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Developing a Model for Assessing Sustainability in Governmental Schools in Palestine: Case Study of Ramallah Schools

By

Aman Omar Adas

Supervisor

Dr. Yahya Saleh

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THESIS APPROVAL

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By

Aman Omar Adas

This thesis was defended successfully on 30/08/2021 and approved by:

Committee Member	Signature
1. Supervisor: Dr. Yahya Saleh,	.....
2. Internal examiner Dr. Ashraf Almimi,	.....
3. External examiner Dr. Ahmad Ramahi,	.....

DECLARATION

I certify that this thesis submitted for the Master's degree in Strategic Planning and Fund Raising is the result of my own research, except where otherwise acknowledged and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Name: Aman Omar Adas

Signature: A.O.A

Date: 25/11/2021

Dedication

To the pure souls of my father (Dr. Omar Adas) and mother (Sameera Abu-Shanab),

may God have mercy on them.

To my beloved, supportive husband Khalid Zeineddin.

To my lovely loving sons Amer, Ameer and Kareem.

To every member in my great family,

and to all those who made this achievement possible…

love and unlimited gratitude.

ABSTRACT

Sustainability and the seventeen sustainable development goals (17SDGs) are gaining an increasing importance in different sectors in the globe. Among the 17 SDGs is goal no. 4 on quality education which ensures inclusive and equitable quality education and promote lifelong learning opportunities for all. To contribute in promoting this goal in Palestine, this study aims to assess the three pillars (economic, environmental and social) of sustainability in governmental schools in Palestine taking Ramallah governorate as a case study as perceived by those governmental schools principals.

To this end, a quantitative hypothesis-testing research approach was adopted. Primary data were collected from a random sample of 70 governmental schools via personally-administered and online questionnaires answered by school principals themselves. The questionnaire consisted of three parts; one for schools' data demographics, the second for sustainability pillars-related data and the last one was for measuring the impact of sustainability on the quality of school education.

Collected data were statistically analyzed using both the SPSS and Smart SEM-PLS. More specifically, descriptive and some inferential statistics were conducted through SPSS while the evaluation of the relevant measurement (outer) and structural (inner) models was conducted by Smart SEM-PLS. The findings revealed that the correlation of the environmental dimension indicators on sustainability was the highest, followed by social aspect indicators and the lowest was related to the economical aspect indicators. It was also found that the expected impact of sustainability in schools on educational quality would be high. Furthermore, a school sustainably assessment tool (SSA-tool) was developed based on the weights of sustainability criteria and sub-criteria generated by the analytic hierarchical process (AHP) using Expert Choice 11 software. The AHP

results reveal that environmental, economic and social sustainability main pillars' weights are found to equal, 30.3%, 36.5% and 33.2%. Also, a comparison of the SSA-tool weights with weight of other rating systems, namely, LEED, CASBEE, BREEAM and GP-tool was conducted. To facilitate the use of the SSA-Tool for assessment, an Excel template of the SSA-tool was developed and validated on a random sample of schools from the 90 targeted ones. The SSA-Tool proved to be valid for assessing the school sustainability quantitatively and qualitatively

A set of managerial implications for policy makers in the Palestinian school education system were provided. Also, one important recommendation to the Ministry of Education is to revisit the policies of the educational system in Palestine and take into consideration sustainability in those policies.

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Chapter One

Introduction

1.1 General Background

In the past few decades, humans have achieved an enormous industrial and technological development in various fields but unfortunately this was on the expenses of other things. More specifically, this development is accompanied by serious damage in ecosystems and communities. Such damage is apparent in pollution, global warming, rising ocean levels, ozone depletion, and many other serious environmental impacts caused by humans, in addition to many economic and social problems such as poverty and inequality in the distribution of wealth, (Lior, 2008).

New global trends have crystallized through the adoption of the seventeen 2030 Sustainable Development Goals (SDGs), especially the fourth goal which is to "*ensure quality, equitable and inclusive education for all and enhance lifelong learning opportunities for all*". In the sequel, many developed and developing countries around the globe have started serious initiatives to cope with these SDGs in general and with the fourth goal in particular. As a developing country, the Palestinian government has adopted a national policy agenda that reflects national priorities for the six years (2017-2022), and at the forefront of these priorities is the quality of education for our children in Palestine. To this end, the Palestinian education sector began preparing the strategic plan for the years 2017-2022, based on the third strategic plan for education 2014-2019 and the foundations of reliable work structures and programs in the desired development.

The Palestinian Ministry of Education commissioned a team of senior officials in the preparation of the sectorial strategy for education for 2017-2022 based on the vision of

education in Palestine stated as *"Palestinian society that possesses values, science, culture and technology to produce knowledge and use it in liberation and development"* and based on the SDG 2030 framework and committed to the national policy agenda 2017-2022.

The strategic plan for education sector for 2017-2022 aims mainly at transforming the education system from teaching method (indoctrination and memorization) to student-centered, dynamic pedagogical methods by a qualified teacher who plays as a facilitator for learning, developing skills and competencies rather than providing knowledge. This requires a qualitative transformational process in the educational system with profound and difficult reforms in the current curriculum, assessment system, and learning styles education, the roles of teachers, supervisors, and a more results-based system of education management.

In addition to the human resources (students, administration and teaching staff) and the curricula, another important component for the success of the education system is the school building itself represented by the facilities design, construction, decorations and most importantly its sustainability as it is intended to be used perpetually!! The effectiveness of any sustainability assessment model for school buildings is not one-dimensional; instead it is multi-dimensional, namely, environmental, economic and social effectiveness.

To talk about the effectiveness of the evaluation model used in any institution, it was found that the institution's building must be evaluated comprehensively in three aspects, which are the environmental, social and economic aspects. Such multi-dimensional model contributes significantly to the application of the model in the various stages of

the school building starting with the design and construction, followed by the operation of the building and the maintenance, (Ali and Al Nsairat 2009).

This research aims to study and analyze tools for assessing the sustainability of well-known school buildings such as: Green Star - Design and Construction, LEED BD + C (Building and Construction Design), BREEAM UK New Construction, and CASBEE-NC for the purpose of developing a model to assess sustainability of schools in Palestine. This study contributes to a better understanding of the concept of sustainability assessment in Palestinian schools, and the developed model may play a crucial role in achieving sustainable development in governmental schools. Private and UNRWA schools were excluded from this study as these schools do not represent the majority in Palestine, besides, they have different educational, administrative and infrastructural settings which make them heterogeneous than the governmental schools. However, the same research methodology can be literally applied for assessing the sustainability in the non-governmental schools in Palestine, which is left as a future research work.

1.2 Problem Statement

Education is included in the 2030 Agenda for Sustainable Development and is a key element for success to achieve all sustainable development goals. In recognition of the importance of the role of education, the 2030 sustainable development plan highlights education as a standalone goal. Goal 4 for sustainable development, stipulates that "*Ensuring quality, fair and inclusive education for all, and enhancing lifelong-learning opportunities for all*". In order to achieve Goal 4 on education among the SDGs, and to achieve other education-related goals contained in other SDGs, mobilization of efforts

at the national, regional and international levels will be required, (The strategic plan of the Ministry of Education 2014-2019).

The Ministry of Education leads the education sector in Palestine, being the official institution responsible for managing the organization and development of the educational system either directly-managed or through supervision of it (in all its sectors). Pre-school/kindergarten, school education 1-12, vocational and technical education, non-formal education, higher education, and the ministry in its official capacity leads the national efforts for strategic planning for education sector in the State of Palestine. The ministry has set major goals and sub-goals for each of the aforementioned strategic plan goals and major policies and strategies have been developed to achieve these goals that will be followed up and evaluated and any proposed alternatives developed. But there are some obstacles and challenges facing the education process in Palestine through several main axes related to various aspects, such as the nature of school buildings and classrooms, as well as rented buildings, restoration and maintenance, multiple parties to supervise education, occupation authorities which enter the education sector and interfere in school curricula, school dropout and education in area C in Palestine, (The strategic plan of the Ministry of Education 2014-2019).

In spite of all the efforts made to achieve the goals of the strategic plan for the education sector, some emergency situations may arise and some threats to the entire educational staff may exist for students, administrative staff and even the local community. The incident of the collapse of part of the Al Safa Basic School for Girls in the Directorate of Education Hebron (on 12/25/2019) as a result of excavation work alongside it is one example of such threats. The ministry confirmed that it had started

an investigation jointly with the relevant parties in the accident, and all necessary and deterrent legal measures were taken to preserve the safety of students and school workers, and not to harm them. Also, it will take all appropriate measures; to provide a safe learning environment for students and to achieve their interests and safety. Another collapse occurred in the wall of the Silat Al-Dhaher Secondary School for Girls in 2018, in the Directorate of Education in Qabatia, which affected the residential building adjacent to the school due to rain and stormy conditions, and the actual causes of this accident were identified to avoid any similar incidents in the future.

At present, there is no tool to measure school sustainability. So, there is a need to develop a model for assessing school sustainability in Palestine. To date, there is no consensus about sustainability assessment tool for measuring sustainability of schools that can be used globally because of the different conditions and priorities according to the region where the tool will be used. Therefore, there is a need to develop a school sustainability model in the local context of the countries depending on the circumstances and priorities in that region. To this end, the current study aims at developing such a model for assessing the sustainability of Palestinian governmental schools economically, socially and environmentally for the purpose of guaranteeing and securing the quality of the services they offer to the Palestinian community.

1.3 Significance of the Research

The importance of this research lies in the main role that education in all its forms plays in Palestinian society, whereby through this research study and evaluation of sustainability in Palestinian schools is the focus of the educational process and the attractive and incubating environment for it. Schools play with their administrative and supervisory teams and their students a key role in providing an educational environment

which contributes to raising the profile of students and upgrading the level of education, ensuring the achievement of the main strategic goal of the Palestinian Ministry of Education. Here, the following question can be asked: *Can we establish sustainable governmental schools in Palestine?* This is what Paul Clarke touched as his study concluded that societies in all countries urgently need to accept changes in their practice, and the urban mind must be re-educated with the concept of sustainability and hard work by leaders in countries to adopt approaches to seek to reach sustainability in all its aspects So we must all strive for the concept of a school renaissance for sustainability, (Clarke, 2012).

School buildings are considered one of the most important government buildings in any country, because they deal with the formation and education of the individual in society, and contribute to supporting the economy of nations due to possible environmental, economic and social problems, especially in developing countries, where the development of sustainability assessment tools is necessary (Ali and Nsairat 2009). Palestine has a unique particularity in these countries due to the exceptional circumstances that Palestinian schools have been encountering for many years. More specifically, Palestinian governmental schools for several years ago, as the environmental, economic and even social problems that have been arising constitute an urgent necessity to develop sustainability assessment tools in Palestine (Ali and Nsairat 2009). Economically, the Palestinian economy is an economy that is dependent on the economy of the occupation and there are many obstacles that are clearly practiced against its development, such as preventing and hindering the export of Palestinian products through crossings internally or externally. Socially-speaking, other tangible obstacles on the ground, because of the high rates of growth in the Palestinian society,

according to the Palestinian Central Bureau of Statistics (PCBS), the population growth rate in the West Bank in 2018 was about 2.8% (PCBS, 2018). Environmentally-speaking, it is noted that there is a shortage of natural resources as the Palestinian government lacks control over water and gas resources available in the West Bank, and depends on imported energy supplies, especially electricity and petroleum products. As it is expected that the demand for energy will increase due to the rapid rate of population growth, so it was necessary to achieve sustainability in Palestinian governmental schools and to develop a model for assessing sustainability in them in order to direct those schools towards achieving sustainability in the future.

1.4 The Research Questions

This research aims at answering the following questions:

1. What type of indicators can be considered in developing an assessment model to evaluate and improve the sustainability of governmental schools in the Palestinian context?
2. How does sustainability at governmental schools in Palestine affect the education quality?
3. How to prioritize, and weight the indicators of sustainability according to the Palestinian context?
4. How to develop a model to be used for assessing and improving the sustainability in Palestinian schools?

1.5 The Objectives of the Research

The general purpose of this research is to assess the sustainability of governmental schools and study its impact on the educational quality as perceived by schools' principals, in order to work on developing a model for sustainability assessment for

schools to be used in the local Palestinian context based on the various current international assessment systems. This would contribute to guiding and improving the sustainability of Palestinian schools. To reach this goal, several research objectives have been developed:

1. Highlighting and analyzing the Palestinian governmental schools' sustainability status (i.e. economic, social, and environmental contexts) and its relation with quality of education.
2. Exploring and prioritizing the sustainability indicators according to the Palestinian context (available recourses, standards, regulations, and challenges).
3. Developing a sustainability assessment model to be used in the local Palestinian schools.
4. Testing and validating the developed model to reveal to what extent the sustainability is considered in the Palestinian governmental schools.

1.6 Research Hypotheses

In accordance with the research questions, the following nine hypotheses will be investigated in this study:

- **First hypothesis (H1):** There are no statistically significant differences at (α =0.05) level between schools' overall score, environmental, economic, and social sustainability attributed to the variable of school's location.
- **Second hypothesis (H2):** There are no statistically significant differences at (α =0.05) level between schools' overall score, environmental, economic, and social sustainability attributed to the variable of school's date of establishment.

- **Third hypothesis (H3):** There are no statistically significant differences at (α =0.05) level between schools' overall score, environmental, economic, and social sustainability attributed to the variable of school specialty.
- **Fourth hypothesis (H4):** There are no statistically significant differences at (α =0.05) level between schools' overall score, environmental, economic, and social sustainability attributed to the variable of school capacity.
- **Fifth hypothesis (H5):** There are no statistically significant differences at (α =0.05) level between schools' overall score, environmental, economic, and social sustainability attributed to the variable of school building areas.
- **Sixth hypothesis (H6):** There are no statistically significant differences at (α =0.05) level between schools' overall score, environmental, economic, and social sustainability attributed to the variable of achieving the objectives of the educational process in line with the policies of the Ministry of Education.
- **Seventh hypothesis (H7):** There are no statistically significant differences at (α =0.05) level between schools' overall score, environmental, economic, and social sustainability attributed to the variable of the satisfaction of the local community and partners about the school's performance and its role in the community
- **Eighth hypothesis (H8):** There are no statistically significant correlation at the level of (α=0.05) between sustainability and the satisfaction of parents with the performance of the school and the performance of their students.
- **Ninth hypothesis (H9):** There are no statistically significant correlation at the level of (α=0.05) between sustainability and student achievement**.**

- **Tenth hypothesis (H10):** There is statistically significant correlation at (α =0.05) level between sustainability and teachers' motivation to work, affiliation and performance.
- **Eleventh hypothesis (H11):** There is statistically significant correlation at (α =0.05) level between sustainability and school quality.

1.7 Deliverables

The main deliverable of this research is a sustainability assessment model to assess the sustainability of Palestinian governmental schools. More specifically, a school sustainability assessment tool to improve West Bank schools' sustainability (SSA-Tool) is developed. In addition, a full descriptive analysis about environmental, economic, and social sustainability status in West Bank Schools is provided.

It is worth noting that the research also resulted in the ease of measuring the degree of the impact of sustainability in governmental schools after analyzing the environmental, economic and social sustainability realities in them, as well as the possibility of measuring the impact of sustainability on the quality of education in the same schools after involving the main stakeholders in the educational process. All pertinent data has been collected from the schools' principals who reported their perceptions on sustainability, educational quality and other school demographics. Schools' principals have been chosen to participate in this study and report the needed data because they represent top management in running their schools and are responsible for handling the educational, administrate, logistic, technical and infrastructural in their schools. Thus, they have enough knowledge and experience in answering the study questions and correctly judging the sustainability reality in their schools.

1.8 Thesis Structure

This thesis consists of five chapters, and a brief discussion about these chapters are presented below. Chapter One includes a brief background is presented on the main topic, and then a discussion of the research problem and its importance, in addition to the research questions and some assumptions and expected results. Chapter Two deals with the literature related to the concept of sustainability and some concepts of quality assurance, in addition to that the chapter discusses in depth the concept of sustainability within the educational sector and schools in particular. Moreover, some well-known Sustainability Assessment (SA) tools are highlighted and some previous literary studies that have focused on the use of SA tools to assess a specific type of building are discussed. Chapter Three summarizes the methodology followed to conduct the study, and it includes presenting how to design the research, types of data, how to collect and analyze them, and the techniques used for this purpose.

Chapter Four presents the results, analysis and discussion by presenting and discussing the results related to the establishment and evaluation of evaluation elements, and the results of school evaluation in the West Bank. Chapter Five includes the conclusions and recommendations of the study as well as managerial implications, the limitations and suggestions for future works.

Chapter Two

Literature Review

2.1 Overview

This chapter provides a review of literature related to the education sector in general and schools in particular. The chapter first discusses the concept of sustainability and its dimensions, then follows the concept of environmental, economic and social sustainability in educational buildings and schools in particular. The most important challenges to sustainability in schools are also discussed.

Then during the chapter, the concept and principles of SA and how to develop environmental assessment methods to reach ways to assess sustainability are presented and discussed, in addition to highlighting the concept of indicators and its important role in assessing sustainability. The main criteria for developing these indicators are also clarified, as well, the chapter analyzes the most important studies in the field of developing quality assurance tools in buildings in general and schools in particular.

Also, a set of topics related to SA in buildings are reviewed, such as the differences between green buildings and sustainable buildings and green valuation tools used to assess building sustainability. Finally, the chapter provides a brief analysis of the Palestinian context with a focus on the West Bank area where SSA tool-WB is implemented, where the analysis includes environmental, social and economic aspects. In addition, the educational sector in Palestine is explored in general, with a focus on the schools that are the focus of the study. Moreover, the chapter highlights some important sectors such as the energy and waste sectors, and explores the challenges facing Palestinian society and the educational sector in particular and progress towards sustainability.

2.2 The Concept of Sustainability

The concepts of sustainability or sustainable development (SD) have a remarkable recognition by international organizations, governments and a number of researchers for several decades. As many definitions of sustainability and sustainable development are included, as an example, according to the US Environmental Protection Agency (US EPA), Sustainability is to support both current and future generations to meet their needs by creating the conditions in which human-environmental relationships are harmonious (EPA, Sustainability | US EPA, 2017).

In his research, Ben Elie (2006) defined sustainability as a dynamic equilibrium between human development and the environment, as a person uses a number of environmental resources in the development process without causing significant and irreversible damage to the environment upon which his life depends.

The term SD had been presented by several definitions and meanings, depending on how they are interpreted by companies, governments, social reformers, and environmental activists, (Giddings et al., 2002).

According to previous research, it can be seen that the terms SD and sustainability were used synonymously, but it can be found that some researchers have seen a difference between the two concepts. To explain this difference between the two terms, we concluded that SD can be seen as the needed process by which we reach sustainability, (Diesendorf, 2000).

According to the Brundtland Report in 1987, sustainable development (SD) was defined as " *development that meets the needs of the present generations without compromising the ability of the future generations to meet their own needs*" (World Commission on Environment and Development, 1987). According to the previous definition,

sustainability is the condition in which our needs are met without affecting the needs of other generations. In addition, sustainability is linked to long-term goals instead of short-term goals.

This mainly depends on the balance and complementarity between the economic, environmental, and social dimensions in the decision-making process, (Emas, 2015). In the same vein, Diesendorf (2000) defines SD as " *all types of economic and social development which protect and enhance the natural environment and social equity* ".

In the scope of business, SD means that companies must use them while they strive to satisfy their needs, in a rational manner that guarantees continuity and availability for future generations. Moreover, organizations should not focus solely on economic growth alone; rather, the social and environmental impacts of any process in order to achieve healthy environmental, social and economic systems must be considered, (Pojasek, 2007). As this requires organizations to formulate new strategies and implement practices in a manner that provides protection and conservation of economic, environmental and social resources (International Institute for Sustainable Development (IISD), 1992) and in the same context, Diesendorf (2000), sustainability has been discussed at the organizational level and found that companies have an active role in achieving or hindering sustainable development, because companies are an important component of the economy and are considered one of the main components of society. In addition, sustainable development must be integrated into corporate strategy these companies contribute to achieving sustainable development.

