities to engage in environmental practices may vary by city or region. For example, Green Riyadh stands out as one of the major projects aimed at promoting large-scale urban greening and improving the quality of public spaces in the capital [51] whereas Red Sea Global projects emphasize regenerative tourism and environmental conservation along the Western coast [52]. In addition, the development of waste-management systems and recycling infrastructure through national institutions concerned with this sector may contribute to differences in the availability of environmental practices across regions [53]. Accordingly, regional differences in environmental behavior and personal participation do not necessarily reflect differences in awareness alone; they may also be associated with variation in the practical opportunities available to residents, the visibility of environmental projects in their local surroundings, and the ease of participating in activities such as recycling, tree planting, low-emission mobility, and local environmental campaigns.

Also, according to the fourth research hypothesis, the results shown were not significant for the overall questionnaire and all of its sections according to educational qualification. This means that participants with different educational levels did not differ meaningfully in their environmental awareness, knowledge, perceptions of institutional and societal roles, or environmental behavior. The absence of significant differences suggests that environmental awareness and pro-environmental attitudes are broadly distributed across all educational groups, and that higher formal education does not necessarily translate into higher levels of environmental consciousness in this sample. This pattern may reflect the impact of nationwide environmental campaigns, social media outreach, and public environmental initiatives that reach all members of society regardless of educational background. It also suggests that environmental issues have become part of the general public discourse, enabling individuals across educational categories to access similar levels of environmental information and develop comparable attitudes toward sustainability.

This outcome aligns closely with previous peer-reviewed studies showing that environmental awareness is often evenly distributed across demographic groups, especially in contexts where national campaigns and public initiatives play a strong role. For example, Chalastani et al. (2020) found no significant variations in environmental awareness among rural populations based on sociodemographic characteristics, suggesting that environmental knowledge may be shaped more by collective exposure to national information channels than by individual educational attainment [24]. In contrast Elmosaad et al. (2025) demonstrate that educational level plays a meaningful and statistically significant role in shaping both environmental awareness and environmental perception in the Al-Ahsa

community [42]; this contrasted with any assumption that education is not related to environmental perception.

In general, there is inconsistency in previous research findings regarding the effect of educational qualification on environmental awareness.

The results showed no statistically significant differences attributable to educational qualification. This finding may be interpreted in light of the educational and policy context in Saudi Arabia. Sustainability has become increasingly present in both educational and national discourse through its connection to human development, environmental and natural resource conservation, and quality-of-life improvement within the broader directions of national development [54]. Educational institutions and national initiatives also promote environmentally friendly practices, such as energy conservation, reduced paper use, and the adoption of smart buildings and sustainable institutional practices [55]. Green-project awareness therefore appears to no longer be limited to formal education or academic courses alone. Rather, it has become part of a broader national discourse associated with Saudi Vision 2030 and the Saudi Green Initiative, reaching individuals through media outlets, digital platforms, public campaigns, and community initiatives [49]. This wide dissemination may contribute to reducing differences among individuals according to educational qualification, as residents may be exposed to sustainability-related messages and green-project content through multiple sources beyond formal education.

5. Conclusions

This research provides a countrywide empirical baseline on Saudi residents' knowledge and awareness of green projects, attitudes and perceptions toward them, self-reported environmental behaviors, and perceptions of institutional and societal roles. The findings suggest four core patterns. First, residents generally expressed positive awareness and supportive attitudes toward green projects, indicating broad social acceptance of sustainability-oriented transformation. Second, the behavioral dimension was positive overall but included more variability than the attitudinal dimension, reinforcing the theoretical point that awareness and positive attitudes do not automatically translate into uniform environmental practice. Third, demographic differences were concentrated mainly by gender and nationality, while educational qualification did not differentiate responses significantly. Fourth, regional differences appeared only in the behavior and personal participation dimension, suggesting that practical environmental action may depend more strongly on local visibility of green projects, infrastructure, and opportunities for participation than on general awareness alone.

