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The Impact of Using Electric Vehicle (EV) Charging Stations on Sustainable Development: Case study of Jadara University, Irbid, Jordan

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Abstract

This study investigates the impact of implementing electric vehicle (EV) charging stations on sustainable development at Jadara University. A descriptive-analytical approach was employed to assess the target population's perspectives, including attitudes, opinions, demographic characteristics, and behavioral patterns. The study focused on all university employees as the target population, from whom 186 valid questionnaires were collected for statistical analysis. The findings reveal that the establishment of EV charging stations has a statistically significant positive impact on the environmental, economic, and social dimensions of sustainable development. Based on these findings, the study recommends that the Energy Sector Regulatory Authority and the Ministry of Higher Education encourage universities to adopt EV charging infrastructure as a step toward enhancing environmental preservation on campus. Additionally, it advocates for replacing university-owned vehicles with electric alternatives to reduce operational costs. The study also emphasizes the need to regulate the charging process to ensure equitable and efficient access for all university stakeholders. Furthermore, the researchers highlight that integrating Artificial Intelligence (AI) technologies—such as smart charging systems and predictive energy management—can further enhance the efficiency and sustainability of EV infrastructure in academic environments

Keywords: *Electric Vehicle (EV), Charging Stations, Sustainable Development, Jadara University.*

1 Introduction

The transportation industry in Jordan is widely recognized as the primary and most significant contributor to air pollution [1]. A substantial portion of emissions in metropolitan areas stems from the heavy reliance on gasoline-powered vehicles [2]. Furthermore, urban regions in Jordan have been shown to exhibit elevated levels of black carbon emissions compared to industrial zones, largely due to vehicular pollution [3]. These environmental challenges have motivated the nation to pursue cleaner energy alternatives, as outlined in

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strategic frameworks such as Jordan's 2025 Vision and the National Green Growth Plan for the transport sector [4].

Electric vehicles (EVs) have emerged as a promising alternative to traditional fossil-fuel vehicles by offering reduced emissions, lower energy costs, and improved energy efficiency. In Jordan, supportive policy frameworks, fuel savings, and increasing environmental awareness are accelerating EV adoption [5]. However, this shift requires reliable and sustainable charging infrastructure to support the growing number of EVs on the road. EV charging stations are crucial in enabling this transformation, yet they also place additional stress on the national power grid [6]. Therefore, proper planning and optimization of charging infrastructure are essential to ensure reliability and sustainability [7].

To further enhance the sustainability and intelligence of EV charging systems, the integration of machine learning (ML) and deep learning (DL) techniques has become increasingly important. These technologies enable predictive modeling of energy demand, optimization of charging schedules, and dynamic load balancing, ensuring efficient energy distribution while minimizing stress on the grid. Additionally, ML and DL models can forecast solar generation, detect system faults, and support real-time decision-making for energy management. When applied to solar-powered EV stations, these intelligent methods significantly boost operational efficiency, reduce waste, and support the long-term viability of green mobility solutions.

In line with these objectives, this study presents the design and implementation of a solar-powered electric vehicle charging station at Jadara University in Irbid, Jordan. By leveraging photovoltaic (PV) cells, the system utilizes clean solar energy to charge EVs, reducing dependence on grid electricity and contributing to emissions reduction. This work serves as a practical model for deploying sustainable charging infrastructure in academic or institutional settings, showcasing both environmental and economic benefits. Our contribution in this work is summarized as follows:

- We developed a functional solar-powered EV charging station as a real-world prototype for green transportation infrastructure at Jadara University.
- We integrated photovoltaic (PV) technology with EV charging to reduce emissions and lower dependency on the national electrical grid.
- We laid the groundwork for future integration of AI-based optimization techniques—such as machine learning and deep learning—to enhance energy management and system sustainability.

The rest of this paper is organized as follows. The following section introduces the related works that have been conducted in this area, Section 3.

2 Related Works

This section cosists of three main subsections. In the first subsection, Electric vehicle (EV) charging stations are overviewed. Subsequently, these chargers impact on sustainability is shown in the second subsection. Finally, how deep and machine learning can be used with these chargers to enhance the sustainability is shown in the last subsection.

