

Chapter Four

Introduction

This chapter illustrates the field study that aimed to show the impact of Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia, for achieving the study objectives and its hypotheses, a questionnaire was developed to collect data from the study sample through distributing a questionnaire list, which are designed for this purpose, then the data obtained was analyzed using suitable statistical methods.

4.1 Study Methodology

This section will deal with the following items:

(4.1.1) The Population and Sample:

A. Study Population

The study population consisted of all Fuel Stations in KSA for the year
2020-2021.

To get reliable information, the researcher distributed several questionnaires lists on the participants at on Fuel Stations in KSA

B: The study sample:

Due to the difficulty of a comprehensive inventory of the study population, the researcher relied on drawing an arbitration sample of 33 observations, so the response rate can be illustrated in table (4/2):

Table (4/2)

Distribution of the study sample according to the Job title at work

the Job title at work	Frequency	Percent
Manager	28	84.8
Owners	5	15.2
Total	33	100.0

(Source: researcher's calculation)

The table (4/2) illustrates that a big number of the respondents are managers , as they represent (84.8%) , followed by 15.2 % of respondents are owners.

(4.1.2) Study variables

The study involves several independent variables (X) and dependent (Y) variables, as X totaled (14) factors & Y totaled (5) factors. Table (4/3) shows the various study variables simply:

Table (4/3)

Independent (X) and Dependent (Y) Variables Related to the Study

Variable	Coding
Sustainable Supply Chain Management	X
Economic Sustainability	X1
Fuel Station's material procurement costs have decreased	X11
Fuel Station's energy consumption costs have decreased	X12
Fuel Station's waste management charges have decreased	X13
Fuel Station has reduced the charges paid for the disposal of wastes	X14
Environmental Sustainability	X2
Fuel Station reduced the amount of wastewater	X21

Variable	Coding
Fuel Station reduced the amount of solid waste	X22
Fuel Station reduced the number of environmental accidents	X23
Fuel Station improved its environmental management system and practices	X24
Social Sustainability	X3
Fuel Station implements occupational health and safety, work standards compliance, and audit systems for our supply chain partners	X31
Fuel Station develops systems of professional ethics with our supply chain partners	X32
Fuel Station and supply chain partners have reduced the health risk that consumers may encounter	X33
Fuel Station has benefited employees throughout the supply chain	X34
Fuel Station and supply chain partners have reduced occupational safety and health risks in new products/processes developed over the last two years	X35
Fuel Station carries out supply chain strategy changes that minimize adverse impacts	X36
Environmental performance of retail petrol stations in Saudi Arabia	Y
Fuel Station has reduced consumption of hazardous/toxic material	Y1
Fuel Station has reduced air emissions	Y2
Fuel Station has reduced effluent wastes	Y3
Fuel Station has sought to improve its environmental image/position	Y4
Fuel Station has reduced energy consumption	Y5

(Source: Prepared by the researcher)

(4.1.3) Data Collection

A- The Stage of Preparing the Questionnaire List:

To achieve the study objectives, the researcher depended on the following sources:

➤ The questionnaire list is considered as a basic tool for collecting the needed data about the impact of Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia. **The survey list was divided into 2 major sections:**

1. Consists of general data that is the job, the scientific and professional degree, the years of experience in addition to the training courses.
2. Consists of some questions according to the Five-Point Likert scale that provided a great amount of freedom of the sample when answering the survey list questions, and to make the results more accurate, as the reliance on the Likert scale can convert the descriptive statements into quantitative statements to be treated statistically in a simple way. The Five-Point Likert scale helps design the questionnaire list on five weights, thus Likert scale ranges from: 1. Strongly Agree, 2. Agree, 3. Somewhat Agree
4. Disagree, 5. Absolutely Disagree

C- The Stage of Distributing and Collecting the Questionnaire List:

The lists were distributed to the study sample to answer at a specific time, and then the data were collected and statistically analyzed after testing its statistical viability to a normal distribution of the data.