In this regard, Pojasek (2007) emphasizes that sustainable development must be incorporated into business planning and management systems and thus entails incorporation of SD principles into business policies and practices. Some examples of

these key principles are leadership commitment, stakeholders need to understand, improving business systems, and environmental and social responsibilities.

Ultimately, the essence of business sustainability lies in achieving long-term success, taking into account environmental principles and social responsibility.

It is worth noting that there is another term related to sustainability which is called (triple minimum). In this paragraph, the researcher sheds light on the two concepts: sustainability, the triple minimum and how to deal with them in previous studies.

For example, Alhaddi (2015) revealed the use of the terms triple minimum and sustainability interchangeably in literature, and found that the term triple bottom line is more consistent than sustainability in referring to the three economic, environmental and social dimensions, especially when combined simultaneously, and some researchers also used the term sustainability to denote one, two and sometimes three dimensions. In the same vein, Pope et al. (2004) pointed out that the concept of triple-end result can be considered as an interpretation of the concept of sustainability, which gives equal importance to the environmental, social and economic dimensions.

2.3 Dimensions of Sustainability

We recently realize that sustainability no longer refers only to environmental issues alone, (Buffoli at el., 2014a), but rather to an integrated concept that takes into account the three dimensions known as the three pillars of sustainability (economic, social and environmental). Thus, we must take these dimensions equally important and complementary because each of these three dimensions has an effect on the other two dimensions; the way each dimension affects other dimensions and the connections between them is important for understanding sustainable development, (Stevens, 2005). Valance et al. (2011) concludes in his study that we cannot achieve

environmental sustainability in difficult economic or social conditions, and the same applies to other dimensions.

Usually, sustainability is represented by three interlocking circles that show the relationships between the three dimensions, and the area of overlap between them crosses the sustainability as shown in Figure 2.1.

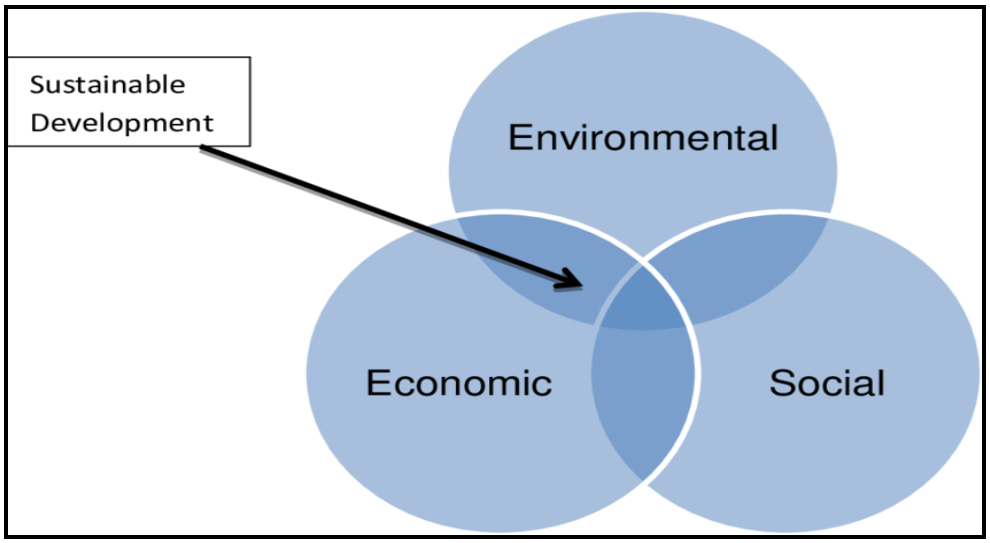

Figure (2.1): Sustainability dimensions (Eadie et al., 2011)

To talk about the environmental dimension, it expresses the extent of business using natural resources wisely, such as using renewable energy resources and mitigating various businesses with direct damage to the environment, in order to preserve the natural resources to serve future generations. What determines the effective economic performance of institutions and the extent of their contribution to the economy is the extent of applying principles of economic sustainability and the optimal use of resources for profitability and long-term sustainability. As regards social sustainability, it indicates the extent to which institutions influence equal opportunities in society, social justice, health, education, etc., (Alhaddi, 2015). According to Stevens (2005), it was found that there are relationships between the dimensions of sustainability, called mutual effects as shown in Figure 2.2.

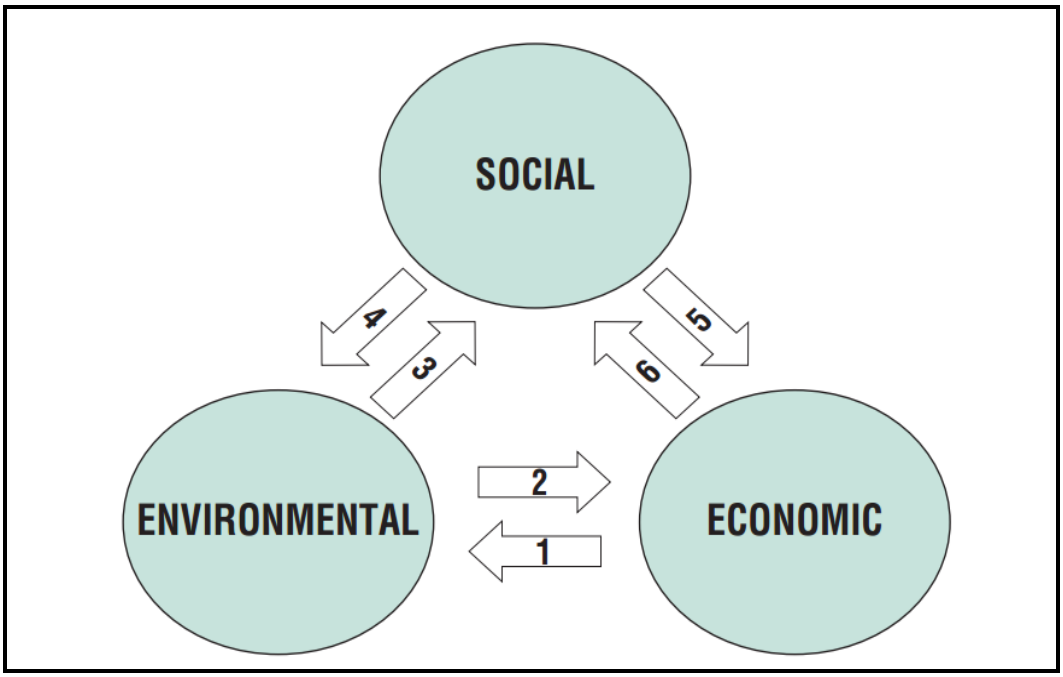

Figure (2.2): Sustainability dimensions interaction (Stevens, 2005)

Teodorescu (2012) had discussed the relationships between the dimensions of sustainability as follows:

Economic – Environmental Interaction: We note that there is an association between economic activities and the surrounding environment, where natural resources can be exhausted there during the implementation of any activity such as energy depletion and the emission of various gases, as well as the waste resulting from some economic industries may cause harm to the environment, so the safety and cleanliness of the environment must be preserved using modern technical methods

Environmental – Economic Interaction: The work of the environment is to provide the natural resources necessary to support any economic activity. Accordingly, it is imperative for any economic sector to adhere to the approved environmental policies, and whenever the environmentally-friendly economy was its effect in highlighting development in several areas.

Environmental – Social Interaction: Also, there is a strong link between society and the surrounding environment, where we note that the more societal awareness of the importance of preserving environmental natural resources, the greater the ability to continue to implement environmental protection policies from pollution and extinction, and appropriate conditions. Disposal of all types of waste to maintain a healthy life in a better way.

Social – Environmental Interaction: It is noted that there is an increase in the daily consumption of the individual caused by the increase in population growth, which leads in the long run to the depletion of natural resources, and this negatively affects the individual's standard of living and healthy life.

Economic-Social Interaction: We note that there is a direct relationship between the economic situation of the country and its ability to provide a decent life in addition to job opportunities that are appropriate to the individual's standard of living.

Social-Economic Interaction: Speaking of individual growth in society, it is considered one of the most important factors for achieving the country's economic success. Therefore, the human factor must be developed effectively, as it is the basis for achieving sustainable development in any society.

Focusing on all dimensions of sustainability together is essential to achieving sustainability, (Ramirez et al. 2013). As it is known that achieving sustainability depends mainly on the interaction of economic, environmental and social dimensions in the decision-making process, (Emas, 2015). Giovannoni and Fabetti (2013) focused on the importance of integration between levels of implementation in all stages of work, including management, measurement, evaluation, monitoring, and others.

On an organizational level, the company must focus on all dimensions of sustainability in order to achieve it, (Ramirez et al., 2013). According to Emas (2015), the economic, environmental and social dimensions can be incorporated into the decision-making process and thus achieve sustainability. In the same context, Giovannoni and Fabetti (2013) stressed the need to use an integrated approach when adopting and using the three dimensions of sustainability at each organizational level using an integrated approach that includes designing and exercising governance, management, measurement, reporting systems and business models.

Finally, we consider it important to highlight the addition of the institutional dimension as a fourth pillar along with the other three environmental, social and economic dimensions, where the Commission on Sustainable Development introduced the institutional dimension in 1995 and related to gender equality, equality in education, participation of the political system and others. The number of these dimensions may be increased in the future, (Doan et al., 2017).

2.4 Sustainable Buildings versus Green Buildings

A large number of stakeholders today still consider the two concepts (green buildings and sustainable buildings) to have the same definition. However, these two concepts (green buildings or sustainable buildings) are not the same. More specifically, Castro et al. (2015) emphasized that the concept of sustainable construction is more comprehensive than the concept of green construction and consists of many criteria related to social and economic dimensions. Figure 2.3 shows the additional criteria that falls under the criteria for a sustainable building, and is often excluded in green buildings, especially in school buildings where social dimensions such as comfort, safety and well-being are very important factors.

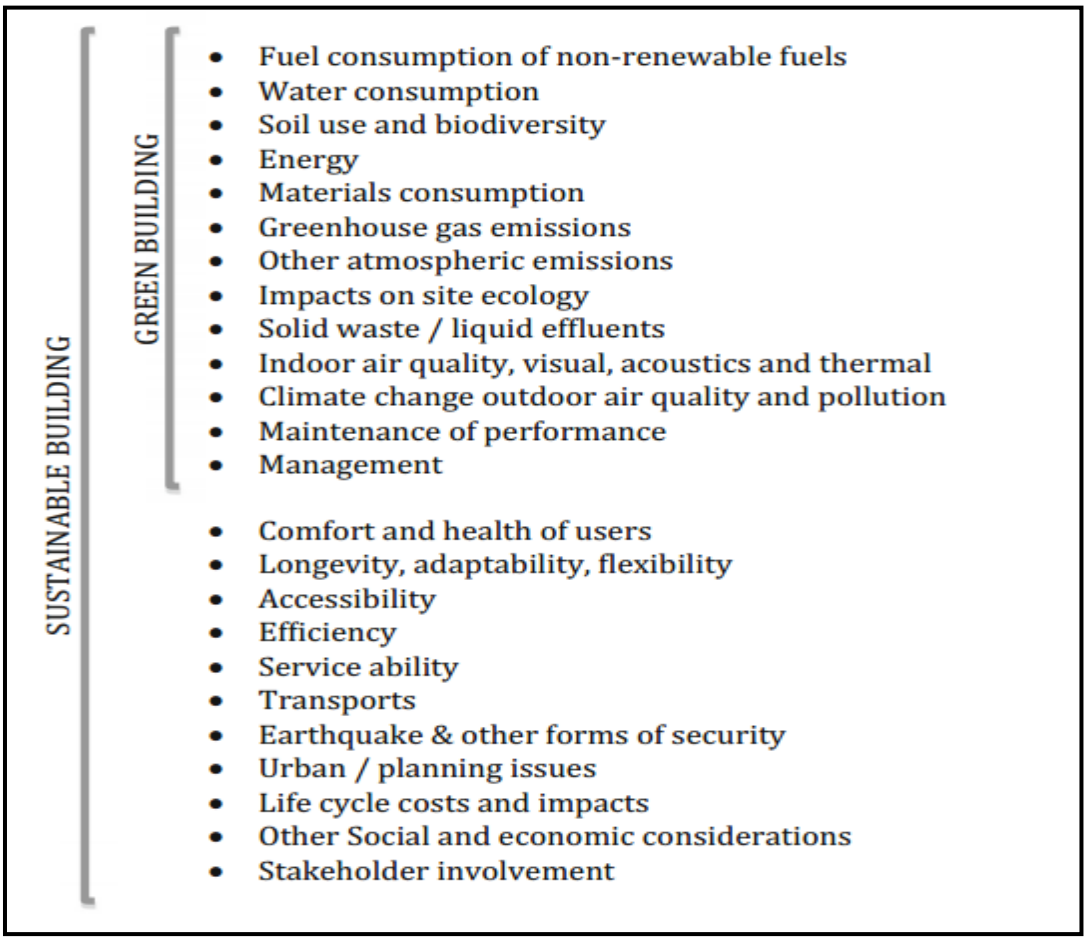

Figure (2.3): Sustainable buildings versus green buildings (Castro et al., 2015).

There are many definitions of green buildings in literature as confirmed by a recent study, Doan et al. (2017) where the authors define green buildings as strategies and design techniques whose main goal is to provide people with a healthy building accompanying the necessity of working to reduce the environmental impact of the building in terms of rational use of renewable and non-renewable natural resources and reduce environmental pollution throughout its life cycle.

But it becomes clear to us that the term “sustainable” is generally broader than “green”. More clearly, green is an environmental term, while sustainability encompasses all environmental, social and economic dimensions. For example, the building can be green but not sustainable, because it is good in terms of energy efficiency and optimal use of

resources, but it is not socially sustainable if it is not a well-designed regarding this aspect.

It is worth noting hat structural equation modeling (Smart SEM-PLS) has been used in this research and is considered a second generation multivariate data analysis method often used because it can test theoretically supported linear and additive causal models (Chin, 1996; Haenlein & Kaplan, 2004; Statsoft, 2013). The study by Fiore et al. (2020) employed the Analytic Hierarchical Process (AHP) method as a decision support method in integrated interventions in school buildings. More specifically, the study considers in an integrative way different aspects related to energy and environmental retrofit, the improvement of seismic safety, and socio-economic assessment. A sustainability assessment tool was developed to support the planning and programming of interventions in school buildings taking into consideration the three sustainability pillars. More elaboration on AHP is presented in Chapter 4.

2.5 Sustainability in Educational Sector

The education sector is one of the most important service sectors in society and its importance lies in providing a targeted educational environment for all members of society, wherever they are, in addition to a noticeable link between education and sustainable development. Specifically, sustainable development promotes quality and fair education for all, and at the same time it is difficult to move forward with sustainable development without providing a good education, (Weisz et al., 2011).

Globally, the importance of equitable education for all was emphasized as an important component of sustainable development. Where the World Health Organization (2017) identified sustainable development from an educational perspective as managing natural and non-natural resources in a fair manner to ensure equitable education for all

generations. Moreover, of the seventeen SDGs adopted by the United Nations (UN) in the 2030 Agenda for Sustainable Development, the fourth goal emphasizes the fundamental role of equitable education for all generations in societies. In addition, there are some other goals that indirectly provide quality education for all individuals.

Over the past few decades, sustainability has included components of the education sector. Several studies have been conducted, (Castro et al., 2015). However, most of these studies focused on improving energy efficiency and waste management, (Stevanovic et al., 2017). According to Jameton & McGuire (2002), sustainability in school buildings is a balance between the needs of students and administrative staff in school buildings, economic concerns and environmental damage. This can be achieved by providing high quality services, taking into account the financial viability of the institution in the long run.

Finally, it should be noted that the human factor and its important role in sustainability cannot be ignored, and in this context, many studies have been carried out such as Goh & Marimuthu's research (2016) who studied the role of organizational commitment to the sustainability of government institutions as researchers reviewed several studies focusing on human resource management and employee satisfaction. The study concluded that the employee’s commitment to sustainable development plays an important role in improving long-term performance and guiding the facilities of these institutions towards sustainability.

2.5.1 Environmental Sustainability in Schools

For years past, the focus was on building durability, away from any environmental damage, (Buffoli et al., 2014b), but nowadays more and more aware societies have emerged of environmental issues. This helped shed light on environmental

sustainability, (Capolongo, et al., 2015b). As a result, institutions and schools have recently become very interested in measuring their environmental performance in order to implement standards and meet the needs of stakeholders and in compliance with legislation and laws, (Blass et al., 2017). Consequently, the construction of green, eco-friendly school buildings has received great attention today, (Bilec et al., 2010).

Morelli (2011) defined environmental sustainability as a state of balance and harmony in the relationships between man and the environment around him and all of this in order to enable societies to meet their needs by using renewable and non-renewable environmental resources, without exceeding the ability of the environment to renew these resources, in addition to reducing pollution that may result from different life activities.

According to Nascimento et al. (2017), there are many critical factors for achieving successful environmental sustainability in government institutions. More specifically, linking sustainable development to strategic planning, improving resources and reducing waste, commitment to leadership, offsetting achievements related to achieving sustainable goals, transparency, and continuous open channels of dialogue with all stakeholders are some factors. In addition, replacing products with environmentally-friendly ones, energy efficiency and waste management programs to reduce costs and increase profit, is a sustainable development area with a team responsible for planning, implementing, monitoring and evaluating sustainable practices.

2.5.2 Schools' Sustainability Challenges

The concept of sustainability is broad and includes many disciplines as it has been defined and interpreted by many researchers and practitioners in several ways. However, despite the large number of definitions of sustainability in the literature, a

lack of a clear and specific definition of sustainability has been observed, and this makes it difficult to define what should be preserved (Moore et al, 2017). It would thus make developing SA a difficult process that contains many indicators and requires managing the flow of information between vast numbers of stakeholders (Matthews and Braganca, 2011).

In the context of the educational sector and especially within the school building system, there is a large number of stakeholders (students, staff, visitors, researchers, public administration, governments, NGOs, etc.) who have diverse and sometimes conflicting interests and needs (Capolongo et al., 2015a; Djukic & Marić, 2017) for example, governments and investors care about the economy while the end user cares about equitable education and comfort (Haapio & Viitaniemi, 2008).

We note that progress towards sustainability requires change at all levels within organizations. Despite this, human nature rejects that change. This may lead to resistance to sustainable practices that often conflict with their usual ways of life, with expected adverse consequences. It can also bring new bad habits that are more harmful to the environment (Vallance et al., 2011).

From an environmental point of view, sustainability requires reducing the consumption of resources, especially water and energy. However, this reduction will pose a challenge in school buildings that can consume twice as much as any residential building (Capolongo, et al., 2015b).

The educational sector is an important sector and is witnessing a tremendous and rapid development in all respects accompanied by an increase in demand for high-quality services from society. Despite this, the planning, construction, and operation of the

school building takes a relatively long time, which may render the school building somewhat unable to provide sustainable services (Capolongo et al., 2015b).

2.6 Sustainability Assessment (SA)

We have noticed in the last few periods that the assessment of sustainability has gained increased recognition because organizations and institutions strive to achieve them and sustainability has become one of the most important goals to be achieved at the local and global levels, regardless of the nature or profitability of the organization, (Boër et al., 2013). Many tools and frameworks have been developed to guide and support decision-making towards sustainability (Pope et al., 2017). However, SA is a complex evaluation methodology, (Sala et al., 2015) and has the potential to guide decision-making towards sustainability, (Bond et al., 2012).

According to a study by Capulongo et al. (2015a), the focus was on the need to design a quality assurance tool in a way that experts can easily use; when using this tool, you save a lot of time and resources. In addition, the results of the program assurance tools must be understandable and specific, and thus play a major role in guiding policies to support sustainability. On the same topic, Castro et al. (2017) focused on the need to align an appropriate assessment framework with sustainability aspects in the concept in which the evaluation will take place. Also in a study by Mateus & Bragança, (2011) discusses that SA systems must be transparent, with some flexibility to accommodate more than one type of building and at the same time be adaptable to technological development.