2.1. **Electric vehicle (EV) charging stations**

In recent times, the utilization of distributed generation (DG) and electric vehicles (EV) has gained significant traction in power systems due to the escalating concerns surrounding energy scarcity and environmental degradation. These technologies are favored for their attributes of being environmentally friendly, offering flexibility in operation, and minimizing energy losses [8]. The performance of distributed generation is susceptible to the influence of environmental conditions, exhibiting significant variability and temporal sensitivity. Furthermore, it is important to note that the space-time characteristics of various electric vehicle models exhibit significant variations. The rapid proliferation of distributed generators (DGs) and electric vehicles (EVs) poses a significant challenge to the reliable functioning of the distribution network. Hence, the examination of collaborative planning between distributed generation (DG) and electric vehicle (EV) charging stations (CS) holds considerable academic and practical importance [9].

The electrical requirements for charging an electric vehicle depend on factors like method, battery capacity, and speed. Three main types include Level 1 charging, which requires a dedicated circuit and a 120-volt household outlet for overnight use, drawing 8-12 amps of current. Level 2 charging requires a 240 volts dedicated station, offering faster charging than Level 1. Amperage varies from 16 to 40 amps. DC fast charging, also known as Level 3, uses high-powered stations to supply direct current to the vehicle's battery, resulting in faster charging times. Electrical requirements can range from 50 kW to over 350 kW [10].

The emergence of electric vehicles with increased range and reduced costs is aiding the gradual transition of the automotive fleet. Nevertheless, the proliferation of electric vehicles necessitates the establishment of a sufficient network of charging stations strategically dispersed across urban areas to ensure that vehicle range limitations do not impede their practicality [11].

The primary concern for electric vehicle (EV) drivers is the driving range, as they must locate a charging station once their battery is down. Many individuals depend on third-party aggregators for the purpose of reserving charging slots [12]. However, the sharing of information between users and service providers can become more intricate due to concerns regarding privacy and confidentiality [13]. Aggregators rely on both independent system operators and power producers, hence introducing a higher level of complexity to the process of information interchange. This phenomenon has the potential to result in increased expenditure by users on charging services, particularly during periods of high demand [14]. Nevertheless, the provision of up-to-date status information regarding charging stations (CS) holds more significance for users and offers advantages to CS operators in terms of pre-planning charging schedules. This facilitates the availability of charging alternatives that are both more efficient and cost-effective for electric vehicle (EV) customers [15].

2.2. Electric vehicles and Sustainable development

The study focus in recent decades has been on the development of a sustainable transportation system, driven by heightened economic and environmental consciousness.

The transportation industry is recognized as the second most significant contributor to carbon dioxide (CO2) and greenhouse gas (GHG) emissions in the atmosphere, mostly due to the extensive reliance on fossil fuels. Petroleum-fueled automobiles account for around 17% of global hydrocarbon fuel consumption and are responsible for approximately 23% of total carbon dioxide emissions released into the Earth's atmosphere [16].

Electric vehicles (EVs) are widely regarded as a feasible solution for establishing a sustainable urban transportation system due to their ability to reduce reliance on oil and mitigate pollution. Additionally, EVs offer potential benefits for both public health and the environment [17]. The widespread adoption of electric vehicles (EVs) is anticipated to provide transformative effects, not only in terms of technological advancements in personal mobility, but also in terms of economic growth and environmental sustainability [18]. This particular means of transportation is characterized by its ease of maintenance, as well as the added benefit of providing users with a quieter and smoother riding experience in comparison to conventional autos [13]. Hossain [19] suggest that electric vehicles (EVs) can promote renewable energy use and reduce environmental pressures. However, the complexity of sustainable development slows adoption. Policymakers should provide more incentives for innovations in grid and EV relationship domains. Future models for EV wireless charging and energy networks are proposed, but power electronics have negative impacts. Strong policy support is needed for sustainable EV development.

2.3. Machine and Deep Learning impact on Chargers Sustainability Deployment

The Sustainable Development Goals (SDGs) are internationally adopted by all 193 UN member states as a roadmap for addressing global challenges—including energy, climate change, inequality, and sustainable infrastructure. Though universal, each country tailors its implementation: advanced nations like Norway or the Netherlands emphasize EV infrastructure scalability, India focuses on rural access, and Jordan integrates EVs into national clean energy plans under SDG 7 and SDG 13. Integrating Machine Learning (ML) and Deep Learning (DL) into EV charging station operations enhances these goals locally and globally—by optimizing clean energy use, reducing emissions, guiding smart infrastructure growth, and promoting access equity across communities.