(4.1.4) Statistical Methods Used in Data Analysis

- **Descriptive Analysis** which can be used to determine the attributes of the study samples through recognizing the mean averages and standard deviation.
- **Cronbach's Alpha Test** can be used to determine the validity and reliability of the questions in the questionnaire.
- **One-Sample Kolmogorov-Smirnov Test** which tests the normal distribution of the study data to determine the suitable statistical tests to analyze the desired data.
- **Kruskal-Wallis Test** which determines the main differences between the trends of the study sample around the role of Sustainable Supply Chain Management to maximize the Environmental performance of retail petrol stations in Saudi Arabia according to demographic characteristics.
- **Correlation Analysis (Pearson)** which estimates the strength and direction of the relationship between the Sustainable Supply Chain Management and the Environmental performance of retail petrol stations in Saudi Arabia. The correlation analysis and determination of the relative contribution can eliminate the personal bias effect in answers to the questions.
- **Multiple Regression Analysis** which can be used to identify the most important predictive variables of adopting Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia, as the independent variables appears in the model to illustrate its role in Environmental performance of retail petrol stations in Saudi Arabia.

(4/2) Data Analysis and Test Hypotheses

This section describes the extent of validity and reliability of questions, it includes the statistical methods adopted by the researcher for testing and analyzing the data, it clarifies the main features, using the methods of the most accepted descriptive analysis such as Mean, Rank and the standard deviation. This section discusses the following elements:

(4/2/1) Analyzing the characteristics of the study sample.

(4/2/2) Testing the validity and reliability of the questionnaire list.

(4/2/3) Analyzing the normal distribution of the data.

(4/2/4) Descriptive analysis of the study variables.

(4/2/5) Testing the study hypotheses and analyzing the results.

(4/2/1) Analysis of the characteristics of the study sample.

The characteristics of the study sample can help to obtain more accurate data and play an important role in explaining the study results, so that we can rely on them. A set of characteristics such as (scientific qualifications, work experience, training courses) have an important value in determining the extent of understanding the questions by the study sample.

➤ Distribution of the study sample according to respondent gender.

Table (4/4)

Distribution of the study sample according to the gender

Gender	Frequency	Percent
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Male	29	87.9
Female	4	12.1
Total	33	100.0

(Source: researcher's calculation)

The table (4/4) illustrates that a big number of the respondents are male , as they represent (87.9%) , followed by 12.1 % of respondents are female.

Distribution of the study sample according to Length of Work in the Company can be illustrated in table (4\5).

Table (4/5)

Distribution of the study sample according to Length of Work in the Company

Length of Work in the Company	Frequency	Percent
Between 2-5 years	15	45.5
Between 5-8 years	6	18.2
Between 8-10 years	4	12.1
More than 10 years	8	24.2
Total	33	100.0

(Source: researcher's calculation)

The table (4/5) shows that the high level of **Length of Work in the Company**, as (45.5%) of the respondents Between 2-5 years of experience in company, followed by (24.2%) of the respondents More than 10 years of experience in company.

Distribution of the study sample according to **Number of Workers Fuel Station** will be illustrated in Table (4\6).

Table (4/6)

Distribution of the study sample according to Number of Workers Fuel Station

Number of Workers Fuel Station	Frequency	Percent
From 20 to 60 <i>Employees</i>	27	81.8
<i>Over 100 Employees</i>	6	18.2
Total	33	100.0

(Source: researcher's calculation)

The table (4/6) declares the high level of Number of Workers Fuel Station, as (81.8%) of stations have From 20 to 60 Employees and 18.2 of stations have Over 100 Employees.

Through the previous presentation it is possible to confirm the possibility of relying on the results obtained as they are based on a high balance of experience and education.

(4/2/2) Testing the validity and reliability of the questionnaire list

This test aims to assess the degree of stability and reliability of each axis in addition to its items, so the researcher can rely on the results of statistical analysis of the questionnaire and generalize them on the study population. To determine the efficiency of the questionnaire list, the researcher can use the test of Cronbach's Alpha which measures the reliability and stability of the survey. According to statistical standards, the value is accepted in case of the desired limits (equal or greater than 60%) to apply the results to the study population (Sekaran & Bougie, 2016). The following items can be considered.