2.6.1 SA Origins

The SA was developed by considering it a new field containing many tools such as impact assessment tools such as Environmental Impact Assessment (EIA) and Strategic

Environmental Assessment (SEA), (Waas et al., 2014). Pope et al. (2004), emphasized that environmental assessment tools form a good basis for developing a quality assurance method by expanding these tools to include economic and social dimensions with the environmental dimension. According to this view, several ways of ensuring the program can be considered as a comprehensive integrated assessment that includes the dimensions of environmental, economic and social sustainability, (Sala et al., 2015).

It is worth noting that in the previous literature several evaluation tools were presented under the title SA. However, there was consensus from many researchers that SA differs from integrated assessment and may be considered the next generation of integrated assessment, (Pope et al., 2004; Ness et al., 2007; Waas et al., 2014; Sala et al., 2015). In light of this, several studies have been conducted to distinguish these tools and compare them in terms of contextual and methodological aspects.

In this context, Pope et al. (2004), proposed a conceptual framework discussing three models for SA:

1- EIA-driven integrated assessment: The EIA is an extension of the relationship between environmental issues and socio-economic factors, and this approach is interactive (post-process). In addition, the environmental, social and economic impacts of any project are evaluated by doing a comparison with the predetermined values / thresholds. Either the impacts are accepted or rejected. It is worth noting that the main goal is to reduce impacts.

2- Objective-based integrated assessment: It is an extension of the Strategic Environmental Assessment, which includes the term triple final outcome, and what distinguishes this approach is that it is proactive (a previous process), which means that it aims to evaluate

sustainability goals before implementing the project in order to identify the most positive goals that It will contribute to sustainability.

3- Sustainability assessment: It is the process of defining the concept of sustainability based on the societal viewpoint to reach a sustainable society, and here the main idea lies in this approach. It depends on having a clear vision based on this definition. Later, the vision is translated into criteria used to compare initiatives with it.

Nice et al. (2007) presented a similar approach that includes a framework for classifying common sustainability tools by focus area, goal, and time dimensions to provide short descriptions and practical examples. In addition, these tools are grouped into three main groups, each with sub-groups:

1- Indicators and Indices: which include integrated (for example Environmental Sustainability Index (ESI), Wellbeing Index (WI), Ecological Footprint (EF), etc), and Non-integrated, for example, Environmental Pressure Indicators (EPI).

2- Product-related evaluations: the tools of this group are used to assess the environmental impact of products and services from a cradle-to-life comprehensive life cycle approach, such as life cycle assessment (LCA), life cycle costs (LCC), product energy analysis and material flow. It is worth noting that the life cycle assessment was widely used to assess the environmental impact of products and services throughout its entire life cycle, including access to raw materials, production, use and disposal. In addition, traditional LCC tools do not take into account environmental costs in valuation except for some tools such as LCCA and FCA.

3-Integrated assessments: These include many tools that are mainly used as forecasting tools such as Multiple Standard Analysis (MCA) and Risk Analysis (RA) and Cost

Benefit Analysis (CBA) and impact assessment tools. It supports these tools and guides decision-making related to projects and policies.

2.6.2 SA Indicators

Nascimento (2017) stressed the importance of SA relying on indicators, where indicators can be defined as "*signals or signals that transmit a complex message, from many possible sources in a simple and useful way", (*Kurtz et al., 2001). It was concluded that, through indicators, it is possible to determine the level of achievement of the goal even if it is moving in the right track, as it is easy to identify symptoms before we face a problem that is difficult to solve, (Sustainable Measures, 2017). In addition, most management decisions are based on previous evaluated indicators, current conditions, or even forecasting future change and risk identification, (Kurtz et al., 2001). In this context, Mateus & Bragança. (2011) summarized the important role of indicators in the sustainability assessment process and lies in the identification, analysis and evaluation of various phenomena. Speaking of sustainability indicators, we see that they differ from other traditional social, environmental and economic indicators. These traditional indicators reflect the level of achieving one dimension while sustainability indicators speak directly or indirectly about more than one dimension of sustainability, (Target Measures, 2017). For example, the "transport" category indicators relate to environmental issues such as pollution, and social issues such as access to transport, and they have an economic meaning in terms of the cost of fuel used for transportation, (Castro et al., 2015). It is worth noting in this context that the indicators of sustainability differ from traditional indicators in that they are related to a reference value (goal, goal or threshold), and the absence of this reference value, there is no meaning to the indicator and cannot reflect the state of the system, (Waas et al., 2014). Moreover,

indicators may differ from one organization to another because the indicator depends on the organization's goals and strategies, (Kalender & Vayvay, 2016). As defined by the Brundtland Report published by the World Commission on Environment and Development in 1987, *"Meeting the needs of the current generation without compromising the ability of future generations to meet their own needs*" (WCED, 1987). We note that indicators are needed to measure long-term progress towards sustainability, (Nascimento et al., 2017). As the use of indicators is important for the purpose of assessing and exchanging between the social, environmental and economic spheres of sustainability and measuring progress towards sustainability only. As reported in the Environment and Development Conference held in Rio de Janeiro - Brazil in 1992, the United Nations proposed an action plan for the twenty-first century (Agenda 21), in which countries were asked to develop indicators of sustainable development in order to achieve sustainable integration between ecosystems and systems Other development (United Nations, 1992). As a result, a number of sustainability indicators have been developed by different stakeholders at different levels and in different contexts for various purposes. In addition, a number of international organizations such as the United Nations Commission on Sustainable Development (UNCSD) and the European Commission (EC) have developed a list of indicators to track sustainable development. Moreover, some countries and groups have adopted a set of indicators to monitor the sustainable development process, (Stevens, 2005). Finally, there are many researchers who have recommended that the selection of sustainability indicators must be according to certain criteria. Some of these important criteria are summarized in Table 2.1.

2.6.3 SA Indicators Frameworks

Several frameworks related to the methodologies used to design and arrange sustainability indicators were developed. Reed et al. (2006) analyzed indicator development frameworks where they revealed that indicator frameworks fall under two main models; from top to bottom (led by experts) and from bottom to top (based on society). Each model has advantages and disadvantages. Where in the descending approach can generate objective indicators which make the indicators difficult to understand affect the concept of simplicity, and the bottom-up approach generates a comprehensive list of indicators that are more relevant to the context of the problem and are characterized as easy to understand and use, but at the same time, these indicators are less objective.

Table (2.1): Criteria for sustainability indicators selection

criteria	References
Clear and easy to understand	Diesendorf (2000), Reed et al. (2006), Blass et al. (2017), SustainableMeasures. (2017), Carnero (2015), and Stevens. (2005).
Measurable	Blass et al. (2017), Carnero (2015), Bottero et al. (2015), and Diesendorf (2000).
Reliable	SustainableMeasures. (2017), Blass et al.,(2017), and Diesendorf (2000).
Relevant	SustainableMeasures. (2017), Blass et al. (2017), Bottero et al. (2015), and Diesendorf (2000).
Upgradable	Reed et al. (2006), Carnero (2015), Bottero et al. (2015).
Data accessibility	Blass et al. (2017).
Specific	Bottero et al. (2015).
Comparability	Carnero (2015),

In addition, a large number of indicators will make the verification and implementation processes difficult and obtaining consensus from all the stakeholders involved is difficult. In addition, the researchers pointed out that most of the indicator frameworks all participate in the steps: setting the context so that priorities and conditions are taken into consideration according to the local context, then setting sustainable development goals and strategies, and the last step consists of developing and evaluating the indicators. Finally, researchers argue that it is preferable to develop local SAAs in order to integrate bottom-up and top-down into a single approach that includes best practices for each of them.

2.6.4 International SA Tools

To talk about the construction field, several quality assurance systems have been developed by organizations and authorities in order to assess the sustainability of buildings in various stages of life cycles; design, construction, operation, maintenance and rehabilitation.

From here we see that it is possible to highlight that there are many benefits as a result of using these tools, which are to develop the required linkages between the building environment and sustainable development, and the sustainable development goals are later translated into the goals of the goals, and create references to sustainable practices at the local and national levels, and global levels, Providing the information necessary to serve the decision-making process and to advance and advance sustainable development, (Castro et al., 2015).

There are many ways to measure the quality of the market for different types of buildings such as the Building Research Foundation (BREAM) method, which was developed in 1990 in the United Kingdom (UK) (BREEAM, 2018), and the sustainable

construction tool (SBTool) that was Developed by the International Nonprofit Initiative for a Sustainable Building Environment (iiSBE) (iiSBE, 2016), Leadership in Energy and Environmental Design (LEED) developed in the United States of America (LEED, 2017), a comprehensive assessment system was also established Efficiency for Built Environment (CASBEE) in Japan (IBEC, 2017) and Australian Green Star Tool, (GBCA, 2018).

In this thesis, the only focus is on relevant rating systems to assess sustainability in school buildings. The most popular and used classification systems are explored. BREEAM, LEED, and CASBEE, a green star. Specifically, these tools can be used to assess the sustainability of school building construction, (Castro et al., 2017).

2.6.4.1 BREEAM

BREEAM (Building Research Environmental Assessment Method) is the first green classification system for buildings and was developed by the Building Research Foundation (BRE) in 1990 in the United Kingdom. It is the first environmentally friendly classification system that was then commercially released. BREEAM is a widely used evaluation system and is adopted by more than 80 countries and has more than 567,600 certificates issued (BREEAM, BREEAM Home Page, 2018), which represents about 80% of the European market share, (Doan et al., 2017). In addition, BREEAM provides a number of plans to evaluate different types of buildings at different life cycle stages in the UK and internationally; BREEAM Infrastructure, BREEAM Communities, BREEAM New Construction (NC) (International only), Home Quality Mark (UK only) , BREEAM in use, and BREEAM refurbishment (UK only). (BREEAM, BREEAM home page, 2018).

Within the BREEAM NC scheme, several types of buildings can be evaluated during design, construction, and major renovation stages, including school buildings. However, this method does not assess schools well in practice, as it relies heavily on quantitative data that does not take into account users' perceptions of the evaluation process, (Buffoli et al., 2015). In addition, BREEAM uses a detailed scheme to assess types of non-standard buildings, including school buildings that do not fall within the range of BREEAM NC school buildings, (BREEAM, 2016).

BREEAM NC evaluates buildings according to ten categories with percent weight for each category (as shown in Table 2.2). Each category includes a set of criteria related to specific sustainability aspects.

Table (2.2): BREEAM assessment categories and weighting (BREEAM, 2016).

Category	Weighting
Management	12
Health and Well being	15
Energy	19
Transport	8
Water	6
Materials	12.5
Waste	7.5
Land use and Ecology	10
Pollution	10
Total	100%
Innovation (Additional)	10%

We note through the categories mentioned-above in the table that it is possible to know that the focus of the assessment is on the environmental factor with eight main categories for assessing the environmental impact of the building. In addition, some social aspects are evaluated through the category "Education and Welfare". Moreover, the “innovation” category recognizes any new innovation in a building that may contribute to sustainable benefits in terms of new features and performance, (Buffoli et al., 2015). Regarding the rating approach, the final score is obtained by adding the

weighted credit for each assessment category to obtain a single overall score, (Refer to Table 2.3).

Table (2.3): BREEAM rating benchmarks (BREEAM, 2016).

BREEAM rating	%score
Outstanding	>=85
Excellent	>=70
Very good	>=55
Good	>=45
Pass	>=30
Unclassified	<30

2.6.4.2 LEED

The USGBC (US Green Building Council) developed the LEED (Leadership in Energy and Environmental Design) and released in 1998. Since that time, many versions of the tool have been released, the latest version was in 2013 and it was recently updated in 2019, (LEED, 2017). Geographically, LEED is the most used SA tool. As the number of countries using this tool increased significantly, it reached 135 countries in 2012, and the number reached 150 countries and regions in 2014. Currently the number is more than 165 countries and regions around the world with more than 92,000 projects using LEED, (Doan et al. ., 2017). LEED offers a number of schemes to evaluate buildings of all types including LEED BD + C (Building Design and Construction), ID + C (Interior and Building Design), O + M (Building and Maintenance Operations), ND (Neighborhood Development), and Homes. LEED BD + C (Building Design and Construction). Where LEED BD + C is evaluated of various types of buildings through a specific methodology with a specific guide and tool. This includes new construction, basic and serendipity, retail, schools, data centers, warehouses and hospitality

distribution centers, and healthcare buildings that are newly built or undergoing major renovation, (LEED, 2017).

LEED follows the points system which is actually a simple added system, therefore there is no weight system adopted by LEED, as all evaluation criteria have the same weight. Table 2.4 summarizes the LEED assessment categories and possible credits.

Table (2.4): LEED assessment categories and possible credits (Doan et al., 2017).

Category	Possible Credits
Location and Transportation	9
Sustainable Sites	9
Water Efficiency	11
Energy and Atmosphere	35
Materials and Resources	19
Indoor Environmental Quality	16
Innovation	6
Regional Priority	4
Total	110

Through Table 2.4, we found that LEED focuses heavily on the environmental performance of the building by including five categories related to water, energy, materials and location. It is worth noting that LEED offers the innovation category with six additional credit points obtained by adopting innovative strategies towards sustainable design. In addition, the LEED includes the (regional priority) category as it provides an incentive to obtain more credits to estimate the environmental priorities identified in a specific geographic region. All of that made LEED more flexible than other well-known tools like BREEAM.

LEED classifies five levels of performance according to the final aggregated score. These levels are shown in Table 2.5.

Table (2.5): LEED rating benchmarks (Doan et al., 2017).

LEED rating	%score
Platinum	80+
Gold	60-79
Silver	50-59
Certified	40-49

2.6.4.3 CASBEE

In 2001 CASBEE (Comprehensive Environmental Efficiency Assessment System) was developed as a collaborative project between academia, industry and local governments in Japan. This system has evolved over time, just as all the other classification systems. The first tool released in 2002 was CASBEE for Offices. Shortly thereafter CASBEE for NC was completed in 2003, CASBEE for existing buildings in 2004 and CASBEE for renovation in 2005. Here we note that CASBEE was designed for use in Japan only which limited its flexibility. However, in 2015 a trial version was developed for use in countries other than Japan, (Doan et al., 2017). CASBEE contains a set of tools known as the CASBEE family, and these tools were developed to be applied at different levels: CASBEE-Housing and CASBEE construction tools were developed to assess the environmental performance of homes and buildings, while CASBEE-Urban Development and CASBEE-City are used to evaluate a group of buildings and their application to urban blocs and local governments respectively, (EPIC, 2017).

This system provides tools to assess the environmental performance of buildings in the different life cycle phases of the building including pre-design, new and existing construction and renovation, (EPIC, 2017). CASBEE includes approximately 80 evaluation criteria divided into two main groups: Q (Building Environmental Quality) which includes Q1: Indoor Environment, Q2: Quality of Service, Q3: External Environment (on site). The other major category is L (building environmental loading)

and includes L1: energy, L2: resources and materials, and L3: off-site environment, (Doan et al., 2017). CASBEE takes a different approach to computing the end result of the evaluation. Where this approach is based on calculating the value of BEE (Building Environmental Efficiency). BEE is the ratio between the environmental quality of buildings and their loading into the environment, and BEE is illustrated in equation (2.1), (Alyami et al., 2015).

(2.1) $$BEE = \frac{(BuildingEnvironmentalQuality)}{(BuildingEnvironmentalLoadings)}$$

Note that each of the major L and Q categories is multiplied by a weight factor. Then all weighted criteria are combined in each L and Q categories to obtain a score from 0 to 100 for each Q and L categories. Then the BEE value is calculated using equation 2.1. Subsequently, the gradient graph shown in Figure 2.4 is used to translate the BEE value into a qualitative measure of five levels from C to A. Table 2.6 tabulates the CASBEE rating benchmarks and Figure 2.4 depicts the environmental labelling based on Built Environmental Efficiency (BEE).

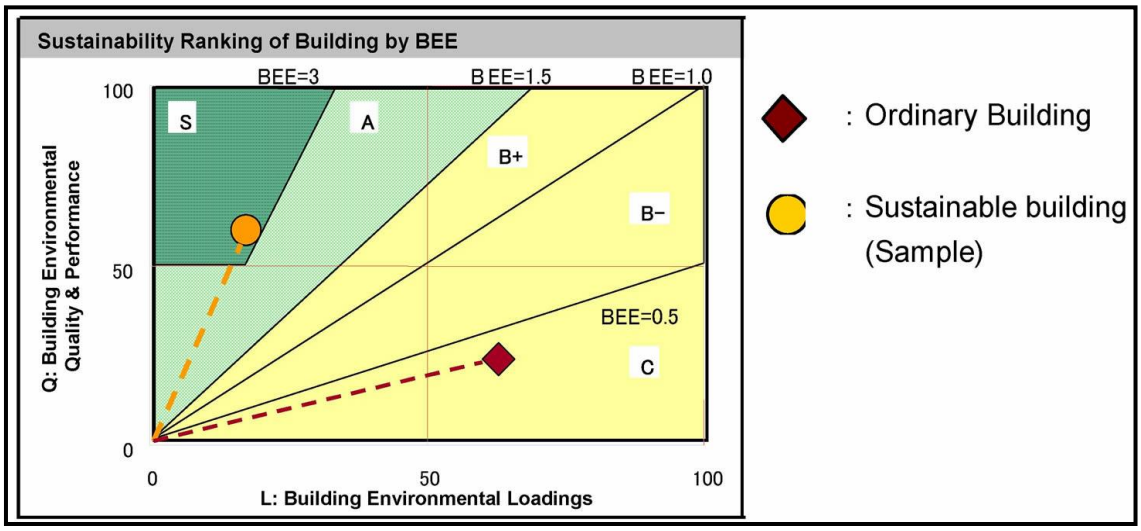

Figure (2.4): Environmental labelling based on Built Environmental Efficiency (BEE) (IBEC, 2017).

2.6.4.4 Green Star

Green Star is the national voluntary social security system for buildings. In 2003, the Green Building Council of Australia (GBCA) was established to improve the environmental efficiency of buildings, increase productivity, and promote health and well-being. Green Star offers tools for evaluating buildings of various scales including Green Star - Communities, this is shown in Table 2.6.

Table (2.6): CASBEE rating benchmarks (Doan et al., 2017).

CASBEE rating	BEE Value
Excellent (S)	BEE = 3.0
Very good (A)	BEE = 1.5
Good (B+)	BEE = 1.0
Fairly poor (B-)	BEE = 0.5
Poor (C)	BEE = < 0.5

Green Star - Design and Construction, Green Star - Interiors, and Green Star - Performance. In 2009, Green Star was first released to assess school buildings during the planning, design, construction, equipment, and operation stages. However, registration under this version was later discontinued in December 2015, (GBCA, 2018).

Green Star –Design & As Built is the tool available to evaluate new schools evaluating buildings according to nine impact categories, with each evaluation category including a number of credits as shown in Table 2.7, (GBCA, 2018). Moreover, the total number of credits for all groups equals 110, including the Green Innovation category that promotes the goal of improving building sustainable performance innovations (Banani et al., 2016). The overall performance rating of the building is also determined according to one of the four green star rating levels that are presented in Table 2.8.

Table (2.7): Green Star assessment categories and possible credits (Banani et al., 2016).

Category	Possible credits
Management	14
Indoor Environment Quality	17
Energy	22
Transport	10
Water	12
Material	14
Land Use & Ecology	6
Emissions	5
Total	100
Innovation (Additional)	10

We notice from Table 2.8 that the goal of the Green Star tool is to evaluate school buildings in terms of environmental impact and the quality of the internal environment of the building.

Table (2.8): CASBEE rating benchmarks (Banani et al., 2016).