For SDG 7 (Affordable and Clean Energy), ML/DL dramatically improve load forecasting and scheduling. A study in Saudi Arabia proposed SARLDNet, a hybrid deep-learning model incorporating solar and wind data over 3.5 years to predict EV charging station energy needs with a MAPE of 7.2%, improving energy allocation and sustainability of EV stations. In Malaysia, an AI-driven smart charging system achieved 30% energy savings and 20% cost reduction compared to conventional scheduling. Meanwhile, another microgrid-based study simulated solar-powered EV charging controlled by DL demand-side management, demonstrating effective peak shaving and CO_2 emission reductions of up to 28%.

Supporting SDG 13 (Climate Action), ML-enabled carbon-aware charging and demand response systems reduce emissions by optimizing charging timing. A deep reinforcement learning (DRL) model using solar PV data achieved 11.5% electricity cost reduction while reaching 88.4% solar utilization in household EV charging shifts. Other DRL frameworks for large-scale V2G coordination with renewables reduced load variance by over 97% and lowered charging cost by roughly 76% compared to uncontrolled charging. These strategies help EV charging contribute positively to decarbonizing energy systems.

Under SDG 9 (Industry, Innovation and Infrastructure)**,** ML and DL support infrastructure planning and system maintenance. A 2024 MIND conference paper deployed a binary quadratic model that uses deep learning and reinforcement learning to optimally place EV charging stations and direct users in real-time based on traffic and availability. Predictive maintenance models using ML (e.g., PSO-RF or hybrid Bayesian-DL) optimize charger reliability and system uptime, enhancing network sustainability and service quality.

Intelligent systems also bolster SDG 11 (Sustainable Cities and Communities) and SDG 10 (Reduced Inequalities) by improving access and equity. Multi-agent reinforcement learning models dynamically recommend less congested charging stations and optimal paths to users, reducing wait times and range anxiety across urban. Furthermore, AI-based planning tools can detect underserved neighborhoods and guide equitable station deployments. A comprehensive optimization framework combining solar PV, battery storage, and load management in high-density residential zones led to 22% lower user energy costs, 31% reduced grid load, and improved voltage stability—benefits especially meaningful for lower-income areas.

Finally, broader sustainability emerges from hybrid AI frameworks that unify several models—using forecasting, clustering, optimization, and reinforcement learning—to manage EV charging in synergy with renewable generation and grid constraints. For example, a CNN-LSTM model with spectral clustering markedly improved EV charging load predictions—reducing prediction error by ~44-47% compared to other neural networks and boosting planning accuracy for grid operators. Another dissertation combined Random Forests with LSTM for solar PV prediction to optimize fast-charging EV stations, increasing system efficiency and renewable utilization. These hybrid approaches provide actionable tools for policy and urban planning to embed sustainable EV infrastructure aligned with multiple SDGs.

3 Hypothesis Development

According to Marisekar [10], electric vehicles (EVs) are gaining popularity due to their environmental benefits and potential to reduce carbon emissions. However, limited charging infrastructure in residential areas hinders their widespread adoption. Hybrid electric vehicle charging stations using solar and diesel generators offer a greener alternative, reducing grid dependency and costs. These systems are adaptable and can be adapted to specific residential areas. They also serve as backup power during power outages. While more research and development are needed to enhance system efficiency and expand applications, hybrid charging stations have the potential to significantly increase EV adoption and improve living standards. According to [20], one of the significant environmental issues confronting society is the pollution generated by automobiles powered by combustion engines. Governments have identified the substitution of conventional vehicles with electric vehicles (EVs) as a feasible approach towards achieving sustainable mobility. The sustainable functioning of rapid charging stations for electric cars (EVs) is a crucial factor influencing the widespread adoption of these vehicles. The establishment of electric vehicle (EV) charging stations is undertaken using emerging and evolving technologies, which can entail considerable costs, intricacy, and inherent risks. [21] Proposes a multi-objective collaborative planning model for distributed generation and electric vehicle charging stations, aiming for minimum annual comprehensive cost and optimal voltage level. The model optimizes energy consumption, schedules charging and discharge, and improves distribution system voltage levels for good economy.