❖ Reliability of Measurements in the Study

It means that the same results of the measurements will be given in case of redistributing them in any time and under the same conditions. To test the reliability and stability of the questionnaire, Cronbach's Alpha test is used.

❖ **Validity of the Items in the Study**

The validity of any measurements was confirmed through the reliability coefficient, as it was one of the main statistical methods. The validity coefficient is equal the square root of alpha Cronbach coefficient, it must be in the needed limit (equal or more than 60%).

According to the previous information, table (4/8) will declare the analysis of reliability and validity of the basic variables in the survey.

Table (4/8)
The reliability & validity of the basic variables in the survey

Basic Axes of the Questionnaire	Coding	Number of statements	Reliability coefficient	Validity coefficient
Economic Sustainability	X1	4	0.663	0.814
Environmental Sustainability	X2	4	0.756	0.869
Social Sustainability	X3	6	0.755	0.868
Sustainable Supply Chain Management		14	0.879	0.937
Environmental performance of retail petrol stations in Saudi Arabia		5	0.876	0.936
Total Items of (X & Y)		19	0.932	0.965

(Source: researcher's calculation)

- Table (4/8) illustrates that the value of validity coefficient at the survey level in general is (96.5%), which is statistically good. The validity coefficient values for all the questions and axes of the survey list are (0.814, 0.869, 0.868, 0.835, 0.754, 0.875, 0.897, 0.8, 0.896) also statistically good. The validity coefficient is 60% or more.
- Table (4/8) also shows that the value of the reliability coefficient at the survey level in general is (93.2%), which is statistically good. The reliability coefficient values for all the questions and statements of the survey list are (0.663, 0.756, 0.755, 0.698, 0.569, 0.766, 0.805, 0.640, 0.804) also statistically good. The reliability coefficient is 60% or more. Therefore, the survey list has a high degree of internal consistency and reliability, and the researcher can rely on them to achieve the objectives of the study and popularize the results.

(4.2.3) Analyze the normal distribution of the data

The researcher depends on the test of One-Sample Kolmogorov Smirnov to determine whether the study data follows the normal distribution or not, then the researcher can choose the appropriate statistical tests to analyze the study data. Table (4/9) shows the results of One Sample Kolmogorov Smirnov test:

Table (4/9)

The results of (Kolmogorov-Smirnov) test for the normal distribution of the data

Coding	Questionnaire Axes	Test Statistic	P-value
X1	Economic Sustainability.	0.155	.000
X2	Environmental Sustainability.	0.219	.000
X3	Social Sustainability.	0.118	.000
X	Sustainable Supply Chain Management	0.186	.000

Coding	Questionnaire Axes	Test Statistic	P-value
Y	Environmental performance of retail petrol stations in Saudi Arabia	0.165	.000

(Source: researcher's calculation)

Table (4/9) illustrates that P-value (significant) for test statistic in Kolmogorov test is less than (0.05), so the data does not follow the normal distribution. On the other hand, the researcher will rely on nonparametric tests to prove the hypotheses validity and achieve more accurate results.

(4/2/4) Descriptive analysis of the study variables

This sub-section will show the results of descriptive statistical analysis that related to the impact of Sustainable Supply Chain Management environment on Environmental performance of retail petrol stations in Saudi Arabia. The descriptive statistical analysis that includes (mean & standard deviation) will be applied in determining the trends of the sample; to identify the most important statements as well as the least important one.

Table (4/10)
Relative importance of standard means of the survey items

Standard Average	Proportional Importance
From 1 to 1.79	Very Little
From 1.8 to 2.59	Little
From 2.6 to 3.39	Average
From 3.4 to 4.19	High
From 4.2 to 5	Very High

Source: (Matell & Jacob, 1971)

The previous table (4/10) shows the relative importance of the questionnaire items is determined according to the scale and numbers in this table.