Green Star rating	%score
6 Stars	75 +
5 Stars	60 – 74
4 Stars	45 – 59
1-3 Stars	10 – 44

2.6.4.5 BREEAM, LEED, CASBEE, and Green Star Comparison

It is worth noting that the four most famous SA tools (BREEAM, LEED, CASBEE and Green Star) have been reviewed for a period in the previous sub-sections, but there is a big challenge which is comparing the building of the program guarantee tools because they include many dimensions of economic, environmental and social sustainability. In addition, different weight standards and systems are used according to the local context in which they were developed, (Haapio & Viitaniemi., 2008; Castro et al., 2015).

In addition, a number of studies have been conducted to describe, analyze and compare these tools. Among these studies are the work of Haapio & Viitaniemi (2008) which has discussed and analyzed sixteen environmental assessment tools, and categorized tools according to their characteristics, the types of buildings being evaluated, the users of the tools, and the building life cycle stages covered. And the nature of the results, errors and doubts. Likewise, Castro et al. (2015) studied BREEAM, LEED, CASBEE and Green Star tools in terms of goals, users, criteria used, structure, weighting system, application lifecycle stage, and shape of outcome communication. In this study, the strengths and weaknesses of these tools were highlighted, and similarities and differences between these tools were identified. The way these tools met the standards of the International Organization for Standardization (ISO) and the European Committee for Standardization (CEN) was analyzed. In the same vein, Stefanovich et al. (2017) used SWOT analysis based on the experiences of architects to compare BREEAM NC and Duuzaamheidsmeter Zorg which is the most popular tool for assessing the sustainability of school building projects and the comparison was made in terms of special weight systems and cover the life cycle stages of the building.

In another study, Doan et al. (2017) compared BREEAM, LEED, CASBEE and New Zealand version of Green Star (Green star NZ). A brief overview of each instrument was provided. Subsequently, the features and structure of each instrument were discussed in detail in terms of integrated sustainability aspects and categories and weighting systems.

Subsequently, for the analysis of a number of previous studies concerning BREEAM, LEED, CASBEE and Green Star tools, including the studies referred to above, the researcher concluded the following:

1- BREEAM is the first developed tool while LEED is the most flexible. In addition, LEED, CASBEE, Green Star and a number of other tools are under the direct or indirect influence of BREEAM. In addition, LEED, BREEAM and Green Star were developed by non-profit organizations while CASBEE was developed through a research project between industry, academia and the Japanese government, (Doan et al., 2017, Banani et al., 2016).

2- Tools are similar in some respects and differ in others. For example, BREEAM, LEED and Green Star have similar structure, weighting system and the following categories: 1- Management; 2- Quality / luxury of the indoor environment. 3- Quality of service. 4 - Energy; 5- Transportation; 6- Water; 7- Articles; 8- Waste; 9. Sustainable sites; 10- Pollution. All four tools also have the same similarity in the presentation of results, testimonials and reports, (Castro et al., 2015).

However, some failures related to these tools are summarized in the following lines:

1-The four tools have unbalanced standards for the environmental, social and economic dimensions, and there is a primary focus on environmental concerns, and there is an

exclusion of some important and necessary economic and social aspects, especially in the school system, (Castro et al., 2015; Buffoli et al., 2015)

2- Most of the time these tools are quantitative in nature, and they are not concerned with the local context of the region in which they will be applied, and it has been observed that they need expert opinions in many cases that require more time and raise the cost of application, (Buffoli et al., 2015)

3- These tools assess the building from the perspective of the evaluator without taking into account the perceptions used by other building users, especially in the school building system where user perceptions are very important, (Buffoli et al., 2015).

4- These tools are design tools rather than performance measurement systems. The building is evaluated from a structural and technical point of view. Therefore it cannot be used to evaluate and improve the performance of school buildings, (Buffoli et al., 2015).

Finally, Table (2.9) shows the main features of the comparison tools and includes country, organization, flexibility, major categories and many other features.

Table (2.9): Main features of BREEAM, LEED, CASBEE, and Green Star (Doan et al., 2017; BREEAM, 2018; LEED, 2017; Banani et al.,2016; IBEC, 2017 ;GBCA, 2018).

	BREEAM	**LEED**	**CASBEE**	**Green Star**
Country	UK	USA	Japan	Australia
Organization	BRE	USGBC	JSBC	GBCA
Flexibility	81 countries	167 countries	1 country	1 country
First version	1990	1998	2002	2003
Latest version	2016	2019	2014	2017
Building types	−Office −Housing	−Offices −Homes	−Residential –Office	−Education −Healthcare

	–Healthcare −Courts −Industrial Units –Retail −Schools −Multi-residential −Schools −Neighbourhoods	−Neighbourhoods Development −Retail −Healthcare −Schools	−Schools −Retail −Health care −Urban development −Cities	−Industrial −Multi-residential –Office −Office Interiors −Retail Centre
Types of projects	-New construction −Refurbishment −Existing buildings	-New construction −Refurbishment −Existing buildings	-New construction −Refurbishment −Existing buildings	-New construction −Refurbishment −Existing buildings
Main categories	Management Health and Wellbeing Energy	Integrative process Indoor Environment Quality	Indoor Environment Quality of Service On-site Environment Energy	Management Indoor Environment Quality Energy

	Transport Water Material Waste Land use and Ecology Pollution Innovation	Energy & Atmosphere Location & Transportation Water Efficiency Material & Resources Sustainable Sites Regional Priority Innovation	Resources & Materials Off-site Environment	Transport Water Material Land Use & Ecology Emissions Innovation
Rating approach	Pre-weighted categories	Additive credits	BEE ranking chart	Pre-weighted categories except for Innovation
Total Maximum Possible Points	110	110	BEE=3	110
Rating level	Pass >=30 Good >=45	Certified 40 Silver 50	Poor: BEE <0.5 Fairy Poor: BEE = 0.5-1.0	1-3 Stars (10 – 44) 4 Stars (45 – 59)

	Very good >=55 Excellent >=70 Outstanding >=85	Gold 60 Platinum 80	Good: BEE = 1-1.5 Very good: BEE = 1.5-3; or BEE >=3 and Q < 50 Excellent: BEE >=3 and Q<=50	5 Stars (60 – 74) 6 stars (+75)
Update interval	Annual	As required	As required	Annual
Number of certified buildings	568,025	80000	541	2000

2.6.5 Customized SA Tools for a Specific Type of Local Context

The aforementioned program guarantee tools are global, as they are designed to serve different regions of the world, which requires a great effort to ensure adaptation to local priorities and conditions during the evaluation process, in addition to the different social, economic and environmental conditions, depending on the region, as well as priorities, restrictions, regulations and legislation, (Ali and Nusseirat) , 2009). As many efforts have been made and many studies have been undertaken to allocate tools to

guarantee the program so that they are dedicated to a specific type of building according to a specific local context and conditions these efforts are discussed as shown below

Several countries have started to customize the international SBTool assessment tool with the aim of applying it at the national level to suit their local context. For example, the SBToolCZ version was developed in the Czech Republic, SBToolPT adaptation will be used in the Portuguese context, and the ITACA protocol that was actually established in Italy, Verde came in Spain. Furthermore, the NZGBC (New Zealand Green Building Council) developed a Green Star NZ rating system based on the Australian Green Star instrument.

In a same way, many researchers have dedicated international SA tools to assess specific types of buildings or to use them in a specific context. Mateus & Bragança (2011) developed an SA (SBToolPT-H) tool to assess the sustainability of existing, new and refurbished residential buildings in the Portuguese context. Where the developed system was based on the above Portuguese version of SBTool - (SBToolPT) and it was developed by the Portuguese chapter of iiSBE to be applied in the Portuguese context. This includes a hierarchical tool developed from (dimensions, categories and major indicators) and includes twenty-five indicators grouped into nine categories covering the dimensions of environmental, social and economic sustainability. The Analytic Hierarchical Process (AHP) methodology was used to weigh the groups and indicators in the study.

Speaking of AHP, we see it as a multi-criteria mathematical technology for decision-making and was developed by Thomas Saaty in 1980 where he has studied and reviewed this technology on a large scale since that time. It has been used worldwide to serve various decision cases in many areas such as government, business, industry,

healthcare, and other areas, (Saaty, 2008). This technology includes two main steps in the decision-making process. The first step is to design a problem or decision in a hierarchical structure consisting of goals, criteria, and alternatives. Then the evaluation step comes based on a double comparison between the elements of the hierarchy structure in order to prioritize and weigh all factors, (Vargas, 1990). AHP is discussed in detail in the Chapter Three.

It is worth noting that several studies have been carried out in developing countries with the aim of developing tools for assessing the sustainability of buildings. The first study is Ali and Nusseirat (2009). They reviewed and developed a tool for assessing green buildings for residential units. As this tool was supposed to be used in the Jordanian context. The researchers adopted a methodology that included an analysis of international green building classification systems such as LEED, CASBEE and BREEAM and the Green Building Tool (GBTool) and highlighted the Jordanian local context (economic, social and environmental conditions). In addition, through interviews (organized and unorganized) and notes, we were able to develop a hierarchical structure that includes the main aspects of sustainability (economic, social and environmental) at the top. At the second level are the main categories, and each category was identified with a number of indicators. Finally, the evaluation elements in each level of the tool were evaluated using AHP.

It was noticed that the groups of energy and energy efficiency had nearly half of the weights during the weighting of the evaluation categories in the proposed tool, and this is in line with the researchers' view, with the fact that Jordan suffers from a severe shortage of natural resources, especially water.

In the same context, and by talking about the analysis and comparison of the most famous international tools (BREAM, LEED, SBTool, and CASBEE), and the use of Delphi technology and the AHP method through a consensus-based approach, Yami (2015) adopted a classification system to assess the sustainability of buildings in the context of Saudi Arabia, it is called the Saudi Environmental Assessment Method (SEAM). The study proposed 11 criteria for a weighted evaluation: indoor environmental quality (12.7%), water efficiency (25.8%), energy efficiency (18.4%), waste management (6.8%), pollution (8.3%), and management (4.9%), location Quality (5.4%), materials (6.4%), quality of service (4.5%), economic aspects (4.3%), and cultural aspects (2.5%).

In a largely similar fashion and within the same region, Banani et al. (2016) has defined a sustainability assessment framework to measure the performance of non-residential buildings in the Kingdom of Saudi Arabia. This study analyzed and compared a number of international classification systems - such as LEED, BREEAM, Green star and CASBEE - to create a set of variables to assess the sustainability of non-residential buildings. The variables used were revised according to the Saudi context through semi-structured interviews. In addition, the researchers used survey questionnaires and AHP method to develop a weighting system for the assessment items that included nine criteria and 36 sub criteria. The specific criteria with weight are energy efficiency (24%), water efficiency (27%), material selection (10%), indoor environmental quality (10%), land and waste (7%), effective management (7%), cost of life Complete (7%), quality of service (5%), and cultural aspects (3%).

In Iranian politics a more recent study has been done, as Al-Zarghami et al. (2018) proposed a set of categories and criteria for use in assessing the sustainability of the

residential building, and the proposed categories and indicators have been proposed based on an investigation of common indicators of well-known SA tools (LEED, BREEAM, CASBEE, and SBTool). In addition to the fact that indicators and categories were weighted according to the Iranian context using the questionnaire of marital comparisons conducted by local residential building experts, the Fuzzy AHP (FAHP) method was also applied to generate the final priorities for the categories and indicators. The suggested weighted categories are energy efficiency (30.1), water efficiency (28.1), sustainable site (17.5%), materials and resources (15%), and the quality of the indoor environment (9.3%).

2.6.6 Customized SA Tools for Educational Buildings

Public buildings and government institutions are considered one of the major pollutants, as they consume resources and energy in a large way and release various types of waste and toxins into the environment. Therefore, attention must be paid to working towards achieving sustainability in these buildings and institutions. So a lot of effort has been made by researchers and practitioners to assess sustainability in public buildings and government institutions. However, there is still no comprehensive SA method for the facilities of these institutions, (Stevanovic et al., 2017).

Speaking of LEED, BREEAM and Green star tools, several other quality assurance tools have recently been developed to assess the sustainability of public institutions from the early design stage. However, it is later proved that these tools still suffer from weaknesses despite their great use due to their simplicity and subjectivity, (Stevanovic et al., 2017).

Several researchers and scholars have conducted several studies in the context of SA in public institutions, some of which (such as Capolongo et al., 2016; Carneiro. 2015) have

developed SAs to assess the sustainability of some government buildings with only a focus on environmental or social dimensions. Other studies have included the three dimensions of sustainability in more comprehensive tools developed (such as: Buffoli et al., 2013; Castro et al., 2017) and these and other studies are discussed in depth below.

Bovouli et al. (2013) developed an SA tool based on well-known assessment tools such as LEED, BREEAM and ITACA, with the aim of being used in the European context. The tool was designed to assess the sustainability of a government building implemented on the ground or in the design stage. In addition, the developed tool provides guidance and strategies to support future sustainability.

The researchers focus on the presence of a difference in the importance, weight, or even application of each indicator, depending on the condition of the building, whether it is implemented and under operation, or at a design stage. For example, indicators related to the environmental impact of the building have more weight at the design stage because the environmental impact depends largely on the materials and technologies used to construct the building. However, when operating the building it is very difficult to change these things because they are present and the process of changing them will be costly in terms of money and time. Moreover, the application of standards also varies according to the condition of the building itself. For example, the comfort of users and employees is measured through a questionnaire of the government building, but if the building is in the design phase, these criteria can only be evaluated by ensuring that experts or designers ensure the comfort of the users.

The hierarchical structure of the developed system contains the three dimensions of environmental, social and economic sustainability. These dimensions are categorized into criteria, and then they are evaluated through a number of indicators.

The technique includes weighting, and then the system components are organized into a network hierarchical structure taking into account the interconnection between the components. To determine the weighting system at any hierarchical level, an analytical network process (ANP) (ANP) is used. ANP is a mathematical technique used in the process of complex decision-making analysis which was later developed by Saaty in 1996. Also, ANP is a generalization of AHP which is based on the assumption that the higher levels of the hierarchical structure are independent of the lower levels and also assumes independence The elements are at any level from each other, whereas, ANP assumes a correlation between structure elements that are grouped into groups of related factors rather than hierarchical levels (Saaty, 2008).

It is worth noting that the aforementioned advanced system has been tested by Buffoli et al. (2014b) They used the tool to analyze and compare the sustainability (environmental, social and economic) aspects of government buildings in Italy (in the Lombardy region). As an old government building was compared to another new building in design, the necessary information was collected from both buildings using field visits, interviews, questionnaires, and the necessary documentation, as sustainability was evaluated in both cases. The researchers' study concluded a number of recommendations and strategies aimed at developing weaknesses and shortcomings in critical areas. Among the results obtained was the economic score for sustainability recording the most satisfactory score in both cases, and the researchers attributed the reason to the fact that economic performance is affected by management policies more than the structure of the building itself.

Castro et al. (2017) conducted a study where the SA method for building a government institution in the Portuguese context, (HBSAtool-PT), was developed. It is a method

that can be used in new and renovated government buildings. The methodology followed in this study is very similar to that in the study of Ali and Nusseirat (2009). Their similarities were in terms of studying international SA tools in government buildings such as LEED BD + C, BREEAM UK NC, Green Star - Design & As Built, and CASBEE - NC, and local Portuguese context analysis. The study later explored the need to make continuous standards such as ISO TC59 and CEN TC350 related to sustainable construction.

A comparison of the evolving approach has also been made with previously known methods (BREEAM UK NC, LEED BD + C, Green Star - Design & As Built) used in buildings and government institutions SA in light of the basic categories of ISO and CEN standards. In addition, comparisons were made with other studies in the same field.

The proposed hierarchical structure includes a number of indicators, areas and categories. A list of fifty-two indicators of sustainability was established and classified in twenty-two categories, which were compiled in turn to measure the main dimensions of sustainability; environmental, social, cultural, functional, economic, technical, and location. In addition, AHP was used to weight the indicators and categories by converting the results of the personal interviews into quantitative numbers. Sahmir et al. (2017) conducted a study with the aim of determining the criteria for an evaluation system for some green government buildings according to the Malaysian context. The researchers explained that the evaluation of the green government building must take into account environmental, economic and social factors. The researchers suggested that the evaluation items include two levels, the first top level includes the main evaluation elements that contain 10 criteria: energy efficiency, internal environmental quality,

sustainable site planning and management, materials and resources, water, innovation, transportation, land use, environment, pollution and waste . In addition, they proposed several sub-criteria for each of the main criteria, based on the analysis of major international SA systems such as LEED, BREEAM and Green Star. Table 2.10 shows a brief comparison between the three studies mentioned above.

Finally, many other frameworks that were developed in the SA field were monitored from government building structures. However, these frameworks cannot be considered comprehensive because they did not address all dimensions of sustainability, as the focus was mainly on assessing government buildings from a social or environmental point of view. Some of these studies are summarized in Table (2.10).

Table (2.10): Comparison of Buffoli et al., (2013); Castro et al., (2017) and Sahamir et al. (2017) studies.

The study	**Buffoli et al.(2013)**	**Castro et al. (2017)**	**Sahamir et al (2017)**
System structure	The assessment items arranged into a three level hierarchal structure(Areas, Criteria, Sub-criteria)	The assessment items arranged into a three level hierarchal structure (Areas, Categories, and Indicators)	The assessment items arranged into a two level hierarchal structure (Criteria, and Sub-criteria)
Weighting technique	Analytic Network Process (ANP)	Analytic Hierarchy Process(AHP)	No weighting system
Phase of application	Two set of criteria to assess operative or in design	One list of criteria to assess new or refurbished building	One list of criteria to assess dministrative's building in general
Governmental	Administrative	buildings in general	Administrative

building type	Building		building
Context	Italian context	Portuguese context	Malaysian context

2.7 Palestinian Context

In the following discussions, environmental, social and economic realities within the Palestinian context in West Bank is investigated.

2.7.1 Environmental Reality

2.7.1.1 Water

Water is one of the most important natural resources used in all areas and sectors of life. Precipitation is the main source of water in Palestine, and ranges between 100-650 mm per year; where the water resources in Palestine are fed from rain water. These sources include (Environmental Quality Authority (EQA), 2017):

1- Surface water: Surface water is scarce in the West Bank, and it flows for a limited period of the year so that it cannot be exploited. The Jordan River is the main source of surface water sources in the West Bank. However, this river is controlled by the Israeli authorities and used for irrigation and homes.

2- Groundwater: Groundwater layers in Palestine are usually found in three main basins (the western basin, the eastern basin, and the northeastern basin). Agriculture, for example, relies mainly on groundwater through springs and wells. Groundwater is fed through rainfall 8-814 million cubic meters annually in the West Bank, (EQA, 2017).

3- Non-traditional water sources: The Palestinian government recently developed unconventional water sources. This includes sources such as desalination projects and some pilot projects for wastewater reuse.

It is worth noting that water sources in the West Bank suffer from many challenges, including the control of the Israeli authorities on approximately 80% of the available water resources in Palestine, the lack of nutrition in the groundwater basins due to climate change, and the lack of access to some sources due to the wall, groundwater pollution as a result of untreated wastewater, and non-use of unconventional water sources such as the exploitation of wastewater. Water losses in the West Bank range from 24% to 36%, which is higher than international standards, (EQA, 2017).

2.7.1.2 Energy

Energy sources in Palestine are limited, as they depend on purchasing all kinds of energy from external sources. More specifically,

1- Electricity: It is the main source of energy that Palestine depends on for various domestic and industrial uses. But Palestine in all of its sectors depends on purchasing electricity from external sources such as Israeli companies, as the proportion of electricity imported in 2014 was 88% from Israel, 4% from Jordan and Egypt, and 7.3% from the Gaza Power Station, (EQA, 2017) .The electricity purchased is distributed to various population centers in the Palestinian territories through six distribution companies, five of which are in the West Bank in addition to some local authorities. However, the rate of electricity loss is high and about 24% of purchases are attributable to technical matters related to the efficiency of transportation and other non-technical networks due to the theft of electricity by some consumers, and this loss rate is high if compared with losses in neighboring countries, where the proportion Losses in Jordan are 14% and 6.5% in Israel, (Mas, 2014).