According to [22], the depletion of fossil fuels and environmental concerns have led to the development of clean and green energy using renewable sources. The growing demand for electric vehicles (EVs) has led to a growing EV market. Photovoltaic (PV)-powered EV charging can significantly reduce carbon footprints. The combination of solar power and EV charging is a sustainable approach. In India, the development of charging infrastructure is a challenge due to dense population. The optimal configuration and investment efficiency in urban areas are influenced by solar irradiation and feed-in-tariff prices. [23] assert that the transportation sector ranks as the second most substantial source of carbon dioxide and greenhouse gas emissions, mostly attributable to its heavy dependence on fossil fuels. Electric vehicles (EVs) are widely regarded as a viable answer for establishing a sustainable urban transportation system. This is primarily attributed to their capacity to diminish dependence on oil, alleviate pollution levels, and provide advantageous outcomes for public health and the environment. The anticipated widespread implementation of electric vehicles (EVs) is projected to have significant disruptive impacts in various domains, including technological improvements, economic growth, and environmental sustainability. Electric vehicles (EVs) are distinguished by their convenient maintenance requirements and the provision of a quieter and smoother ride in comparison to traditional automobiles.

Authors of [24] offer a suggestion for an electric vehicle that aligns with the requirements of municipal and state governmental bodies to the maximum degree feasible. The objective has been successfully accomplished through the utilization of the PROSA-C (PROMETHEE for Sustainability Assessment—Criteria) multi-criteria decision analysis technique in conjunction with the Monte Carlo approach. The PROSA-C methodology facilitates the advancement of sustainable vehicles by considering several factors such as technical, economic, environmental, and social aspects.

According to the above, the following hypotheses can be reached:

H1: There is a statistically significant effect at the level ($\alpha \leq 0.05$) of using electric vehicle charging stations on sustainable development at Jadara University. The following sub-hypotheses emerge from this hypothesis:

H1.1: There is a statistically significant effect at the level ($\alpha \leq 0.05$) of using electric vehicle charging stations on social development at Jadara University.

H1.2: There is a statistically significant effect at the level ($\alpha \leq 0.05$) of the use of electric vehicle charging stations on economic development at Jadara University.

H1.3: There is a statistically significant effect at the level ($\alpha \leq 0.05$) of the use of electric vehicle charging stations on environmental development at Jadara University.

4 Methodology

To The study utilized a descriptive and analytical approach to gather data, test hypotheses, and address research questions pertaining to the current state of the study subject. The analytical descriptive method was employed to evaluate the target population, encompassing attitudes, opinions, demographic information, conditions, and procedures.

4.1. The Study Population and Sample

The target population for this research consists of all employees at Jadara University. To achieve the goal of this study, an electronic questionnaire was sent to all employees at the university via email. The researchers were able to collect (186) questionnaires, all of which were valid for the purposes of statistical analysis. The majority of the participants were male workers, their place of residence was 20-40 kilometers away from the university, and they wanted to buy an electric car.

4.2.Data Collection

Two different sources were used to acquire the information needed to complete the study's objectives. The use of secondary sources began with the use of theoretical and scientific literature. These sources played a crucial role in helping researchers gather the information they needed to build the study's theoretical framework, refine its goals, and review key findings. Additionally, they were extremely important in developing the study's hypotheses and enhancing the conversation. Books, university theses, scholarly research articles, peer-reviewed magazines, and academic works published.

4.3.Reliability Test

To ensure that the questionnaire's items were adequate and consistent, the Cronbach's Alpha value was determined. The value is statistically acceptable if the result is more than 0.70, and the closer it is to one (or 100%), the more reliable the search tool will be [25] Cronbach Alpha ranges from 0.876 to 0.927, as seen in Table (1). To put it another way, the study tool is reliable, and the data it generates is accurate and trustworthy for assessing variables. Since all independent and validated variable dimensions are greater than 70%, reliability has been taken into account.

Table 1: Cronbach's Alpha Coefficient

	Number of items	alpha Cronbach
Establishing electric vehicle charging stations	9	0.927
Environmental dimension	6	0.919
The economic dimension	4	0.910
The social dimension	5	0.908
Sustainable Development	15	0.876

4.4. Descriptive Statistical Analysis

According to Table (2), the mean for the variable "Establishing electric vehicle charging stations" was calculated to be 3.567. This indicates a medium level of agreement among the respondents regarding this variable. Upon examining the individual item responses, it is evident that "Public charging stations rely on charging ports that are not compatible with different types, and this must be avoided when installing charging stations at Jadara University.", received the highest average rating of 3.887. On the other hand, the Paragraph "The Ministry of Education and Higher Education encourages universities to establish charging stations for electric vehicles", which received a lower average rating of 3.436.