The research therefore responds to the gap identified in the literature by moving beyond single-city, student-focused, or policy-level discussions and offering an empirical assessment of green-project awareness and related attitudes and behaviors among residents across several Saudi regions. Theoretically, the study contributes by integrating Sustainable Development Theory, Environmental Awareness Theory, and the Theory of Planned Behavior to clarify that green-project engagement is multidimensional: it includes cognitive awareness, evaluative attitudes, behavioral participation, and perceptions of social and institutional support.

The conclusions should be interpreted in light of important limitations. The cross-sectional design does not reveal changes over time and does not establish causality. In addition, the sample distribution was not fully balanced across gender, nationality, and educational qualification, which may limit generalizability. Finally, the behavioral results are based on self-reported practices and should be complemented in future studies with longitudinal designs, geospatial indicators of green infrastructure, and explanatory models

such as structural equation modeling to test the pathways from awareness to attitudes, intention, perceived control, and behavior.

5.1. Recommendations

- Strengthen public awareness programs on green projects.
- Provide targeted communication for groups with lower awareness levels.
- Encourage community participation in environmental activities.
- Enhance institutional communication and visibility about their environmental roles.
- Integrate sustainability and green project topics into school and university curricula.
- Offer training programs for professionals working in environmental institutions.

5.2. Future Research Directions

- Investigate the reasons behind neutral awareness items, especially regarding institutional roles.
- Conduct comparative studies across regions or countries.
- Use causal models (e.g., TPB, SEM) to examine predictors of environmental behavior.
- Explore how educational institutions influence awareness and engagement.
- Assess the impact of national initiatives such as the Saudi Green Initiative.
- Conduct longitudinal studies to track changes in awareness and behavior over time.

Author Contributions: Conceptualization, A.M.A.-H.; methodology, A.M.A.-H., A.A., S.N.A., A.M.E.K., Y.M.Y. and I.M.G.; software, M.S.A.; formal analysis, M.S.A.; investigation, M.S.A., A.A., S.N.A., A.M.E.K., Y.M.Y. and I.M.G.; data curation, M.S.A. and Y.M.Y.; writing—original draft, A.M.A.-H.; writing—review and editing, A.A., S.N.A., A.M.E.K., Y.M.Y. and I.M.G.; supervision, A.M.E.K. All authors have read and agreed to the published version of the manuscript.

Funding: The authors extend their appreciation to the Deanship of Scientific Research and Libraries in Princess Nourah bint Abdulrahman University for funding this research work through the Research Group project, Grant No. (RG-2025-25).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Princess Nourah bint Abdulrahman University (protocol code HAP-01-R-059 and 28 April 2025 date of approval).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author due to privacy and ethical restrictions.

Acknowledgments: During the preparation of this manuscript, the authors used ChatGPT (GPT-5.5; OpenAI, San Francisco, CA, USA) to assist in developing the study instrument, drafting selected paragraphs and parts of the literature review, and translating certain sections of the manuscript. All AI-assisted content was critically reviewed, verified, and revised by the authors to ensure its accuracy, relevance, and consistency with the study. The authors take full responsibility for the final content of the manuscript.