Electricity prices purchased in Palestine are the most expensive compared to European and neighboring countries due to the reliance on external sources to supply electricity, (EQA, 2017).

2- Oil derivatives: The Palestinian authorities buy oil derivatives from Israel. This includes gasoline, diesel, kerosene and liquefied gas. It is worth noting that the demand for petroleum products is increasing due to population density, (EQA, 2017).

3-Renewable energy: Renewable energy resources are among the most endless and polluting energy resources compared to other types of energy. In addition, renewable energy generation reduces dependence on others to supply energy.

Where renewables include solar, wind, and solid and organic waste. However, renewable energy represents 18% of the total energy consumed in Palestine. Palestine uses renewable energy only to use solar energy to heat water or to burn wood, charcoal, and peat, in addition to some small projects that aim to generate electricity by exploiting sunlight, (EQA, 2017).

The Palestinian energy sector suffers from many difficulties and obstacles (EQA, 2017):

1. The biggest challenge is that energy in Palestine in its various forms is purchased from external sources, which makes the provider control many things, the most important of which is the price and quantities of energy purchased.

2. The lack of interest in renewable energy sources and the lack of optimal utilization of resources. Investment initiatives in the field of renewable energy are limited to some small projects.

3. Weak awareness programs in the field of energy saving and consumption reduction

4. Palestine lacks the national electricity grid, as electricity is the main energy source used in Palestine.

5. The overlap of responsibilities between the relevant authorities.

2.7.1.3 Climate Change

Climate change is one of the most serious problems threatening humanity's future on Earth. Palestine, like other countries, is suffering from the effects of climate change. It affects the air temperature, amount of rain and its distribution in addition to desertification, floods, heat waves and many other serious economic, social, health and environmental consequences.

The Palestinian government is striving to develop and prepare strategies to avoid the harm of climate change, in addition to participating in relevant conferences and concluding agreements with relevant stakeholders, (EQA, 2017).

2.7.1.4 Wastes

- **Wastewater and Sanitation**

In Palestine, wastewater and sanitation threaten public health. About 70 million cubic meters of wastewater is discharged annually, in addition to 40 million cubic meters of wastewater from illegal Israeli settlements.

However, the wastewater and wastewater infrastructure is insufficient and suffers from many problems such as the lack of wastewater treatment plants and insufficient existing plants as there are only 10 wastewater treatment plants, five of which are in the West Bank. Moreover, sewage collection networks in major cities are ineffective and incomplete, and wastewater collection and treatment services in rural areas are not sufficient.

Finally, it is important to note that there is a great threat to the Palestinian environment, which is the wastewater that the Israeli settlements pump into the Palestinian land, in

the absence of a system for examining its type and quantity of this wastewater, (EQA, 2017).

- **Solid Waste**

There is no approved solid waste management system in Palestine. Moreover, the solid waste management sector faces many financial and administrative difficulties and obstacles, including conflicting laws and regulations in this field, while the lack of a unified national database for solid waste. Moreover, there is a lack of sanitation landfills, and the spread of many open solid waste landfills in different areas of Palestine. In addition, Palestine lacks control over transboundary waste.

Finally, with regard to different waste, there is no system for separating and treating solid waste except for some efforts made by some government buildings. (EQA, 2017).

- **Hazardous Waste**

Hazardous waste is considered a waste that may cause cumulative harmful effects that harm the environment or threaten human health and other organisms. It can be found in liquid, solid or gaseous conditions. Moreover, hazardous wastes fall into four categories: flammability, corrosion, reaction, and toxicity, (EQA, 2019).

As with solid waste management, the hazardous waste management system also faces many challenges that include the absence of special hazardous landfills, except for some pilot projects (incinerators and treatment units) in some Palestinian areas. Likewise, there is no system for the treatment and separation of hazardous waste except for some efforts made by some institutions (EQA, 2017).

- **Chemicals and Hazardous Materials**

Chemicals in Palestine are used in many fields, including agriculture, industry, health, research, and more. However, it should be noted that there is no accurate inventory of

the types and quantities of chemicals that enter the land of Palestine in a legal or illegal way, especially the dangerous chemicals that are caused by Israeli settlement factories inside the Palestinian territories. Not to mention that these dangerous chemicals pollute the environment severely and are harmful to public health.

It should be noted that the Palestinian government faces many challenges in managing hazardous chemicals and materials, including a lack of expertise and equipment to examine the materials, as well as poor coordination between the relevant authorities in the government, (EQA, 2017).

2.7.2 Demographic and Social Characteristics Reality

At the end of 2019, the population reached approximately 4,976,684 distributed among 60.01% in the West Bank and 39.99% in Gaza Strip, where the percentage of males reached 50.9% and the percentage of females 49.4%. The population density in Palestine is 800 people / km2, and the population density specifically in the West Bank is 519 people / km2, with a difference in density between the governorates of the West Bank, where the highest density was in Jerusalem and reached 1236 people / km^2, and the lowest was In Jericho where it was 90 people / km^2.

The Palestinian community is considered a young society, with 54.5% of the population being children. The percentage of those under five years of age is 15.2%, the age group 0-14 is 39.8%, while the population over the age of 65 makes up only 3.1% of the population (PCBS, 2019b).

2.7.3 Economic Reality

Palestine is a developing country with a weak economy that relies heavily on foreign aid. The economic situation in Palestine also depends on the unstable political situation, which hinders investment in such conditions. Moreover, any final decision regarding

everything related to economic development in Palestine is related to the Israeli approval, as exports, imports, taxes, etc. are subject to Israeli control. According to the latest estimates issued by the Palestinian Central Bureau of Statistics, the unemployment rate in Palestine was 25.9% in 2019, 26.4% for males and 53.7% for females. (PCBS, 2019b)

To talk about the poverty rate among the Palestinian population, it is considered high, as in 2019 it reached 29.2% according to real consumption patterns, with 13.9% in the West Bank and 53.0% in the Gaza Strip. It is estimated that 16.8% of the citizens of Palestine suffer from extreme poverty (PCBS, 2019a).

2.7.4 Palestinian Educational Sector

2.7.4.1 General Overview

After signing the Oslo Accords, and after the Palestinian National Authority took over the administration of the Palestinian Authority, and after it began operating in 1994, it was and still is responsible for providing equitable education for all in the West Bank and Gaza Strip. Since then, despite the obstacles imposed by the Israeli authorities and the difficult political and economic conditions, the Palestinian educational sector has witnessed a remarkable development over many years, for example, the number of school buildings in the Palestinian governorates reached 1474 in 1994 and the number increased in a few decades to 2998 in the year 2018, (MOE, 2019).

The Palestinian education sector is one of the most important sectors in Palestine, where the most recent statistical data indicate that the total spending on education in Palestine in 2017 amounted to about 1,321.3 million USD, which represents 5.3% of GDP, which is a relatively high number, and higher of spending on education in 2016, which was 5.7% of the GDP (PCBS, 2018b).

The education sector in Palestine is led by the MOE, being the official institution responsible for managing the organization and development of the educational system is either directly managed or through supervision of it (in all its sectors) Pre-school/ kindergarten, school education (1-12), vocational and technical education, and non-formal education, and the official capacity of the Ministry is to lead national efforts for strategic planning for the education sector in the State of Palestine through the Planning and Budget Group. Participating in the planning process are the relevant official and government institutions, civil society institutions, and international institutions concerned with education, (MOE 2017). The Palestinian people live in a tragic situation in which the occupier exercises conditions of intransigence, arrogance and armed violence that threatens the lives of men, women, children and the elderly, impedes the wheel of life and work, not to mention the disruption of progress and development. Knowledge and its building has been a victim of fraud, as the education system has been severely damaged as a result of the inability of many teachers and students to reach school over the long days, and Israel continues to pursue its policy of obstructing the educational process in the Palestinians, by implementing policies of limit, cut, and blockade, and curb and demolish schools and centers Education, impeding students and teachers 'access to their schools, preventing building schools in areas classified as" C "and in Jerusalem, to distort Palestinian curricula in Jerusalem, press schools to intimidate and intimidate to implement Israeli curricula and dispense with Palestinian curricula, and impose a blockade on the Gaza Strip and prevent the arrival of materials Construction to build and restore schools hinders the introduction of textbooks, and impedes communication and movement between the Gaza Strip and the West Bank, (MOE, 2017).

2.7.4.2 Educational Services Delivery System

The Palestinian National Authority was established in the wake of the Oslo agreement, which was concluded in 1993 between Israel and the Palestine Liberation Organization, and its first action was to take over responsibility for education in the West Bank and Gaza Strip. The Palestinian National Authority received the Ministry of Education with a destroyed educational infrastructure; The occupation did not mean education and its institutions; Therefore, the Ministry made efforts in all directions, such as building new schools, restoring old schools, building additional classes, appointing the necessary educational cadres, appointing teachers, developing curricula, opening new directorates, and paying attention to educational techniques; The number of teachers, divisions and schools increased. Perhaps the most prominent achievement of the Ministry: setting a new system for general secondary exams, issuing Palestinian secondary school certificates, paying attention to students, encouraging them, and honoring the first ones; the educational life in Palestine became better than it was. Thus, the Palestinian Authority achieved a quantitative development, in addition to achieving a qualitative leap; It built the Palestinian curriculum that matches Palestinian privacy, and reflects the needs of Palestinian students and the requirements of its society; It unifies the Palestinian educational system and solves the issue of duplication in the West Bank and Gaza; By preparing books that include the Palestinian curriculum, according to the Palestinian vision; Escort guides were issued to teachers. The Palestinian National Authority has also made several amendments, including: the introduction of the English language from the primary class, technology education, free activity, civic education and national education.

2.7.4.3 Schools

The school is an educational institution in which students learn lessons in various sciences and the study has several stages, which are elementary, middle or preparatory and secondary, and it is called compulsory primary education in many countries. The schools are divided into government schools, private schools and private schools. Many schools around the world adhere to a uniform to prevent class discrimination, to preserve pupil form, to be well disciplined, and to distinguish them from other school students

A report issued by the Ministry of Education on the educational reality of the academic year 2011-2012 showed that the number of schools in the Palestinian territories reached 2707 schools, with 2019 schools in the West Bank, and 688 in the Gaza Strip; The number of schools supervised by the government reached 2005, 343 schools were supervised by UNRWA, and 359 were supervised by the private and private sector. This report shows the large increase in the number of people practiced. There were 1474 schools in 1994/95 (when the Palestinian National Authority received education). Table 2.11 shows the increase in the number of schools from 1994 (the year in which the Ministry of Education took over), to 2018.

Table (2.11): Number of schools and kindergartens in Palestine and stage (1994-2018)

Schools			**Kindergartens**	**Academic Year**
Total	**High**	**Elementary**		
1474	333	1141	436	1995/1994
1470	372	1098	532	1996/1995
1532	414	1118	705	1997/1996

1611	454	1157	789	1998/1997
1691	487	1204	823	1999/1998
1767	508	1259	843	2000/1999
1835	519	1316	811	2001/2000
1918	554	1364	806	2002/2001
2006	602	1404	758	2003/2002
2109	647	1462	847	2004/2003
2192	695	1497	901	2005/2004
2277	740	1537	935	2006/2005
2337	774	1563	945	2007/2006
2430	815	1615	972	2008/2007
2488	853	1635	..	2009/2008
2577	880	1697	..	2010/2009
2652	905	1747	..	2011/2010
2707	915	1792	..	2012/2011
2784	942	1842	1539	2014/2013
2856	960	1896	1620	2015/2014
2914	960	1954	1666	2016/2015
2963	969	1994	1808	2017/2016
2998	1201	1795	1954	2018/2017

The data of the Ministry of Education indicate that the enrollment rates for students in basic education have achieved a large quantitative leap since the establishment of the Palestinian National Authority, with improvement in the inputs to the educational

process in terms of buildings, equipment, laboratory preparation and level of rehabilitation, in addition to improving living standards.

2.7.4.4 Classification of Schools

A brief description of the education sector: There are multiple sub-sectors under the education sector in the State of Palestine, and these sub-sectors intersect with many other sectors in their interests and interventions, and the education sector consists of the following sub-sectors:

1. **Pre-School Education (Kindergarten)**

It extends from the age of three years and seven months to the age of admission to school, and this stage aims to provide an environment that contributes to the development of the child's personality (physical, mental, emotional and social) and prepares him to enroll in the basic stage. By providing enough opportunities for him to develop his abilities to the optimum by playing and doing some activities such as simple drawings, taking picnics, and telling stories, dialogues, chants and songs in proportion to his age and environment.

2. **Basic and Secondary School Education**

Basic education stage: This stage starts from the first grade until the end of the ninth grade, and is divided into two sections:

a. **The minimum basic stage for grades (1-4), (Basic stage)**: Education at this stage is a basic basis for education, construction, and development to ensure comprehensive formation that is mentally, emotionally, and physically balanced, and enables children to master basic skills in the Arabic language and arithmetic and employ them in daily life. Their patriotism and thinking, deepening their environmental sense, and caring for the child’s physical health.

b. Upper Basic Stage (Empowerment): This stage includes grades (5-9) and aims to enable students to have different knowledge and sciences.

3. **Secondary Education (Possession)**: This stage includes grades (10-12) with its various tracks, academic, professional and technical, as students enroll in these tracks according to their abilities and inclinations and according to the laws and regulations organizing this. Specialized cultural, scientific, and professional experiences are provided that meet the real or hoped-for needs of the community at a level that helps students to continue their higher education or join the labor market. The goal of this stage is to help students to expand to work and university life as a bridge between basic education and various higher education institutions and the labor market.

4. **Higher Education**: It is a higher stage of education taught in universities, private colleges, technical colleges, etc. Or in any institution awards a university degree. Higher education differs from school education; Where the student studies in higher education in a specialized field that qualifies him to work in one of the fields of work after obtaining a degree in a specific specialization during his university studies.

5. **Non-Formal Education**: It includes learning activities that are usually organized outside the framework of formal education. This term usually corresponds to the terms formal and formal education. It addresses every purposeful and organized educational activity, and every knowledge, skill, value, or behavior that takes place outside the framework of educational systems consisting of schools, higher education institutions, universities, and other educational institutions that exist in a systematic manner, whether in social, economic, or political institutions, or in factories, or Civil society, etc. It is every purposeful educational activity that takes place outside the framework of school education or any organized activity that falls outside the school educational

system. Included under this type of education are two programs offered by the Ministry of Education and Higher Education: (1) the parallel education program: offered to dropouts who have completed 5-6 years in basic education, and (2) the literacy and adult education program: for those over the age of 15 who have not Fluent in reading and writing, (MOE 2017).

2.7.5 Sustainable Development in Palestine

In 2016, the Palestinian government confirmed its commitment to achieving the sustainable development goals. A national team was subsequently established, headed by the Prime Minister's Office. This team consists of members in several related fields. In addition to forming a team responsible for implementing and monitoring the sustainable development goals in Palestine. During the voluntary Palestinian national review on the implementation of the 2030 Agenda, the Palestinian government affirmed that the Israeli occupation is the main obstacle to achieving sustainable development goals in Palestine. Moreover, it stresses that achieving the SDGs requires the participation of all sectors including the education sector. Here we conclude that all sectors in Palestine are required to move towards sustainability.

As being discussed above, the concept of sustainability is considered an old, renewed concept that has received great attention over the past few decades, all of this as a result of what is caused by the development that man seeks to achieve in several fields in the form of environmental and social consequences that may be often dangerous. In addition to this concept, it was formulated with several definitions, according to certain factors, including the level of influence, priorities, conditions and many other factors.

Stakeholders seek to implement programs with the aim of achieving sustainability at various levels, whether institutional, national or even global, and this has led to the

emergence of many methods of ensuring the program. However, SA is not an easy process because there are many factors with mutual relationships.

In the past, the focus was on environmental impact assessment, such as that found in impact assessment tools. After that, SA methods emerged to form the next generation of EIA methods such as EIA and SEA, and these tools were expanded to include social and economic aspects with environmental aspects.

We note that a number of quality assurance tools are available in the market with the aim of assessing the sustainability of a variety of building types (including school buildings) in the project life cycle phases, for example, LEED, BREEAM, CASBEE and Green Star. However, the aforementioned and other tools have many weaknesses including a heavy focus on the environmental dimension and are not considered comprehensive as they are not appropriate to all contexts and are time consuming. For these reasons, several studies have been undertaken to work on developing tools and frameworks to assess the sustainability of a particular type of building and within a specific context according to specific circumstances and priorities.

It is worth noting that a lot of research has been done to develop SA methods to assess the sustainability of buildings of all types, especially school buildings that are characterized by the excessive use of natural resources and the dumping of different types of waste. However, these studies were conducted in developed countries where priorities and circumstances differ from developing countries.

Palestine is a developing country as it has limited control over its natural resources and borders. Also, its economy is weak and depends primarily on foreign aid, and is controlled by the Israeli economy in all its fields. Therefore, we see that all sectors suffer from harsh and difficult conditions that hinder development and the provision of

sustainable services. In addition to that, recently, Palestine is witnessing an increase in population density, especially in the major cities and refugee camps, all of this accompanied by an increase in the rate of unemployment and poverty

The education sector in Palestine is led by the Ministry of Education and Higher Education - being the official institution responsible for managing, organizing and developing the educational system (either directly or through supervision of it) in all sectors (pre-school / kindergarten, and school education (1--12), vocational education) Technical, non-formal education, and higher education (-). The Ministry, in its official capacity, will lead the national efforts for strategic planning of the education sector in the State of Palestine through the Planning and Budget Group. There are 81 government schools in Palestine, 51 in the West Bank and 30 in the Gaza Strip However, many of these schools are constructed and operating for many decades and have become old buildings.

Education is at the core of the 2030 Agenda for Sustainable Development, and is an essential component for success in achieving all sustainable development goals. In recognition of the importance of the role of education, the 2030 Agenda for Sustainable Development highlights education as a stand-alone goal (Goal 4 for sustainable development) which aims to “ensure quality, equitable and inclusive education for all, and enhance lifelong learning opportunities for all, and therefore there are many challenges that It can negatively affect sustainability and threaten the Palestinian environment and community health. To this end, this study aims to develop a quality assurance tool that is dedicated to assessing the sustainability of school buildings within the scope of developing countries, especially in the West Bank.

Chapter Three

Methodology

3.1 Overview

This chapter shows the research methodology used in this thesis. Various research philosophies and some research methods were discussed in the first section. The optimal choice of quantitative, qualitative, or even multiple methods was adopted in the next section. Specific research strategies were also designed.

The sampling mechanisms, the focus of the study, were explained as part of the data collection process in this chapter, taking into account the importance of focusing on the data collected being reliable and valid. The last section presents the mechanisms and techniques of data analysis (PLS-Path modeling) which is what has been used in this thesis to explore the relationships between the construct.

3.2 Approach of Research Design

Research methodology is an organized method that includes the following: defining the problem, formulating hypotheses, collecting data and facts, evaluating and analyzing them, and finally arriving at a reliable result to confirm whether it is compatible with the previously formulated hypotheses. Research is a systematic way to search for a solution to a problem or a new fact. (Kothari, 2017).

There are several ways to distinguish the types of research subject to several bases such as the objective of the research, the approved research method, the environment in which the research is conducted, the time frame, or according to other factors. To speak of the purpose of research, research can be categorized into three general categories: exploratory, descriptive, explanatory, or a combination of these categories (Thornhill, Saunders and Lewis, 2009; Gordon, Carrigan and Hastings, 2011; Kothari, 2017)

An exploratory study is an important means of formulating hypotheses rather than testing them, and its main objective is to explore what is happening to gather information about an important topic or even discover the nature of a problem. Therefore, the design of such research must be flexible and adaptable to potential change as many aspects of the diverse problem are monitored and modified as they arise during the progress of the research. There are many ways to conduct these exploratory studies including literature search; Conducting "expert" or individual in-depth interviews, focus group interviews, or even conducting a survey (Thornhill, Saunders and Lewis, 2009; Kothari, 2017).