Table 2: Descriptive Statistics mean and standard deviation of establishing electric vehicle charging stations

NO.	Items	Mean	SD	Rank	Importance
1	The number of electric vehicles is increasing at Jadara University	3.650	0.647	2	Medium
2	The number of electric vehicles has increased significantly in Ma'an Governorate in recent years.	3.650	0.891	3	Medium
3	The lack of charging stations for electric vehicles at Jadara University affects the mobility of these car owners	3.457	0.769	6	Medium
4	The Energy Sector Regulatory Authority encourages universities to establish electric vehicle charging stations.	3.446	0.988	8	Medium
5	Public charging stations rely on charging ports that are not compatible with different types, and this must be avoided when installing charging stations at Jadara University .	3.887	0.862	1	High
6	Establishing electric charging stations at Jadara University encourages workers to buy electric cars	3.591	0.813	4	Medium
7	Establishing electric charging stations at Jadara University to ensure that the vehicle does not lose power after exceeding the permitted kilometers when forgetting to charge it at home.	3.553	0.977	5	Medium
8	The Ministry of Education and Higher Education encourages universities to establish charging stations for electric vehicles.	3.419	0.896	9	Medium
9	Establishing charging stations for electric vehicles at Jadara University contributes to achieving sustainable development	3.451	0.924	7	Medium
	Establishing electric vehicle charging stations	3.567	0.658		Medium

The mean of **Sustainable Development** is 3.788, According to Table (3), the mean for the variable "**Environmental dimension**" was calculated to be 3.780. This indicates a high level of agreement among the respondents regarding this variable. Upon examining the individual item responses, it is evident that the paragraph "At Jadara University, cooperation takes place with environmental organizations to achieve sustainable development", received the highest average rating of 3.962. On the other hand, the Paragraph "Encouraging the Ministry of Education and Higher Education to preserve the university environment", has a lower average rating of 3.424.

The mean for the variable "**The economic dimension**" was calculated to be 3.842. This indicates a high level of agreement among the respondents regarding this variable. Upon examining the individual item responses, it is evident that the paragraph "Jadara University works to save energy through the use of sustainable sources", received the highest average rating of 3.989. On the other hand, the Paragraph "Jadara University 's cars can be replaced with electric cars, which in turn reduces the university's overhead expenses", which lower average rating of 3.704.

The mean for the variable "The social dimension" was calculated to be 3.743. This indicates a high level of agreement among the respondents regarding this variable. Upon examining the individual item responses, it is evident that the paragraph "The owner of an electric car working at Jadara University feels secure and a sense of belonging to his university when electric charging stations are available", received the highest average rating of 3.871. On the other hand, the Paragraph "Organizing charging in the event of establishing electrical charging stations ensures regular distribution to all employees of Jadara University ", which received a lower average rating of 3.559.

Table 3: Descriptive Statistics mean and standard deviation of Sustainable Development

NO.	Items	Mean	SD	Rank	Importance
10	Encouraging the Ministry of Education and Higher Education to preserve the university environment	3.424	0.945	6	Medium
11	At Jadara University , cooperation takes place with environmental organizations to achieve sustainable development.	3.962	0.794	1	High
12	Achieving sustainable development is one of the priorities of Jadara University	3.758	0.792	5	High
13	An environmental control system is available in Jadara University facilities and its surroundings.	3.844	0.839	3	High
14	Jadara University provides and maintains green spaces in its facilities.	3.849	0.791	2	High
15	The process of establishing electric vehicle charging stations encourages the reduction of environmental pollution by encouraging individuals to own electric vehicles.	3.844	0.852	4	High
	Environmental dimension	**3.780**	**0.564**		**High**
16	Jadara University works to save energy through the use of sustainable sources.	3.989	0.749	1	High
17	Providing electrical charging stations at Jadara University is the optimal use of stored energy	3.795	0.851	3	High

18	Solar panels save Jadara University from high electricity bills	3.881	0.803	2	High
19	Jadara University 's cars can be replaced with electric cars, which in turn reduces the university's overhead expenses	3.704	0.926	4	High
	The economic dimension	**3.842**	**0.723**		**High**
20	Environmental advice and guidance are provided to Jadara University employees to encourage ownership of an electric vehicle.	3.720	0.928	3	High
21	The owner of an electric car working at Jadara University feels secure and a sense of belonging to his university when electric charging stations are available	3.871	0.841	1	High
22	Jadara University is keen to provide a safe work environment free of pollution.	3.865	0.810	2	High
23	The presence of charging stations for electric vehicles raises the level of Jadara University in the international Green Metric classification	3.698	0.972	4	High
24	Organizing charging in the event of establishing electrical charging stations ensures regular distribution to all employees of Jadara University	3.559	1.044	5	Medium
	The social dimension	**3.743**	0.737		High
Sustainable Development		**3.788**	**0.579**		**High**