- The descriptive analysis of the sample responses for the independent variables (X) will be as follows:

1.2.4.1 Descriptive analysis of Economic Sustainability

Table (4/11)
The descriptive analysis of Economic Sustainability

Statement		Mean	Standard Deviation	Rank
X11	Fuel Station's material procurement costs have decreased	4.68	0.708	1
X12	Fuel Station's energy consumption costs have decreased	3.83	1.013	3
X13	Fuel Station's waste management charges have decreased	3.71	1.374	4
X14	Fuel Station has reduced the charges paid for the disposal of wastes	4.06	1.197	2
X1	Economic Sustainability	4.06	0.529	

(Source: researcher's calculation)

- Table (4/11) declares that the trends of the sample of the study showed a general agreement towards approving the expressions related to the first independent variable (Economic Sustainability) with a Mean (4.06) and standard deviation (.529).
- The most general agreement in the views of the sample is that the highest dimension to achieve this variable is (Fuel Station's material procurement costs have decreased) with a Mean (4.68) and standard deviation (0.708).

The lowest dimension for this variable is (Fuel Station's waste management charges have decreased) with a mean (3.71) and standard deviation (1.374).

4.2.4.2 The descriptive analysis of Environmental Sustainability

Table (4/12)

The descriptive analysis of Environmental Sustainability

	Statement	Mean	Standard Deviation	Rank
X21	Fuel Station reduced the amount of wastewater	4.48	0.619	1
X22	Fuel Station reduced the amount of solid waste	4.20	0.930	3
X23	Fuel Station reduced the number of environmental accidents	3.99	1.214	4
X24	Fuel Station improved its environmental management system and practices	4.21	1.012	2
X2	Environmental Sustainability	4.14	0.630	

(Source: researcher's calculation)

- Table (4/12) illustrates that the trends of the sample of the study showed a general agreement towards approving the expressions related to the second independent variable (Environmental Sustainability) with a Mean (4.14) and standard deviation (.630).
- The most general agreement in the views of the sample is that the highest dimension to achieve this variable is (**Fuel Station reduced the amount of wastewater**) with a Mean (4.48) and standard deviation (.619).

The lowest dimension for this variable is (**Fuel Station reduced the number of environmental accidents**) with a Mean (3.99) and standard deviation (1.214).

4.2.4.3 The descriptive analysis of Social Sustainability

Table (4/13)**The descriptive analysis of Social Sustainability**

Statement		Mean	Standard Deviation	Rank
X31	Fuel Station implements occupational health and safety, work standards compliance, and audit systems for our supply chain partners	4.64	0.625	1
X32	Fuel Station develops systems of professional ethics with our supply chain partners	4.05	0.904	4
X33	Fuel Station and supply chain partners have reduced the health risk that consumers may encounter	3.97	1.073	5
X34	Fuel Station has benefited employees throughout the supply chain	3.90	1.195	6
X35	Fuel Station and supply chain partners have reduced occupational safety and health risks in new products/processes developed over the last two years	4.27	0.759	2
X36	Fuel Station carries out supply chain strategy changes that minimize adverse impacts	4.13	1.103	3
X3	Social Sustainability	4.21	0.491	

(Source: researcher's calculation)

- Table (4/13) shows that the trends of the sample of the study showed a general agreement towards approving the expressions related to the third independent variable (Social Sustainability) with a mean (4.21) and standard deviation (.491).
- The most general agreement in the views of the sample that the highest dimension to achieve this variable is (Fuel Station implements occupational health and safety, work standards compliance, and audit systems for our supply chain partners) with a Mean (4.64) and standard deviation (.625).

The lowest dimension for this variable is (Fuel Station has benefited employees throughout the supply chain) with a Mean (3.90) and standard deviation (1.195).

➤ **The descriptive analysis of the sample responses for the dependent variables (Y) will be as follows:**

Table (4/17)

The descriptive analysis of the impact of Sustainable Supply Chain Management on the Environmental performance of retail petrol stations in Saudi Arabia

Statement		Mean	Standard Deviation	Rank
Y11	Fuel Station has reduced consumption of hazardous/toxic material	4.04	1.082	4
Y12	Fuel Station has reduced air emissions	4.39	0.651	1
Y13	Fuel Station has reduced effluent wastes	4.06	1.199	3
Y14	Fuel Station has sought to improve its environmental image/position	3.79	1.359	5
	Fuel Station has reduced energy consumption	4.09	0.999	2
Y1	Environmental performance of retail petrol stations in Saudi Arabia	4.07	0.877	

(Source: researcher's calculation)

- Table (4/17) declares that the trends of the sample of the study showed a general agreement towards approving the expressions related to the dependent variable (Environmental performance of retail petrol stations in Saudi Arabia) with a mean (4.07) and standard deviation (.877).
- The most general agreement in the views of the sample is that the highest dimension to achieve this variable is (Fuel Station has reduced air emissions) with a Mean (4.39) and standard deviation (0.651).