Conflicts of Interest: Author Islam M. Gaber was employed by the company Advanced Telecommunications Solutions & Services (ATSS). The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Litim, N. Climate Change: The Causes, the Future Repercussions and the Adaptation Mechanisms. *J. Leg. Stud.* **2022**, *9*, 347–390.
2. Abdel-Baset, S.A.A. Community Awareness towards the Transition to a Green Economy in the Face of Environmental Challenges: A Field Study. *Egypt. J. Soc. Behav. Sci.* **2023**, *7*, 148–197.
3. Heurtebise, J. Sustainability and Ecological Civilization in the Age of Anthropocene: An Epistemological Analysis of the Psychosocial and “Culturalist” Interpretations of Global Environmental Risks. *Sustainability* **2017**, *9*, 1331. [\[CrossRef\]](#)
4. Al-Mahdawi, N.M. Household waste in central Tripoli: The level of awareness of its impacts and methods of dealing with it. *Al-Qal’ah J.* **2017**, *8*, 630–653.
5. Tan, C.N.L.; Ojo, A.O.; Thuramy, R. Determinants of green product buying decision among young consumer in Malaysia. *Young Consum.* **2019**, *20*, 121–137. [\[CrossRef\]](#)
6. United Nations. Report of the World Commission on Environment and Development: Our Common Future. 1987. Available online: <https://www.brundtland.co.za/wp-content/uploads/2022/08/Brundtland-Report-1987-Our-Common-Future.pdf> (accessed on 1 June 2026).
7. Council of Economic and Development Affairs Saudi Arabia’s Vision 2030. Kingdom of Saudi Arabia. 2016. Available online: https://www.vision2030.gov.sa/media/rc0b5oy1/saudi_vision203.pdf (accessed on 1 June 2026).
8. Hegazy, I.R.; Hammad, H.A.; Munshi, A.M.; Alqurashi, A.A.; Bahreldin, I.Z. Pathways to green urbanism: Evaluating Jeddah’s environmental sustainability progress and prospects. *Int. J. Low-Carbon Technol.* **2024**, *19*, 1177–1188. [\[CrossRef\]](#)
9. Khan, U.; Haque, M.I.; Khan, A.M. Environmental Sustainability Awareness in the Kingdom of Saudi Arabia. *J. Asian Financ. Econ. Bus.* **2020**, *7*, 687–695. [\[CrossRef\]](#)
10. Kollmuss, A.; Agyeman, J. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ. Educ. Res.* **2010**, *8*, 239–260. [\[CrossRef\]](#)
11. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Processes* **1991**, *50*, 179–211. [\[CrossRef\]](#)
12. United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development. 2015. Available online: <https://sdgs.un.org/2030agenda> (accessed on 1 June 2026).
13. Sachs, J.D.; Lafortune, G.; Kroll, C.; Fuller, G.; Woelm, F. *From Crisis to Sustainable Development: The SDGs as Roadmap to 2030 and Beyond: Sustainable Development Report 2022*; Cambridge University Press: Cambridge, UK, 2022. [\[CrossRef\]](#)
14. International Energy Agency. *World Energy Outlook*; International Energy Agency: Paris, France, 2023.
15. Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin, F.S., III; Lambin, E.F.; Lenton, T.M.; Scheffer, M.; Folke, C.; Schellnhuber, H.J.; et al. A safe operating space for humanity. *Nature* **2009**, *461*, 472–475. [\[CrossRef\]](#) [\[PubMed\]](#)
16. United Nations Human Settlements Programme. *World Cities Report 2020: The Value of Sustainable Urbanization*; United Nations Human Settlements Programme (UN-Habitat): Nairobi, Kenya, 2020.
17. United Nations Environment Programme. *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*; United Nations Environment Programme: Nairobi, Kenya, 2011.
18. Islam, M.T.; Ali, A. Sustainable green energy transition in Saudi Arabia: Characterizing policy framework, interrelations and future research directions. *Next Energy* **2024**, *5*, 100161. [\[CrossRef\]](#)
19. Alwakid, W.; Aparicio, S.; Urbano, D. The Influence of Green Entrepreneurship on Sustainable Development in Saudi Arabia: The Role of Formal Institutions. *Int. J. Environ. Res. Public Health* **2021**, *18*, 5433. [\[CrossRef\]](#) [\[PubMed\]](#)
20. Alhejaili, M.O. Integrating Climate Change Risks and Sustainability Goals into Saudi Arabia’s Financial Regulation: Pathways to Green Finance. *Sustainability* **2024**, *16*, 4159. [\[CrossRef\]](#)
21. Alhowaish, A.K. Green Municipal Bonds and Sustainable Urbanism in Saudi Arabian Cities: Toward a Conceptual Framework. *Sustainability* **2025**, *17*, 3950. [\[CrossRef\]](#)
22. Yusuf, N.; Abdulmohsen, D. Saudi Arabia’s NEOM Project as a Testing Ground for Economically Feasible Planned Cities: Case Study. *Sustainability* **2023**, *15*, 608. [\[CrossRef\]](#)
23. Alwafi, A.A.M. Climate change as an influential factor in designing future cities (case study the NEOM Project “The line city” in Saudi Arabia). *J. Umm AL-Qura Univ. Eng. Archit.* **2025**, *16*, 237–251. [\[CrossRef\]](#)
24. Chalastani, V.I.; Manetos, P.; Al-Suwailem, A.M.; Hale, J.A.; Vijayan, A.P.; Pagano, J.; Williamson, I.; Henshaw, S.D.; Albaset, R.; Butt, F.; et al. Reconciling Tourism Development and Conservation Outcomes Through Marine Spatial Planning for a Saudi Giga-Project in the Red Sea (The Red Sea Project, Vision 2030). *Front. Mar. Sci.* **2020**, *7*, 168. [\[CrossRef\]](#)
25. Green Riyadh Project. Available online: <https://www.vision2030.gov.sa/en/explore/projects/green-riyadh> (accessed on 1 May 2026).
26. Almulhim, A.I.; Abubakar, I.R. Understanding Public Environmental Awareness and Attitudes toward Circular Economy Transition in Saudi Arabia. *Sustainability* **2021**, *13*, 10157. [\[CrossRef\]](#)
27. Almulhim, A.I. Understanding public awareness and attitudes toward renewable energy resources in Saudi Arabia. *Renew. Energy* **2022**, *192*, 572–582. [\[CrossRef\]](#)