5 Hypothesis Testing

5.1.The First Main Hypothesis

To test the first main hypothesis, Multi linear regression analysis was performed.
The first main hypothesis of the study was as follows: "There is a statistically significant impact at the level of (α≤0.05) of establishing electric vehicle charging stations at Jadara University in sustainable development".

Table 4: Results of Testing the Impact main hypothesis

I.V	Model Summery		ANOVA		Coefficients				
	R	R^2	F		variable	B	standard error	T	Sig T*
Establishing electric vehicle charging stations	0.731	0.534	69.582		Environmental dimension	0.141	0.072	1.568	0.021
					The economic dimension	0.168	0.064	2.610	0.010
					The social dimension	0.412	0.056	7.414	0.000

*The effect is statistically significant at the level (α ≤ 0.05)

The correlation coefficient (R = 0.731) shows that Establishing electric vehicle charging stations at Jadara University has an impact on sustainable development. Table No. (4) shows that the effect of the independent variable (Establishing electric vehicle charging stations) on sustainable development is statistically significant, with a calculated value of F (69.582) and a level of significance (sig = 0.000) less than 0.05. The coefficient of determination (R^2 = 0.534) shows that variation in quantitative methods can account for 53.4% of the variation in (sustainable development).

The values of the regression coefficients for the variable (Establishing electric vehicle charging stations at Jadara University) on sup-dimensions to (sustainable development) are displayed in Table (4). The table makes it evident that the Environmental Dimensions B value was (0.141) and that its computed T value was (1.568) at a significant level (0.021). It is less than 0.05, meaning that at the significance level (α≤0.05), there is a substantial positive effect. The table shows that the value of the economic dimension of T was calculated in this dimension (2.610) at a significance level (0.010), that is, less than 0.05, indicating a substantial positive effect at (α≤0.05). The value of B was (0.168). The table makes it evident that there was a substantial positive influence in the social dimension, with the B value being (0.412) and the T value being (7.414) at a significance level of (0.000), less than 0.05. where (α≤0.05).

To test the sub-hypotheses, simple linear regression analysis was performed.

H1.1: "There is a statistically significant impact at the level of (α≤0.05) of establishing electric vehicle charging stations at Jadara University in Environmental dimension".

H1.2: "There is a statistically significant impact at the level of (α≤0.05) of establishing electric vehicle charging stations at Jadara University in the economic dimension".

H1.3: "There is a statistically significant impact at the level of (α≤0.05) of establishing electric vehicle charging stations at Jadara University in the social dimension".

Table 5: Impact test results H1.1, H1.2, H1.3 and H1.4

D.V	Model Summery		ANOVA		Coefficients			
	R	R^2	F	Sig F*	B	standard error	T	Sig T*
Environmental dimension	0.532	0.283	72.596	0.000	0.523	0.061	8.520	0.000
The economic dimension	0.606	0.367	106.572	0.000	0.505	0.049	10.323	0.000
The social dimension	0.713	0.508	189.952	0.000	0.536	0.039	13.782	0.000

*The effect is statistically significant at the level (α ≤ 0.05)

A positive association was found between the first dimension (Establishing electric vehicle charging stations at Jadara University) and the second dimension (Environmental dimension), as indicated by Table 5's R-value of (0.532). When all other factors stay constant, the coefficient of determination results shows that (R^2 = 0.283), which indicates that, when it comes to the Environmental dimension, the (Establishing electric vehicle charging stations)