- The lowest dimension for this variable is (Fuel Station has sought to improve its environmental image/position) with a Mean (3.79) and standard deviation (1.359).

Testing the study hypotheses and analyzing the results

This section shows the results of statistical tests related to the hypotheses as follows:

(4.2.5.2) Testing the relationship between Sustainable Supply Chain Management and Environmental performance of retail petrol stations in Saudi Arabia

" There is no significant relationship between the applying of Sustainable Supply Chain Management and the Environmental performance of retail petrol stations in Saudi Arabia ". To test this hypothesis, the Pearson coefficient will be used for correlation analysis and table (4/26) can show the results of this test as follows.

Table (4/26)
Matrix correlation coefficients between the basic Variables (X & Y)

	Statistics	Sustainable Supply Chain Management (X)	Environmental performance of retail petrol stations in Saudi Arabia (Y)
Sustainable Supply Chain Management (X)	Correlation coefficient (Pearson)	1	.697**
Environmental performance of retail petrol stations in Saudi Arabia (Y)	Significance level		0.000
	Correlation coefficient (Pearson)	.697**	1
	Significance level	0.000	
	Significance level (0.01)		

(Source: researcher's calculation)

The table (4/26) can illustrate the strong positive correlation between the basic variables (X, Y) (Sustainable Supply Chain Management & Environmental performance of retail petrol stations in Saudi Arabia), as the correlation coefficient is (0.697**) according to the correlation of Person, and at a significance level of (1%). It is also noted that there is an assurance related to the validity of the statements that can be used to measure the study variables, therefore the basic variables (X, Y) are really correlated.

- It is noted from previous correlation results that the second hypothesis “There is no significant relationship between applying Sustainable Supply Chain Management and the Environmental performance of retail petrol stations in Saudi Arabia” can be rejected and accept alternative hypothesis that there is significant relationship between applying Sustainable Supply Chain Management and the Environmental performance of retail petrol stations in Saudi Arabia.

(4.2.5.3) Testing the impact of Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia

“There is no significant impact of applying Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia”. The table (4/28) illustrates the results of multiple regression analysis as follows:

Table (4/28)

The results of multiple regression test related to the most important variables

affecting the Environmental performance of retail petrol stations in Saudi Arabia

Symbol	Variables	Unstandardized coefficients		Standardized Coefficients	T	P-value	TOL	VIF
		B	Std. Error					
X1	Economic Sustainability.	0.093	0.060	0.124	1.551	0.123	0.404	2.478
X2	Environmental Sustainability	0.147	0.051	0.233	2.866	0.005	0.389	2.569
X3	Social Sustainability.	0.177	0.048	0.218	3.705	0.000	0.743	1.347
Constant				1.075				
Correlation coefficient (R)				.714				
Determination Coefficient (R2)				.509				
Adjusted determination coefficient (Adj.R2)				.494				
F-test				32.871				
P-value				0.000				

(Source: researcher's calculation)

❖ Table (4/28) explains the significance of the model in testing the most important variables affecting the dependent variable (Y), as (F-test) is (32.871) and (P-value) is (0.000), which can show that the model is valid for predicting the value of (Y) and the results have a statistical significance as the significance level is (0.000) less than (5%), which helps us in making the decision. Moreover, the variance inflation factor (VIF) for each variable is less than (10) and tolerance (T) is greater than (0.1) for each variable, meaning that there is no multi-collinearity among the explanatory variables so the researcher can rely on the results of this model. There is a high correlation (.714) between the independent variables in the previous table and the dependent variable (Y: Environmental performance of retail petrol stations in Saudi Arabia), and the determination coefficient (R2) reveals that

the explanatory variables are contributing to explain 50.9% of the variation in (Y) dependent variable.