Descriptive study: This study aims to obtain data for describing the characteristics of the research subject. It may be a continuation of a piece of exploratory research or often part of an explanatory research.

It is worth noting that descriptive research designs are often structured and specifically designed to measure the characteristics described in research questions, and the process of data collection in this type of studies is usually within structured processes, such as data observation or interviews with a number of structured questions in contrast to exploratory studies Therefore, descriptive studies are confirmatory studies in other words, they are used to test hypotheses (Thornhill, Saunders and Lewis, 2009; Hair Jr, Page and Brunsveld, 2019).

Explanatory study: This type of study is concerned with establishing causal relationships (cause and effect) between variables. A well-known example is the study of a specific case or problem to understand and explain the relationships between variables. The collected data is subjected to a statistical test such as correlation and

others in order to understand the impact of the outcomes on Results (Thornhill, Saunders and Lewis, 2009).

3.3 Research Approach (Quantitative Method)

According to (Creswell and Creswell, 2017) research approaches *"are plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis. It involves the intersection of philosophical assumptions, designs, and specific methods"*. The research method usually consists of a deductive or inductive approach, in which an approved theory is usually used to formulate research objectives and hypotheses and to develop a model for data collection, after which a deductive approach is used, that is, the deductive approach is considered as a "top-down" approach to falsification or verification of theory (Thornhill, Saunders and Lewis, 2009; Creswell and Creswell, 2017).

Whereas, the **inductive approach** begins with data collection and analysis, with the aim of developing a conceptual framework to guide subsequent work. The inductive approach is considered fundamental because of the nature of the theory. The inductive approach organizes work back and forth between all topics and the database and a comprehensive set of those topics is formed, then the collected data is then evaluated deductively (Thornhill, Saunders and Lewis, 2009; Creswell and Creswell, 2017).

The selection of the appropriate research approach depends on the nature of the research problem and the way to address it, and according to the personal experiences of the researchers, as well as the nature of the audience to be searched. As there are two basic methods of the research method, namely the qualitative approach, or the quantitative approach, and the two approaches can be combined together by the so-called mixed methods.

The qualitative approach: Qualitative research involves collecting and analyzing non-numerical data (e.g., text, video, or audio) to understand concepts, opinions, or experiences, this approach is an important way to explore and evaluate a particular phenomenon related to a social or human problem, and uses certain data collection techniques such as interviews, and later the data collected is analyzed using the procedure (such as data classification) that uses non-numerical data.

The quantitative approach : Quantitative research emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques. This approach is important to test the theory by examining the relationship between the measured variables in order to derive numerical data that is later analyzed using statistical techniques. Two main strategies associated with this approach are the experimental and the investigative, and it includes key data collection tools that are questionnaires, structured interviews, or perhaps structured observation (Thornhill, Saunders and Lewis, 2009; Creswell and Creswell, 2017).

The approach that combines the two research approaches mentioned above is called the hybrid approach, where quantitative data (i.e. quantifiable data) and qualitative data (i.e. text or images) are collected and analyzed, where a clearer and more accurate picture of the collected data is provided and a view of the Best for problem and research questions (Creswell and Creswell, 2017; Creswell and Guetterman, 2018).

In this research, the deductive quantitative method was used, where the required data were collected through a questionnaire.

Quantitative research is concerned with describing the research problem by describing the trends or the need and explaining the relationship between the variables. Then,

justifications for the research problem are formulated, and specific, measurable and observable research questions or hypotheses are formulated. The numerical data is then collected by tools with some pre-set questions and answers; After that, trends and variables are analyzed by using statistical analysis and formulating the final results, and finally a structured research report is written (Creswell and Guetterman, 2018). It is worth noting that quantitative research is carried out using the experimental, correlation or survey design strategy.

A survey research strategy is one of the procedural strategies in quantitative research where the research sample is scanned to describe attitudes, trends, opinions, or characteristics of the target sample. Cross-sectional and longitudinal studies are used by collecting data using questionnaires, structured observation, or even structured interview techniques (Creswell and Creswell, 2017).

The survey strategy is generally related to the exploratory deductive research approach as it is a common strategy in business and management research (Thornhill, Saunders and Lewis, 2009). Both quantitative and numerical data are collected in a survey strategy which is quantitatively analyzed using descriptive and inferential statistics (Thornhill, Saunders and Lewis, 2009).

Correlational design strategy: It is one of the processes in which descriptive correlational statistics is used to measure the degree of correlation (or relationship) between two or more variables (Creswell and Creswell, 2017).

Experimental design strategy: This approach is a way to conduct a quantitative research, where the researcher seeks in the experimental research to determine the effect of a particular treatment on a result or a dependent variable by applying the experiment to one group and withholding it from another group, and then determining how the two

groups together affect the result, and the search strategy is used Survey using questionnaire technique. (Creswell and Creswell, 2017; Creswell and Guetterman, 2018).

3.4 Research Methodology

Talking about **the research strategy**, we conclude that it is a specific set of steps that must be followed in an orderly manner to achieve the objectives of the research, and it includes the following: formulation and identification of the research problem, literature review, determining the purpose of the research, research design, data collection, data analysis and interpretation. Finally, preparing the necessary reports and evaluating the research. Depending on this, a specific research strategy is adopted that aligns with the research objectives, what the research questions are, and other important factors such as access to data sources, study preparation and time horizon (Thornhill, Saunders and Lewis, 2009; Creswell and Guetterman, 2018). According to (Sekaran and Bougie, 2016), common research strategies include experiment, investigative research, observation, case studies, basic theory, action research, and mixed methods.

This research is considered a quantitative inferential research, where the survey research strategy was used, and then organized steps were followed and explained in the research methodology flow chart according to Figure (3.1) below in order to achieve the objectives of this research.

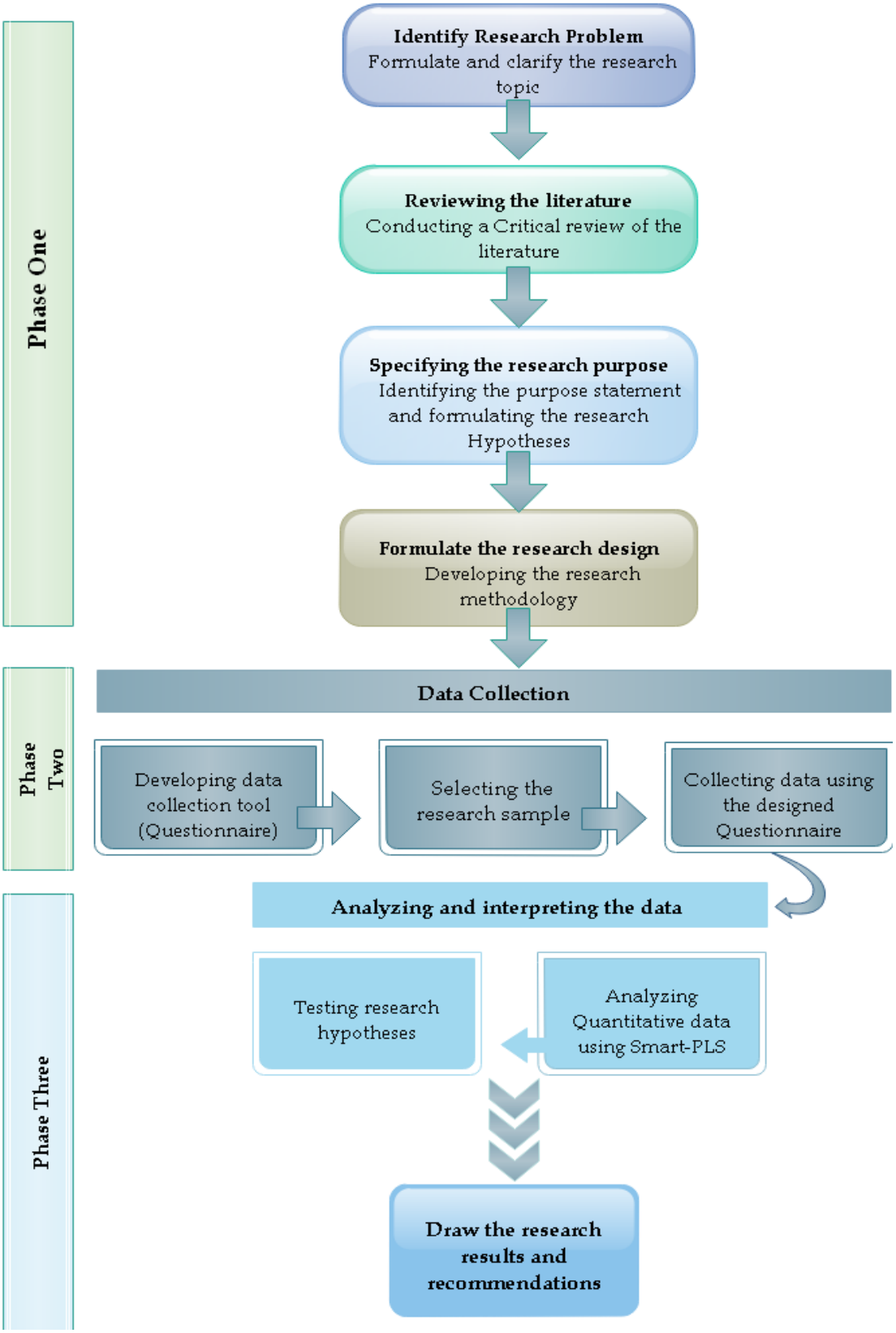

Figure (3.1): Research Diagram Flow Chart

In the beginning, the research problem was identified in the first stage of the study, in which the scope of the study, its justifications and the importance of the research were determined. Then an in-depth literature review was conducted to explore the concept of sustainability and to define the research gap and its goal, and then the research objectives were narrowed to specific research questions and hypotheses. Finally, the research methodology and strategy are structured to answer the research questions and hypotheses.

This was followed in the second stage by working on collecting the data required to answer the research hypotheses, the study population was determined, the representative study sample was selected, and the data collection tool (the questionnaire) was designed. The questionnaire was distributed to the selected sample either online or in person.

In the last stage of the research, the collected data was explained and analyzed and the relationship between the variables in the proposed model was tested statistically using the Smart-PLS application, and then it was determined whether to accept or reject the proposed hypotheses after using the results of the analysis.

Finally, the conclusions and recommendations of the research were developed in the last stage of the process.

3.5 Data Collection- Questionnaire Design

Specific tools are used in collecting quantitative data, the most important of which are survey questionnaires and standardized tests, and they include a number of questions related to the topic of research that are used to measure, observe or document quantitative data (Creswell and Guetterman, 2018). It is worth noting that the questionnaire is one of the most widely used data collection tools in the survey strategy,

especially in management and business research. The questionnaire includes a set of pre-prepared questions that are distributed to respondents to analyze their answers (Sekaran and Buji, 2016). Where questionnaires tend to be used for descriptive research. or even explanatory such as organizational practices (Thornhill, Saunders and Lewis, 2009).

The researcher’s use of the questionnaire makes it easier for him to collect data by sending it to a large number of respondents at the same time. It is considered one of the tools that save time, effort and cost compared to other tools such as interviews and observation, not to mention that collecting data through the questionnaire does not require specific skills as they are primarily required in conducting Interviews (Bell, Bryman and Harley, 2018).

In this research, both in-person and online questionnaires were used, and included questions centered around a closed format. According to (Bell, Bryman and Harley, 2018) closed questions are important in providing many advantages to the researcher, the most important of which is enhancing the comparability of all answers, which in turn facilitates the process of evaluating the relationship between variables, facilitating the processing and coding of answers, and reducing the probability and variance, It is also characterized by its ease and speed of completion. Five-point Likert scales were also used to measure a school's economic, environmental and social performance.

After an in-depth review of the previous literature on sustainability and an analysis of papers on the sustainability of school buildings, a research questionnaire template was formulated,

the questionnaire was designed to test the hypotheses of the research model, it is composed of three main constructs. The first one is related to the demographic

information of schools and their principals which consists of 13 items. Then the sustainability three pillars-relate evaluation categories and indicators were divided into three main parts, namely, environmental, economic and social aspects, collectively, with 11 items. The last part, includes 5 items for assessing impact of sustainability on the quality of school education. The five-point Likert scale was used for reporting the school principals' responses of sustainability and quality items.

After preparing the questionnaire it was revised by a group of experts to ensure its validity and consistency of the items. All of them gave a concern of length, word and number of sentences have been considered and modified. The last edition of the survey was written in English (as shown in Appendix A) but based on the fact that the mother language in Palestine is Arabic, it was translated to Arabic (as shown in Appendix B). The Arabic version of the questionnaire was used for data collection.

Using Google Drive Templet, an electronic (online) questionnaire was created, it was elaborately designed online in Arabic and sent via WhatsApp to all the 90 targeted schools. School principals were also contacted via phones, and many of them were contacted in person to motivate them. To fill out the questionnaire, facilitate cooperation and clarify any ambiguity in the questionnaire's axes. Two months were needed to collect all the responses, and all the collected data was stored anonymously on a google drive database for analysis.

3.6 Sampling Techniques

According to (Sekaran and Bougie, 2016) *"Sampling is the process of selecting a sufficient number of the right elements from the population so that a study of the sample and an understanding of its properties or characteristics make it possible for us to generalize such properties or characteristics to the population elements"*, Hence, we

see that the sampling process includes defining the population, selecting the representative sample frame, and defining the sample design and its appropriate size according to the study.

The study population consisted of governmental schools in Ramallah and Al-Bireh district. Based on the available data, the target community included (90) governmental schools (boys and girls). The sample of the study representing the research was adopted by setting a set of criteria in order to draw correct generalizations of the conclusions after analyzing the data.

All 90 schools were investigated by contacting the principals of the schools under study. Probability sampling was used in this study, and the sample size was calculated using the Herbert Arkin formula:

$$n=\frac{p(1-p)}{(SE\div t)+[p(1-p)\div N]} \quad \text{.....(3.1)}$$

Where:

n= the sample size

N=Population

P=Proportion of property offers and neutral

SE=Error margin

t= is the upper α/2 of the normal distribution (for 95% confidence level 1.96)

Using the Herbert Arkin formula, and the following parameters were used N= 90, P= 0.5, SE= 0.05 and t=1.96 for 95% confidence level 95%, the accurate sample size is approximately n= 88, as a consequence electronic questionnaire was distributed to the 90 school to collect the needed primary data. Data from 70 governmental schools out of the 90 (about 78% response rate) could be collected and were valid for further analysis.

Table (3.1) summarizes some frequencies and percentages of the sampled 70 schools. It was found that 90% of schools are located in villages, 44% were established before 25 years, 61% of principals gained educational sciences degree, 81% of schools are secondary schools, 47% of schools are located on 2 to 4 acres' area. It is worth noting that there is a need to determine the minimum required sample size in the case of surveys and other statistical methods, in order to generalize the results to the population (Saunders et al., 2009). To obtain a statistically representative sample size of the population, the recommendation of Hair et al.. (2016) was followed and Barclay et al. (1995) for facilitating the analysis using SEM-PLS. More specifically, the 10-time rule was adopted, which indicates "10 times the largest number of structural paths directed towards a particular building in the structural model".

Table (3.1): The sample distributed by frequencies and percentages

Variable	**Values**	**Frequency**	**Percentage%**
School location	City	7	10%
	Village	63	90%
Date of establishment	Less than 25 years	31	44%
	Between 25-50 years	14	20%
	More than 50 years	25	36%
Specialty	Educational sciences	43	61%
	Administrative sciences	2	3%
	Engineering sciences	3	4%
	Other	22	31%
School capacity	Secondary	57	81%
	Higher basic	10	14%

	Lower basic	3	4%
School building area	Less than 2 Acres	22	31%
	Between 2 and 4 Acres	33	47%
	More than 4 Acres	15	21%

Based on the above rule, 70 responses were required to complete the questionnaire. Due to the outbreak of the Covid-19 pandemic and to reach the principals of the schools under study, data were collected from April 2020 to May 2020 via the electronic survey by Google Drive.

3.7 Data Analysis Techniques

After the process of collecting quantitative data through the representative study sample, which included the schools of Ramallah and Al-Bireh, it is then necessary to process and analyze this data, which is considered preliminary, in order to derive useful information for the subject of the research. Charting and graphing techniques as well as complex statistical modeling .To test the relationships between variables, there are many quantitative analysis programs, including spreadsheets such as Excel, as well as more advanced statistical analysis program packages such as Minitab, SPSS and SMART-PLS.

To highlight this research, the collected data have been analyzed statistically using PLS-SEM (Partial Structural Equation Modeling of Least Squares) in order to test the research hypotheses. And the hypotheses are in exploratory research mainly, and this comes by understanding and explaining the variance in the dependent variables when the model generated by the use of multivariate analysis is examined, as PLS path modeling has been used through several researches related to strategic management, organizational behavior and marketing (Henseler, Ringle and Sinkovics , 2009).

It is worth noting that the PLS-SEM technique is considered a statistical technique that fits with this research for many reasons, as it is suitable for exploratory studies, especially when the theoretical model is not easy and has not been subjected to any statistical test before, so PLS-SEM is a statistical method that does not require the distribution of data in a way Normal, the PLS-SEM technique is also characterized by path model estimation even if the sample size is small (Henseler, Ringle and Sinkovics, 2009; Hair Jr et al., 2016).

3.7.1 SEM -PLS Path model

The path model is a schematic diagram that connects the variables and hypotheses that are examined when applying SEM, and to fly this model, two types of theories must be available: measurement theory and structural theory. While the structural model serves to clarify how structures and variables relate to each other in this model, scaling theory also defines how each structure is measured (Hair et al., 2016).

To talk about the PLS-SEM path model, we found that it consists of two parts: First, the structural model (also called the internal model) which is related to the variables / combinations (represented by circles or ovals). The structural model also defines the relationships (paths) between those variables/constructions. Second, scaling models (also called exogenous models) are the relationships between the constructs and their corresponding indicator variables (rectangles). Also, this path includes two types of measurement models (also called indicators): one is a model for the external latent variables (which explain the external structures in the model) and the other is for the internal variables (that is, those structures are explained inside the model) (Hare et al., 2016).

3.7.2 Assessing PLS-SEM Path Model

The PLS-SEM path model works on an empirical measurement of the empirical measures of the relationships between indicators and variables (measurement models) as well as the relationships between variables (structural model).

It is worth noting that the PLS-SEM technology does not provide an appropriate signal quality standard. Therefore, a number of non-parametric evaluation criteria were developed by researchers and worked on using specific procedures such as the bootstrap to evaluate both the external and internal model. It is to focus on evaluating measurement models, which facilitate the evaluation of the reliability of structural standards, and their validity as required by specific standards related to the external model before the internal path model is evaluated.

After the measurement model is evaluated, the internal consistency and validity are subsequently tested. Composite reliability measures (as a means of assessing the reliability of internal consistency) also include convergent validity and discriminatory validity. The structural model as a whole is subsequently evaluated to confirm the reliability and validity, and this includes determining the ability of the measurement model to predict.

3.7.3 Selecting the Appropriate Model

AHP is an MCDM technology and is preferred by many users. It is simple, flexible, easily adaptable, and does not include complex mathematical equations. It is based on a hierarchical structure and thus the focus is better placed on each sub-criterion (Ishizaka and Labib, 2009; Shahroodi et al., 2012). Thomas Saaty proposed the use of this method in the 1970s (Shahroodi et al., 2012) where AHP provides a framework that has the ability to deal with differences and conflicts as well as supports any decision making in

the planning process. The implementation of AHP follows a structured process in order to make any decision that is summarized in the following steps:

Step One: Form a hierarchical model and define the main goal. Since the objective of the study in this technique is located at the highest level of the hierarchy, several alternatives to the solution are also available at the lower level. The second and third level, respectively, include standards and sub-standards (Saaty and Vergas, 2012). Criteria and sub-criteria help decision makers to determine preferences which in turn help in making the optimum final decision. The decision maker can add many levels, depending on the required level of analysis.