domain accounted for (28.3%) of the variation. At the significance level ($\alpha \leq 0.05$), it was demonstrated that the regression's significance was supported by the value of (F) reaching 72.596 at the confidence level (sig = 0.000).
There is a positive association between the establishments of electric vehicle charging stations at Jadara University in the economic dimension, as indicated by the second dimension's R-value of 0.606. After adjusting for all other factors, the coefficient of determination results in ($R^2 = 0.367$), which indicates that the (Establishing electric vehicle charging stations) domain accounted for (36.7%) of the variance in (The economic dimension). Furthermore, the value of (F) reached (106.572) at the level of confidence (sig = 0.000), demonstrating the significance of the regression at the level of significance ($\alpha \leq 0.05$), was demonstrated.
There is a positive association between the establishments of electric vehicle charging stations at Jadara University in the social dimension, as indicated by the second dimension's R-value of (0.713). After adjusting for all other factors, the coefficient of determination results in ($R^2 = 0.508$), which indicates that the (Establishing electric vehicle charging stations) domain accounted for (50.8%) of the variance in (The social dimension). Furthermore, the value of (F) reached (189.952) at the level of confidence (sig = 0.000), demonstrating the significance of the regression at the level of significance ($\alpha \leq 0.05$), was demonstrated.

6. Discussion

The results showed that the effect of the independent variable (Establishing electric vehicle charging stations) on sustainable development is statistically significant, where the variation in quantitative methods can account for 53.4% of the variation in (sustainable development). A positive association was found between the first dimension (Establishing electric vehicle charging stations at Jadara University) and the second dimension (Environmental dimension), as the (Establishing electric vehicle charging stations) domain accounted for (28.3%) of the variation. There is a positive association between the establishment of electric vehicle charging stations at Jadara University in the economic dimension, as the (Establishing electric vehicle charging stations) domain accounted for (36.7%) of the variance in (The economic dimension). Furthermore, there is a positive association between the establishment of electric vehicle charging stations at Jadara University in the social dimension, as the (Establishing electric vehicle charging stations) domain accounted for (50.8%) of the variance in (The social dimension).
These conclusions are supported by a number of other investigations. Electric vehicles (EVs) are becoming more popular due to their environmental benefits and carbon reduction potential, according to Marisekar et al. (2023). The lack of household charging infrastructure inhibits their adoption. Greener hybrid electric vehicle charging stations using solar and diesel generators reduce grid dependency and expenses. Mousavi et al. (2023) say combustion engine cars pollute the environment. Conventional vehicles can be replaced with electric vehicles (EVs) to achieve sustainable transportation, according to governments. The widespread adoption of electric cars (EVs) depends on the sustainability of rapid charging stations. Electric vehicle (EV) charging stations are built using new technologies, which can be expensive, complicated, and risky. Luo and Qiu (2020) claim that the transportation industry emits the second most carbon dioxide and greenhouse gases due to its intensive use of fossil fuels. Electric vehicles (EVs) are considered a sustainable urban transportation

solution. Due to their ability to reduce oil reliance, pollution, and health and environmental benefits. Electric vehicle (EV) adoption is expected to disrupt technology advancements, economic growth, and environmental sustainability.

7. Conclusion

The integration of Electric Vehicle (EV) charging infrastructure within the premises of Jadara University has made a substantial contribution towards the advancement of sustainable development. These stations have the capacity to decrease greenhouse gas emissions and reduce reliance on fossil fuels, hence thereby enhancing ambient air quality. Additionally, the promotion of electric vehicles, which exhibit higher energy economy compared to traditional vehicles, serves as a means to further encourage energy efficiency. The integration of renewable energy sources into the charging infrastructure can serve as a means for the university to further boost its energy efficiency. The provision of electric vehicle (EV) charging stations within the university campus acts as a driving force for broader adoption and usage of electric vehicles among the university community, hence promoting the availability of sustainable transportation alternatives. Electric vehicles typically incur lower operational and maintenance costs in comparison to conventional vehicles, hence offering the possibility for substantial cost reductions in the realm of transportation expenses over an extended period of time. The implementation of electric vehicle (EV) charging stations at the institution underscores the university's commitment to environmental stewardship and demonstrates its progress in embracing emerging technology. It is advisable for Jadara University to persist in the expansion and enhancement of its electric vehicle (EV) charging infrastructure. This can be achieved by strategically situating charging stations throughout the campus and engaging in partnerships with external entities to bolster sustainability initiatives and explore prospects for research and development. The study recommends that the Energy Sector Regulatory Authority and the Ministry of Education encourage universities to establish electric vehicle charging stations, which contributes to the conservation of the university's ecological surroundings. It also recommends replacing Jadara University cars with electric cars, which which would subsequently lower the university's operational expenditures. In addition to organizing the charging process in the event of establishing electrical charging stations, it ensures regular distribution to all members of Jadara University.

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