- ❖ The results show that the variables (Social Sustainability, Environmental Sustainability,) have a positive impact on the dependent variable (Y: Environmental performance of retail petrol stations in Saudi Arabia) at 5% significance level. We can use the following equation to illustrate the main result obviously:

$$Y = 1.075 + 0.093X_1 + 0.147X_2 + 0.177X_3$$

Therefore, we can refuse the third hypothesis: "There is no significant impact of applying Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia "and accept the alternative hypothesis that there is a significant statistical impact of applying Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia.

(4/3) Summary

This chapter deals with the field study including the questionnaire prepared by the researcher and then distributing them to the study sample. The first section explained the methodology of the field study included the study population and sample, study variables, study data collection, the statistical methods which can be used to test the validity of hypotheses and finally the study hypotheses, The second section covers the analyses of the study data

and testing the validity of hypotheses. They can be illustrated as follows:

- The study data does not follow the normal distribution, so the researcher can use nonparametric tests to prove the hypotheses validity and achieve more accurate results.
 - Cronbach's Alpha test declared the validity of study tools, and then the researcher can trust it to achieve the study goals.
 - The descriptive analysis illustrated that there is an agreement in the study sample opinions related to the basic variables included (Economic Sustainability, Environmental Sustainability, Social Sustainability. The impact of Sustainable Supply Chain Management on the Environmental performance of retail petrol stations in Saudi Arabia, Benefits of Sustainable Supply Chain Management for a company's business, The impact of Sustainable Supply Chain Management on Environmental performance of retail petrol stations in Saudi Arabia).
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- ❖ **H1:** There is a significant relationship between applying Sustainable Supply Chain Management and the Environmental performance of retail petrol stations in Saudi Arabia.
 - ❖ **H2:** There is no significant impact of a Economic Sustainability on Environmental performance of retail petrol stations in Saudi Arabia.

- ❖ **H3:** There is a significant impact of **Environmental Sustainability** on Environmental performance of retail petrol stations in Saudi Arabia
- ❖ **H4:** There is a significant impact of **Social Sustainability** on Environmental performance of retail petrol stations in Saudi Arabia

Recommendations :

Based on the results of the study, the following eight recommendations can be made:

1. Enhance Environmental Sustainability Practices:

- Retail petrol stations in Saudi Arabia should prioritize environmental sustainability practices as they have a significant positive impact on environmental performance. This includes reducing emissions, improving waste management, and adopting cleaner energy sources.

2. Strengthen Social Sustainability Initiatives:

- Given the positive impact of social sustainability on environmental performance, companies should invest in social programs that benefit both employees and local communities. This could include community engagement initiatives, fair labor practices, and social responsibility programs.

3. Promote Economic Sustainability:

- Although the impact of economic sustainability on environmental performance was not found to be significant, it should not be overlooked. Petrol stations should aim to balance economic goals with environmental and social objectives to achieve long-term sustainability.

4. Implement Comprehensive Sustainable Supply Chain Management (SSCM):

- The significant relationship between SSCM and environmental performance suggests that retail petrol stations should fully integrate sustainable practices across their supply chain. This includes selecting suppliers committed to sustainability and reducing the environmental impact of logistics and procurement.

5. Continuous Monitoring and Evaluation:

- To ensure the effectiveness of sustainability initiatives, petrol stations should establish continuous monitoring and evaluation mechanisms. Regular assessments will help in identifying areas for improvement and ensure that sustainability goals are being met.

6. Increase Awareness and Training:

- Companies should invest in training programs to increase awareness and understanding of sustainability among employees. Educating staff about the benefits and practices of SSCM can lead to better implementation and enhanced environmental performance.

7. Leverage Technology for Sustainability:

- The adoption of advanced technologies can significantly enhance sustainability efforts. Retail petrol stations should explore the use of digital tools and innovations, such as IoT for energy management, to improve efficiency and reduce environmental impact.

8. Engage Stakeholders in Sustainability Efforts:

- Collaboration with stakeholders, including customers, suppliers, and regulatory bodies, is essential for achieving sustainability goals. Petrol stations should engage stakeholders in dialogue and partnerships to drive collective action towards better environmental performance.