Step Two: Rank each teacher at each level of the hierarchy using a scale of nine integers suggested by Saaty (Saaty & Vargas, 2012). This measure is shown in Table (3.2) in order to assess the severity of the significance between parameter 1 and 2 related to its immediate higher level. After that, a specific matrix is formulated to make the pairwise comparison after comparing all the parameters with the preference scale pair, with reference to the opinion of the decision makers.

Step Three: In which the weights of the parameters are estimated according to each level in the sequence of the decision, after the judgment matrix has been formulated. It is possible to calculate Eigen vectors, sometimes called relative weights, by normalizing each column in the same matrix; Then each row is summed up so that each row is summed separately; Later, the average of each row in the matrix is calculated.

Table (3.2): AHP measurement scale

Intensity of importance	Definition
1	Activity A is equally important to activity B
3	Activity A is slightly more important than activity B
5	Activity A is strongly more important than activity B
7	Activity A is very strongly more important than activity B
9	Activity A is extremely more important than activity B
2, 4, 6, 8	Intermediate values to comprise between weights values
Reciprocals	If activity A has one of the above non- zero numbers assigned to it when compared with activity B, then B has the reciprocal value when compared with A.

Source: (Saaty & Vargas, 2012).

When calculating the relative weights of a number of alternatives related to a specific sub-criterion, it is thus easy to obtain the relative weights of each alternative by multiplying the matrix that resulted from the previous step with the local weights of those sub-criteria according to each criterion. This is shown in equation (3.2).

$$(\text{Relative weights of alternatives with respect to each subcriterion}) * (\text{Relative weights of subcriteria with respect to each criterion}) = (\text{Relative weights of alternatives with respect to each criterion}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Finally, the global weights of the proposed alternatives are calculated by multiplying the weights of the alternatives related to the criteria by the relative weights of the same criteria related to the goal. This is shown in equation (3.3). It is worth noting that the calculations will be presented in detail in the discussion results chapter.

$$(\text{Relative weight of alternatives with respect to each criterion}) * (\text{Relative weight of criteria with respect to goal}) = (\text{Alternatives weights}) \quad \ldots\ldots\ldots\ldots (3.3)$$

Step four: In which work is done to verify the validity of the results under study by calculating the degree of consistency. One of the most important features of AHP is the ability to calculate consistency due to people being inconsistent in their judgments. Where consistency ratio (CR) is used to measure consistency mathematically as

$$CR = \frac{CI}{RI} \quad \text{..... (3.4)}$$

In which CI is the consistency index, which equals

$$CI = \frac{\lambda max - n}{n-1} \quad \text{.....(3.5)}$$

where λmax is the largest eigenvalue and is called the eigenvalue principle. RI is a random consistency index and is defined as the average CIs of a large set of matrices with random inputs, and there is a change in the number of parameters in the comparison (n). The RI values are shown with respect to n in Table (3.3) (Saaty & Vargas, 2012).

Table (3.3): Random consistency index (RI)

N	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.4	1.45	1.49

Source: (Saaty & Vargas, 2012)

Step five: The last step in the AHP program includes calculating the total weight for each main criterion and sub criterion, in which the results of both local and global weighting are clarified in the results chapter and discussion.

According to Watchmaker (1977), weights are considered consistent if their score is less than or equal to 10%, otherwise the data is inconsistent, and the decision maker's answers need to be revised.

It is worth noting that the AHP method has been applied in several areas including resource management, corporate policy and strategy, energy planning, logistics and public policy, as well as transportation engineering (Ishizaka & Labib, 2009; Shahroodi et al., 2012). Robles Algarín, Llanos, & Castro (2017) has demonstrated the suitability of this method in various renewable energy projects in a number of studies, where the AHP method was used to assess risks in a number of rural/Caribbean areas in Colombia; Ahmad & Tahar (2014) worked on accrediting the AHP Renewables Classification Program in Malaysia. In 2016, Al Garni et al worked on an AHP application for evaluating renewable energy generation sources in Saudi Arabia. (Kaplan, 2004) used the AHP program in order to select the most appropriate option for energy conservation policy in Jordan. Also in 2009, Chatzimoratidis & Pilavachi used the AHP program to compare multiple power plants with the aim of generating electricity from a technological and economic perspective. In addition, Theodorou, Florides and Tassou (2010) previously used the AHP program to find a suitable financing scheme for renewable energy projects in Cyprus. Finally, the sustainable electricity generation of Pakistan was evaluated by Aamir and Dim (2011).

Chapter Four

Data Analysis and Discussion

4.1 Results and Discussion

The overall purpose of this research is to develop a sustainability assessment model for schools to be used in the local Palestinian context based on the different existing international evaluation systems, in order to guide and improve sustainability of the Palestinian schools; also to examine the significant mean differences of the sustainability assessment model for schools to be used in the local Palestinian context based on the different existing international evaluation systems from the viewpoint of administrators and teaching staff and its improvement strategies according to the independent variables (gender, academic qualification, job title, the college name, years of experience and participate in quality training programs or courses). We will use the following scale to consider the level impact mean scores degree for sustainability dimensions and statements, this scale depends on interval length=range/number of intervals, interval length= (5-1)/3=1.33. The following scale represents the result: 1-less than 2.33 is low; 2.33- less than 3.66 is medium and 3.66-5 is high. The result related to the main question: **What is the level impact of sustainability assessment model indicators for schools to be used in the local Palestinian context?**

Out of the above question the following sub-questions are derived.

1- What is the level impact of sustainability according to environmental aspect indicators for schools to be used in the local Palestinian context?

2- What is the level impact of sustainability according to economic aspect indicators for schools to be used in the local Palestinian context?

3- What is the level impact of sustainability according to social aspect indicators for schools to be used in the local Palestinian context? To answer this question Table (4.1) shows the means and standard deviations distributed according to sustainability dimensions and the whole instrument.

Table (4.1) means scores and standard deviations distributed by sustainability dimensions

Sustainability Aspects	**Mean**	**Standard Deviation**	**Level**
Environment Indicators	3.43	0.70	Medium
Economic Indicators	4.18	0.54	High
Social Indicators	3.79	0.55	High
Average score	**3.80**	**0.60**	**High**

It appears from Table (4.1) after analyzing data using the SPSS, that the degree effect of the average score of the sustainability assessment is high with the total average (3.80) and standard deviation (0.60), the highest mean score (4.18) related to the "Economic Indicators" and standard deviation equals (0.70) with a high level, followed by the mean (3.79) related to the "Social indicators" and standard deviation equals (0.55) with a high level, the lowest mean equals (3.43) related to the "environment indicators" with a medium level effect, and standard deviation equals (0.70). The researcher attributes this result to the strong impact of the general economic situation in the local Palestinian context with regard to sustainability in governmental schools, and this is also represented in the mechanism of supporting government projects, especially school buildings, through external funders, or even supporting these important projects through the Palestinian government itself.

4.2 Survey Validity

The content validity dealt with how the representative and comprehensive items were in creating the scale. It was assessed by examining the process, by which the scale items were generated. The content validity in this study should be relatively acceptable, since the various parts of the questionnaire were all based on the literature review and on the opinions of several experts who would examine the items. To make sure of the questionnaire validity, internal consistency is used. More specifically, we calculate a correlation between every statement and the sustainability dimension, if the value of the calculated correlation is less than (0.30) the correlation is weak, between (0.30- and less than 0.70) the correlation is medium, (0.70 and more the correlation is high), (Garcia & Gonzalez, 2006). Table (4.2) shows the correlations between each sustainability dimension and its associated items.

Table (4.2): The correlation between statements and dimensions of sustainability

Statement	**Correlation**	**Statement**	**Correlation**	**Statement**	**Correlation**
Environment					
ENV-A-1	**0.546**	ENV-D-4	**0.710**	SOC-A-3	**0.423**
ENV-A-2	**0.746**	ENV-E-1	**0.405**	SOC-A-4	**0.618**
ENV-A-3	**0.550**	ENV-E-2	**0.575**	SOC-A-5	**0.534**
ENV-A-4	**0.471**	ENV-E-3	**0.497**	SOC-A-6	**0.425**
ENV-A-5	**0.537**	ENV-F-1	**0.498**	SOC-A-7	**0.420**
ENV-B-1	**0.728**	ENV-F-2	**0.615**	SOC-A-8	**0.485**
ENV-B-2	**0.641**	ENV-F-3	**0.485**	SOC-A-9	**0.424**
ENV-B-3	**0.474**	ENV-F-4	**0.502**	SOC-A-10	**0.413**
ENV-B-4	**0.670**	ENV-F-5	**0.563**	SOC-A-11	**0.482**

ENV-B-5	**0.403**	ENV-F-6	**0.778**	SOC-A-12	**0.695**
ENV-B-6	**0.777**	ENV-F-7	**0.718**	SOC-A-13	**0.647**
ENV-B-7	**0.600**	**Economic**		SOC-A-14	**0.713**
ENV-C-1	**0.509**	ECO-A-1	**0.755**	SOC-B-1	**0.614**
ENV-C-2	**0.582**	ECO-A-2	**0.669**	SOC-B-2	**0.657**
ENV-C-3	**0.528**	ECO-A-3	**0.407**	SOC-C-1	**0.773**
ENV-C-4	**0.649**	ECO-B-1	**0.774**	SOC-C-2	**0.648**
ENV-C-5	**0.521**	ECO-B-2	**0.721**	SOC-C-3	**0.666**
ENV-C-6	**0.874**	ECO-B-3	**0.703**	SOC-C-4	**0.679**
ENV-C-7	**0.712**	ECO-B-4	**0.524**		
ENV-D-1	**0.526**	**Social**			
ENV-D-2	**0.481**	SOC-A-1	**0.556**		
ENV-D-3	**0.754**	SOC-A-2	**0.546**		

It is clear from Table (4.2) that the correlation between statements and related dimensions of sustainability, are greater than 0.30, which is significantly acceptable, and hence we conclude that every statement is related to its corresponding dimension. Similarly, Table (4.2) shows the correlations between the school education quality and its related statements divided with respect to stakeholders.

Table (4.3): The correlation between statements and dimensions of education quality

Statement	**Correlation**	**Statement**	**Correlation**
Students			
STU-1	**0.897**	**Parents**	
STU-2	**0.957**	PAR-1	**0.955**
STU-3	**0.931**	PAR-2	**0.968**

Teacher		PAR-3	0.975
TEA-1	0.969	Community	
TEA-2	0.971	COM-1	0.939
TEA-3	0.912	COM-2	0.959
Administration		COM-3	0.961
ADM-1	0.966		
ADM-2	0.983		
ADM-3	0.952		

From Table (4.3), we conclude that the correlation between statements and related dimensions of school quality, are greater than 0.30, which is significantly acceptable, and hence, we conclude that every statement is related to this dimension. Figure (4.1) depicts the path coefficients between sustainability and its three dimensions.

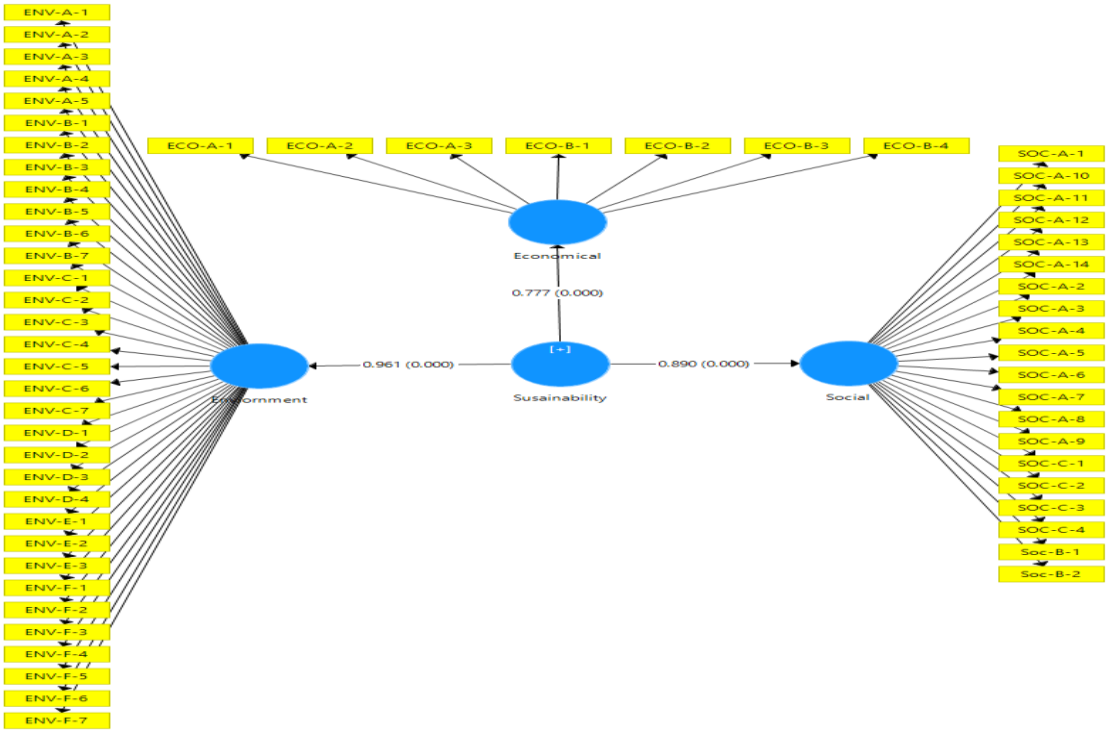

Figure (4.1): Path coefficients between sustainability and its main three dimensions

It is clear from Figure (4-1) that the correlation of the environmental dimension indicators on sustainability is the highest with (0.96), followed by social aspect indicators with (0.89), the lowest related to the economical aspect indicators with (0.777). All these coefficients are significant as their p-values summarized in brackets are all 0.000 and less than the 5% significance level. On the other hand, Figure (4.2) shows Path coefficient between school education quality and stakeholders. It is clear that the correlation between the community indicators and school education quality is the highest with coefficient value of 0.910, followed by parents' indicators with correlation value of 0.903, while teachers indicators come thirdly with correlation value of 0.878, whereas administrators indicators result in correlation value of 0.806, and the lowest correlation related to students indicators resulted in 0.592. All correlation coefficients are significant as their p-values are 0.000 and less than the 5% significance level.

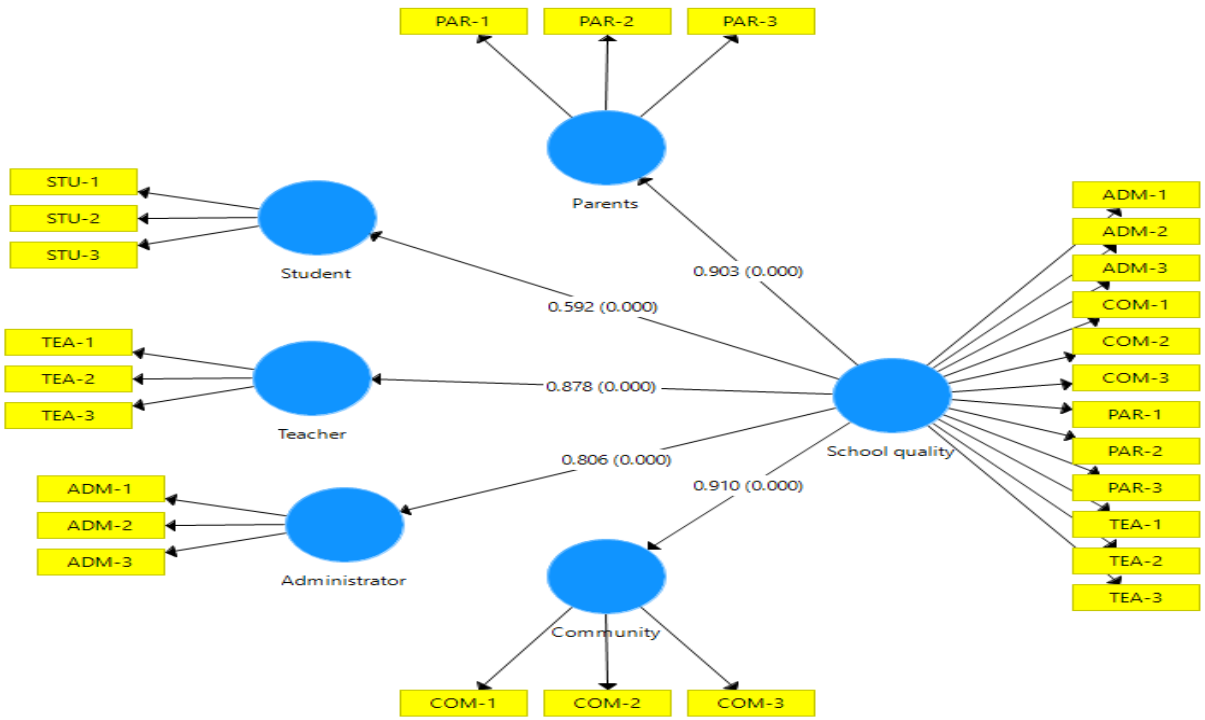

Figure (4.2): Path coefficient between school education quality and stakeholders

4.3 Reliability

To find out the reliability degree of the questionnaire, the reliability coefficient (Cronbach alpha) is calculated as an indicator of the homogeneity to the level of the instrument. An accepted level would be more than (70%). Table (4.4) summarizes the Cronbach's alpha values.

We found from the above Table (4.4) that Cronbach's Alpha for all dimensions of sustainability and school quality are more than 0.70, specifically, the range of reliability located between (0.778) and (0.966). The reliability for the whole instrument of sustainability equals 0.955. Also, the reliability for the whole instrument of school quality equals (0.958).

Table (4.4) Cronbach's Alpha values for sustainability and school quality dimensions

Dimension	**Cronbach's Alpha**	**ρ_A**	**Composite Reliability**
Economic	**0.778**	**0.776**	**0.841**
Environmental	**0.939**	**0.949**	**0.945**
Social	**0.873**	**0.894**	**0.893**
Sustainability	**0.955**	**0.963**	**0.958**
Admin	**0.966**	**0.966**	**0.978**
Community	**0.949**	**0.950**	**0.967**
Parents	**0.964**	**0.964**	**0.977**
Student	**0.920**	**0.931**	**0.949**
Teacher	**0.947**	**0.949**	**0.966**
Quality	**0.958**	**0.962**	**0.963**

All Cronbach's Alpha values are high and statistically-accepted for the purposes of this research,. Figure (4.3) depicts the Cronbach's Alpha values of the study.

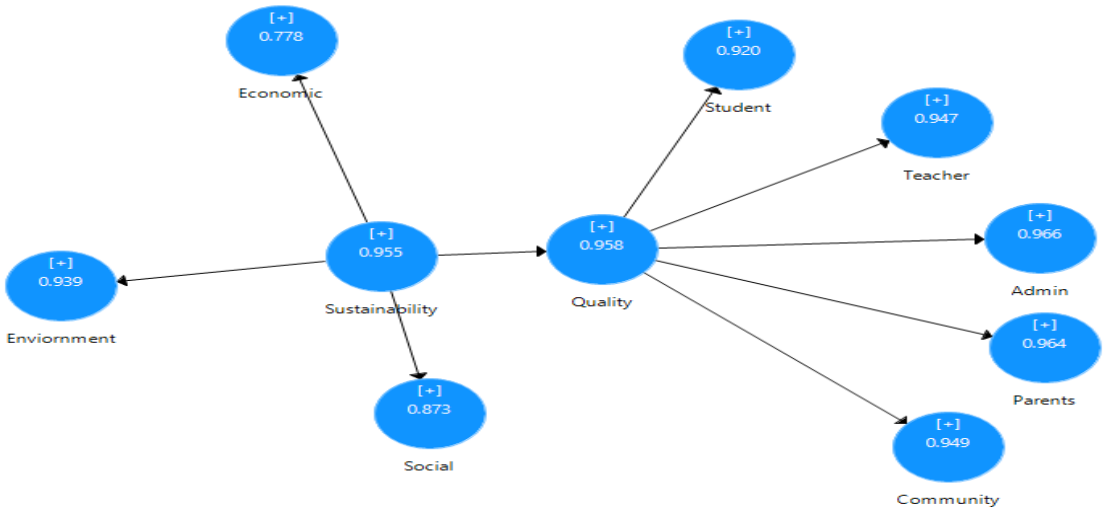

Figure (4.3) : Cronbach's Alpha for sustainability and school education quality dimensions

4.4 Sub questions discussion

The First main question: Are there significant mean differences at the level of (α=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by the dependent variables (environmental, economic, social, quality of school education)?