28. Khayat, R.O.; Felemban, D.N.; Altowairqi, T.K.; Aljahdali, M.O. “Measurement of Saudi Society Environmental Awareness in Relation to 2030 Saudi Vision and the Saudi Green Initiative” Researchers. *Arab. J. Sci. Publ.* **2023**, *6*, 5798.
29. Almusalami, A.; Alnaqbi, F.; Alkaabi, S.; Alzeyoudi, R.; Awad, M. Sustainability Awareness in the UAE: A Case Study. *Sustainability* **2024**, *16*, 1621. [CrossRef]
30. Ahmed, S.; Ali, A.; D’angola, A. A Review of Renewable Energy Communities: Concepts, Scope, Progress, Challenges, and Recommendations. *Sustainability* **2024**, *16*, 1749. [CrossRef]
31. Hussain, A.; Kanwel, S.; Erum, N.; Pasha, U.; Asad, M.; Khan, S.N.; Zakaria, N.B.; Sanusi, Z.M. The role of environmental awareness, renewable energy, and green innovation in shaping climate change perceptions. *Sci. Rep.* **2025**, *15*, 40933. [CrossRef] [PubMed]
32. Druta, R.M.; Lakatos, E.S.; Munteanu, R.A.; Cioca, L.; Ferenci, S.; Barnisca, M.; Puiac, A.V. Bridging the Gap in Renewable Energy Participation: A Case Study on Energy Communities. *Processes* **2025**, *13*, 2632. [CrossRef]
33. Tsiaras, E.; Tampekis, S.; Gavrilakis, C. Public Perceptions and Social Acceptance of Renewable Energy Projects in Epirus, Greece: The Role of Education, Demographics and Visual Exposure. *World* **2025**, *6*, 111. [CrossRef]
34. Ibrahim, M.; Din, S.U.; Iqbal, Q.; Shah, A. Energy Consumption and Public Awareness in Large-Scale Residential Developments: Toward Sustainable Urban Planning in Riyadh, Saudi Arabia. *Kashf J. Multidiscip. Res.* **2025**, *2*, 25–41. [CrossRef]
35. Benhacene, H.L.M.; Hussien, A.M. The Impact of Adopting Renewable Energy Resources on Sustainable Development in Saudi Arabia: A Qualitative View. *Sustainability* **2025**, *17*, 768. [CrossRef]
36. Alshuwaikhat, H.M.; Mohammed, I. Sustainability Matters in National Development Visions—Evidence from Saudi Arabia’s Vision for 2030. *Sustainability* **2017**, *9*, 408. [CrossRef]
37. Arshad, H.M.; Saleem, K.; Shafi, S.; Ahmad, T.; Kanwal, S. Environmental Awareness, Concern, Attitude and Behavior of University Students: A Comparison Across Academic Disciplines. *Pol. J. Environ. Stud.* **2021**, *30*, 561–570. [CrossRef] [PubMed]
38. Cvetković, V.M.; Sudar, S.; Ivanov, A.; Lukić, T.; Grozdanić, G. Exploring environmental awareness, knowledge, and safety: A comparative study among students in Montenegro and North Macedonia. *Open Geosci.* **2024**, *16*, 20220669. [CrossRef]
39. Chin, Y.S.J.; De Pretto, L.; Thuppil, V.; Ashfold, M.J. Public awareness and support for environmental protection—A focus on air pollution in peninsular Malaysia. *PLoS ONE* **2019**, *14*, e0212206. [CrossRef] [PubMed]
40. Bozdogan, E.; Sahinler, S.; Korkmaz, E. Environmental Awareness and Attitudes in University Students. An Example from Hatay (Turkey). *Oxid. Commun.* **2016**, *39*, 661–672.
41. Naquin, M.; Cole, D.; Bowers, A.; Walkwitz, E. Environmental Health Knowledge, Attitudes and Practices of Students in Grades Four through Eight. *ICHPER-SD J. Res. Health Phys. Educ. Recreat. Sport Danc.* **2011**, *6*, 45–50.
42. Elmosaad, Y.M.; Al Rajeh, A.M.; Llaguno, M.B.B.; Belal, S.; Hassan, B.H.; Aatif, M.; Ibrahim, A.; Almulhem, M.; Albugami, H.F.; Elhassan, A.M.S.; et al. Community awareness, perception, and perceived behaviors regarding the impacts of advanced technology on the environment among residents of the eastern region, Saudi Arabia: A cross-sectional study. *Front. Public Health* **2025**, *13*, 1649249. [CrossRef] [PubMed]
43. Gökmen, A. The effect of gender on environmental attitude: A meta-analysis study. *J. Pedagog. Res.* **2021**, *5*, 243–257. [CrossRef]
44. Li, Y.; Wang, B.; Saechang, O. Is Female a More Pro-Environmental Gender? Evidence from China. *Int. J. Environ. Res. Public Health* **2022**, *19*, 8002. [CrossRef] [PubMed]
45. Mandarić, D.; Hunjet, A. Gender Disparities in Pro-Environmental Attitudes: Implications for Sustainable Business Practices in Croatia. *J. Bus. Econ. Rev.* **2024**, *9*, 73–84. [CrossRef] [PubMed]
46. Mazhenova, S.; Choi, J.G.; Chung, J. International Tourists’ Awareness and Attitude about Environmental Responsibility and Sustainable Practices. *Glob. Bus. Financ. Rev.* **2016**, *21*, 132–146. [CrossRef]
47. Elamin, N.E.A. Assessing Knowledge of Sustainable Development Goals Among Diverse Students: A Case Study of Al Qasimia University. *Sustainability* **2025**, *17*, 3343. [CrossRef]
48. Garcia, E.C.; Luansing, B. Environmental Awareness Among Select Graduating College Students in Region Iva. *LPU-Laguna J. Multidiscip. Res.* **2016**, *5*, 1–10. [CrossRef]
49. Saudi Green Initiative. SGI: Steering Saudi Arabia Towards a Green Future. Available online: https://cdn.climatepolicyradar.org/navigator/SAU/2021/saudi-green-initiative_86a88a092800d52bf585953bdd25d1cf.pdf (accessed on 2 June 2026).
50. Saudi Green Initiative. SGI Initiatives. Available online: <https://www.sgi.gov.sa/sgi-initiatives> (accessed on 3 June 2026).
51. Royal Commission for Riyadh City. Green Riyadh Program. Available online: <https://www.rcrc.gov.sa/en/projects/green-riyadh-project/> (accessed on 1 June 2026).
52. Red Sea Global. Responsible Development. Available online: <https://redseaglobal.com/en/responsible-development/> (accessed on 1 June 2026).
53. National Center for Waste Management (MWAN). About Us. Available online: <https://araburban.org/en/infohub/projects/?id=10501> (accessed on 2 June 2026).

54. Ministry of Education, Kingdom of Saudi Arabia. Sustainable Development. Available online: <https://www.moe.gov.sa/en/aboutus/aboutministry/Pages/sustainabledevelopment.aspx> (accessed on 3 June 2026).
55. Ministry of Education, Kingdom of Saudi Arabia. Green Government: Environmental Friendliness. Available online: <https://www.moe.gov.sa/en/aboutus/nationaltransformation/Pages/greengovernment.aspx> (accessed on 2 June 2026).

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.