To answer this question, we need to test the following questions though analysing answers by using SPSS as shown in the following discussion.

Q1- What is the level impact of sustainability according to the environmental aspect indicators for schools to be used in the local Palestinian context?

To answer this question, the mean and standard deviations are calculated for all items to know the impact of sustainability according to the environmental aspect indicators for schools to be used in the local Palestinian context. Table (4.5) shows the results.

Referring to Table (4.5) we notice that the level impact of sustainability according to the environmental aspect indicators is high, the mean score equals (3.43), the highest mean

equals (4.65) related to ENV-D-2 "sufficient number of waste bins are placed in school facilities" with a high effect, followed by ENV-B-5 with the mean score (4.55) “regular maintenance of the electrical network is carried out in the school to maintain the efficiency of the network". The lowest mean score related to the statements ENV-F-4 “the school uses sound-absorbing materials in the finishes, such as sound-absorbing ceiling plinths and cork panels for installing educational aids and advertisements” with mean score (2.26) and a low-level impact.

Table (4.5): Means and standard deviations of the level impact of sustainability according to the environmental aspect indicators

Indicator	Mean	Standard Deviation	Level
ENV-A-1	2.28	1.25	Low
ENV-A-2	2.49	1.33	Medium
ENV-A-3	4.53	0.83	High
ENV-A-4	4.04	0.91	High
ENV-A-5	4.18	0.86	High
ENV-B-1	3.24	1.37	Medium
ENV-B-2	2.92	1.60	Medium
ENV-B-3	2.57	1.27	Medium
ENV-B-4	3.57	1.42	Medium
ENV-B-5	4.55	0.85	High
ENV-B-6	3.65	1.03	Medium
ENV-B-7	3.82	0.83	High
ENV-C-1	4.28	1.21	High
ENV-C-2	3.45	0.98	Medium
ENV-C-3	4.08	1.25	High

Indicator	Mean	Standard Deviation	Level
ENV-C-4	3.63	1.41	Medium
ENV-C-5	2.82	1.38	Medium
ENV-C-6	3.41	1.32	Medium
ENV-C-7	3.88	1.06	High
ENV-D-1	2.35	1.19	Medium
ENV-D-2	4.65	0.86	High
ENV-D-3	3.49	1.24	Medium
ENV-D-4	3.16	1.29	Medium
ENV-E-1	3.90	1.03	High
ENV-E-2	4.00	1.07	High
ENV-E-3	3.22	1.09	Medium
ENV-F-1	3.22	1.26	Medium
ENV-F-2	2.88	1.44	Medium
ENV-F-3	2.75	1.41	Medium
ENV-F-4	2.26	1.20	Low
ENV-F-5	3.84	1.04	High
ENV-F-6	4.12	1.15	High
ENV-F-7	3.02	1.45	Medium
Mean score	**3.43**	**0.70**	**Medium**

Q2- What is the level impact of sustainability according to economic aspect indicators for schools to be used in the local Palestinian context? To answer this question, the mean and standard deviations are calculated for all statements to know the level impact of sustainability according to economic aspect indicators for schools to be used in the local Palestinian context. Table (4.6) shows the results.

Table (4.6): Means and standard deviations of the level impact of sustainability according to economical aspect indicators

Indicator	Mean	Standard Deviation	Level
ECO-A-1	4.20	0.77	High
ECO-A-2	4.33	0.65	High
ECO-A-3	3.55	1.14	Medium
ECO-B-1	4.31	0.78	High
ECO-B-2	4.12	0.90	High
ECO-B-3	4.37	0.86	High
ECO-B-4	4.51	0.70	High
Mean score	**4.18**	**0.54**	**High**

It is obvious from Table (4.6) that the level impact of sustainability according to the economical aspect indicators is high, the mean score equals (4.18), the highest mean equals (4.51) related to ECO-B-4 "high-efficiency distance learning programs are provided and implemented in light of the existence and continuation of the Corona pandemic (such as the zoom and excellence program and other programs) for school students and teachers" with a high level impact, followed by ECO-B-3 with the mean score (4.37) “There is a computer lab and a modern library in the school for various students' uses". The lowest mean related to the statements ECO-A-3 “a budget or allocations are allocated (from the ministry) to build and improve the technical,

administrative and teaching capabilities of the school's workers" with a mean score (3.55) and medium-level impact.

Q3- What is the level impact of sustainability according to the social aspect indicators for schools to be used in the local Palestinian context? To answer this question, the mean and standard deviations are calculated for all indicators to know the impact of sustainability according to the social aspect indicators for schools to be used in the local Palestinian context. Table (4.7) shows the results.

Table (4.7): Means and standard deviations of the level impact of sustainability according to the social aspect indicators

Indicator	Mean	Standard Deviation	Level
SOC-A-1	3.73	1.09	High
SOC-A-2	4.49	0.64	High
SOC-A-3	4.18	1.17	High
SOC-A-4	4.04	0.93	High
SOC-A-5	2.53	1.32	Medium
SOC-A-6	3.90	1.07	High
SOC-A-7	2.82	1.45	Medium
SOC-A-8	4.39	0.63	High
SOC-A-9	2.92	1.37	Medium
SOC-A-10	4.18	0.83	High
SOC-A-11	3.43	1.58	Medium
SOC-A-12	4.33	0.73	High
SOC-A-13	4.33	0.76	High
SOC-A-14	3.92	1.03	High
Soc-B-1	3.47	1.11	Medium

Indicator	Mean	Standard Deviation	Level
Soc-B-2	3.84	1.06	High
SOC-C-1	3.71	1.00	High
SOC-C-2	3.86	0.93	High
SOC-C-3	4.04	0.93	High
SOC-C-4	3.78	1.02	High
Mean score	**3.79**	**0.55**	**High**

From Table (4.7) we conclude that the level impact of sustainability according to the social aspect indicators is high, the mean score equals (3.79), the highest mean equals (4.49) related to SOC-A-2 "the school provides adequate security/safety and hygiene (security surveillance, cameras, etc.) in its facilities" with a high impact level, followed by SOC-A-8 "the school gives the required attention to the educational environment for students (comfort: colors, materials, facilities, good ventilation and lighting, and supportive audio systems ... etc)" with a mean score equals (4.39) and a high impact level. The lowest mean related to the indicator SOC-A-5 “the school provides a transportation system (public or private) to enable students to come to and leave the school at specific times” with a mean score equals (2.53) and a medium-level impact.

Q4- What is the level impact of the quality of school education according to stakeholders in the educational process? To answer this question, the mean and standard deviations are calculated for all statements to know the level impact of the quality of school education according to stakeholders in the educational process. Table (4.8) shows the results. Also, Figure (4.4) depicts the results.

Table (4.8): Mean scores and standard deviations distributed by the quality of school education according to stakeholders

Stakeholders	Mean	Standard Deviation	Level
Students	4.32	0.63	High
Teachers	4.34	0.57	High
Administrators	4.50	0.55	High
Parents	4.32	0.60	High
Community	4.37	0.53	High
Average score	4.37	0.58	**High**

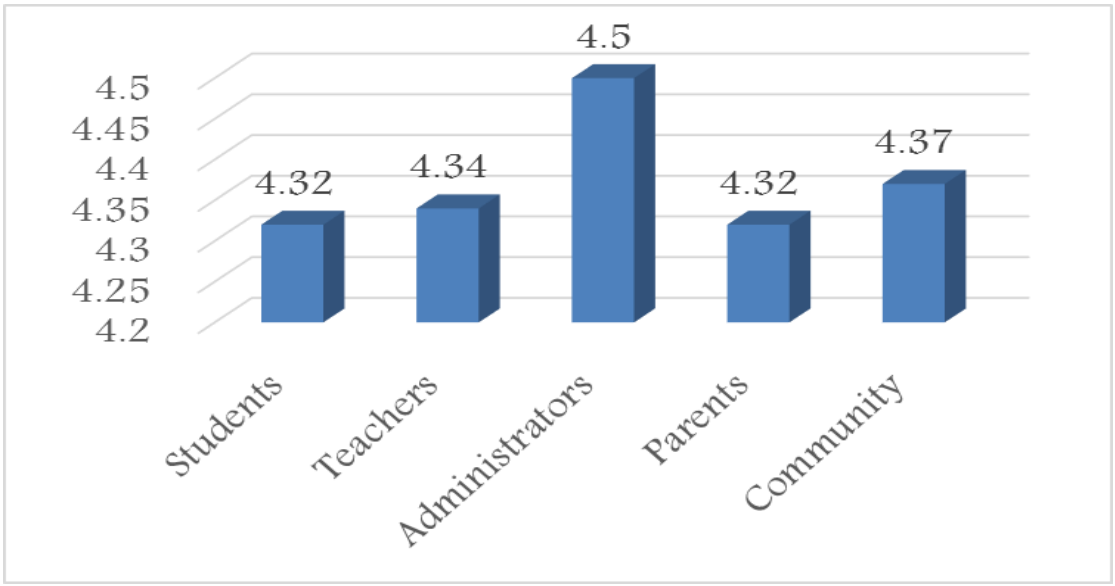

Figure (4.4): Mean scores distributed by the quality of school education according to stakeholders

We definitely assure from Table (4.8) that the level impact of the quality of school education according to stakeholders in the educational process is high with the average score (4.37) and standard deviation (0.58), the highest mean score (4.50) related to the "administrators", with a high degree impact, standard deviation equals (0.55), followed by the mean score (4.37) related to the "community" and standard deviation equals

(0.53) with a high level impact, the lowest mean equals (4.32) related to the "students and parents" with a high level impact.

Table (4.9): Mean scores and standard deviations distributed by the statements of school education quality according to stakeholders

Statement	Mean	Standard Deviation	Level
STU-1	4.35	0.65	High
STU-2	4.28	0.63	High
STU-3	4.33	0.62	High
TEA-1	4.33	0.58	High
TEA-2	4.29	0.57	High
TEA-3	4.39	0.56	High
ADM-1	4.51	0.54	High
ADM-2	4.49	0.54	High
ADM-3	4.49	0.57	High
PAR-1	4.35	0.59	High
PAR-2	4.28	0.63	High
PAR-3	4.33	0.58	High
COM-1	4.37	0.52	High
COM-2	4.37	0.52	High
COM-3	4.37	0.56	High

We found from Table (4.9) that the level impact of sustainability on the quality of school education according to stakeholders in the educational process is high for all statements, the highest mean score equals (4.51) and standard deviation (0.54) related to ADM-1(achieving the environmental sustainability of the school increases the ability of the administration to achieve the goals of the educational process in line with the

policies of the ministry of education), with a high level impact, the lowest mean equals (4.28) related to the STU-2 “achieving the school's economic sustainability increases the rates and academic achievement rates of students” with a high level impact. The researcher attributes this result to the main role played by administrators, including school managers and teachers in governmental schools, in following up and developing the educational process in a distinctive way, which has a great impact on the continuation of maintaining the quality of school education to serve the student and the school in particular, and the advancement of new motivational educational means and methods to maintain the quality of school education in implementation the strategic plan of the Palestinian Ministry of Education.

The Second main question: Are there significant mean differences at the level of ($\alpha<=0.05$) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by the independent variables (school location, date of establishment, specialty, school capacity, school building area)?

To answer this question, we need to test the following hypothesis.

4.5 Testing Hypotheses

4.5.1 Hypothesis 1: There are no statistically significant mean differences at the level of ($\alpha=0.05$) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by school location. To test this hypothesis, we use the significant differences means for independent samples as it is mentioned in Table (4.10).

Table (4.10): Significant differences means for independent samples among the participants according to school location

school location* Sustainability Aspect	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
school location ->economic	-0.22	-0.22	0.11	0.180
school location -> environment	-0.08	-0.08	0.12	0.370
school location -> social	-0.12	-0.13	0.12	0.223
school location -> sustainability	-0.13	-0.14	0.11	0.244

Through the results from Table (4.10), we accept the null hypothesis, which means, there are no statistically significant mean differences at the level of (α<=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by school location. Referring to Figure (4.4), we conclude the different path coefficient (p) values for sustainability dimensions with respect to school location.

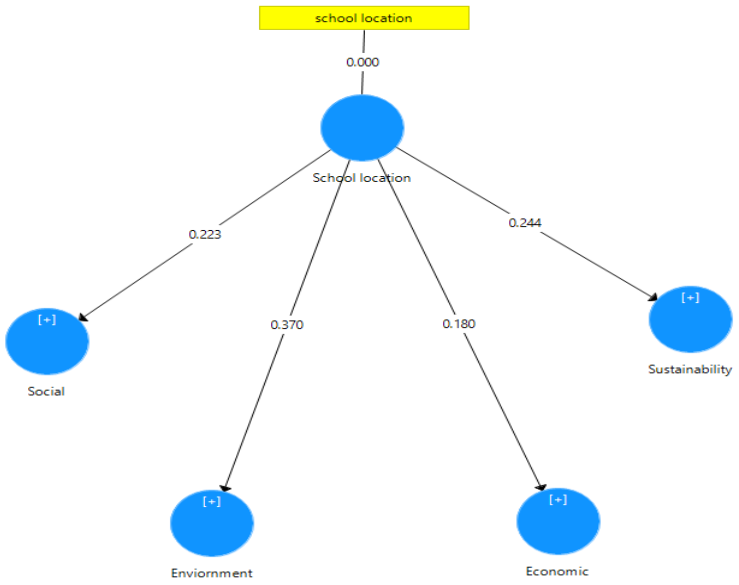

Figure (4.5): Path coefficient shows (p) value for sustainability dimensions by school location

4.5.2 Hypothesis 2: There are no statistically significant mean differences at the level of (α=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by date of establishment.

To test this hypothesis, we use the significant differences means for independent samples. Figure (4.11) includes the results.

Table (4.11): Significant differences means for independent samples among the participants according to date of school establishment

date of establishment* Sustainability Aspect	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
date of establishment -> economic	-0.04	0.13	0.31	0.473
date of establishment -> environment	-0.17	0.15	1.12	0.124
date of establishment -> social	0.04	0.13	0.33	0.459
date of establishment -> sustainability	-0.08	0.15	0.53	0.335

Through the results from Table (4.11), we accept the null hypothesis, which means, there are no statistically significant mean differences at the level of (α<=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by date of establishment. Referring to figure (4.5) we conclude the different path coefficient (p) values for sustainability dimensions with respect to date of school establishment.

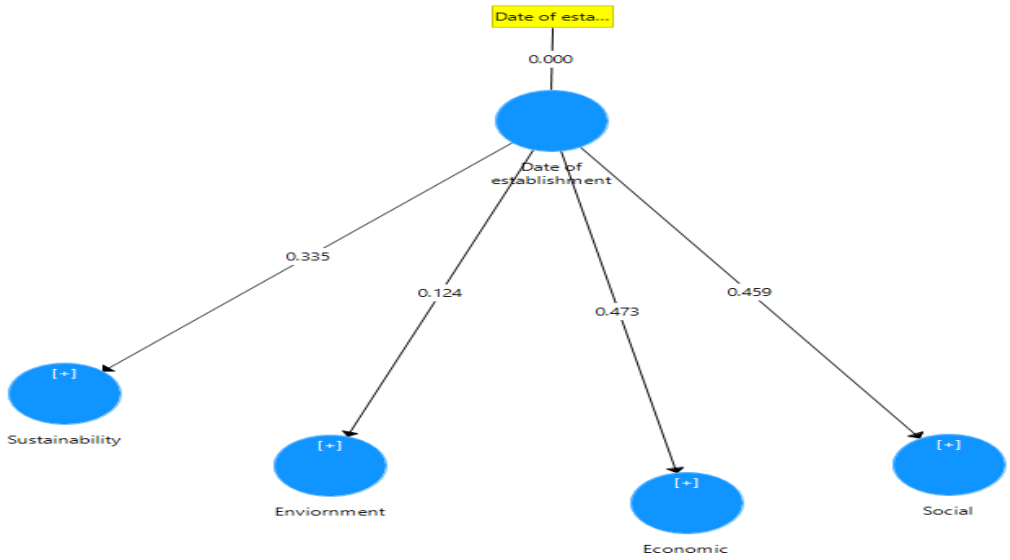

Figure (4.6): Path coefficient shows (p) value for sustainability dimensions by date of school establishment

4.5.3 Hypothesis 3: There are no statistically significant mean differences at the level of (α=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by school specialty.

To test this hypothesis, we use the significant differences means for independent samples. Table (4.12) summarizes the results.

Table (4.12): Significant differences means for independent samples among the participants according to school specialty

Specialty* Sustainability Aspect	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
specialty -> economic	-0.23	0.14	1.66	0.311
specialty -> environment	-0.14	0.16	0.88	0.436
specialty -> social	-0.02	0.16	0.13	0.422
specialty -> sustainability	-0.13	0.16	0.80	0.340

Through the results from Table (4.12), we accept the null hypothesis, which means, there are no statistically significant mean differences at the level of (α<=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by school specialty. Referring to Figure (4.6) we conclude the different path coefficient (p) values for sustainability dimensions with respect to speciality.

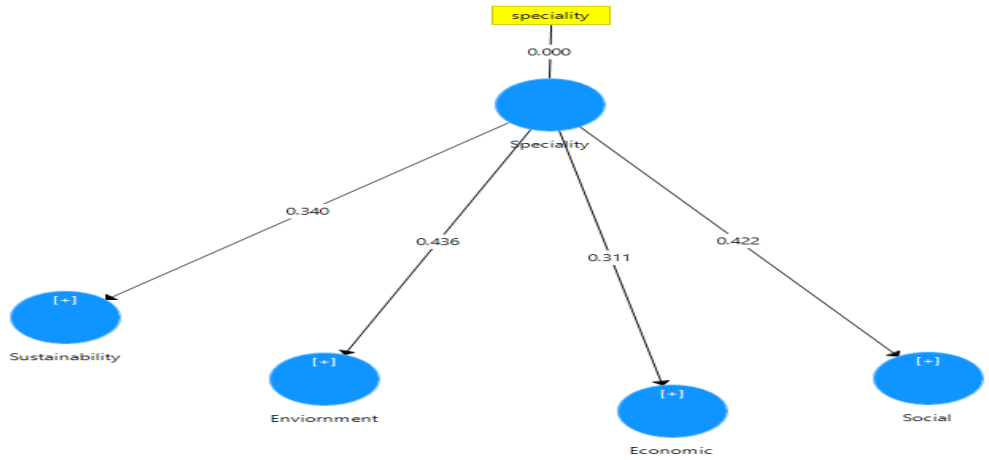

Figure (4.7): Path coefficient shows (p) value for sustainability dimensions by school specialty

The researcher attributes this result to the fact that the independent variables and the location of the school as well as the date of establishment in addition to the scientific school specialty do not have a strong impact on the sustainability of schools according to the indicators of the aspects (environmental, economic and social), which indicates their independence in this aspect, in contrast to the independent variables, school capacity and school level as well. The construction area, which shows a clear impact of sustainability, since the educational staff, their ability and excellence in education, as well as the scientific level in it, are among the most important factors that raise the level of the school's sustainability index.

4.5.4 Hypothesis 4: There are no statistically significant mean differences at the level of (α=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators for schools to be used in the local Palestinian context by school capacity.

To test this hypothesis, we use the significant differences means for independent samples. Table (4.13) summarizes the results.

Table (4.13): Significant differences means for independent samples among the participants according to school capacity

School capacity* Sustainability Aspect	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
School capacity -> economic	0.21	0.11	1.90	**0.010**
School capacity -> environment	0.20	0.14	1.33	**0.192**
School capacity -> social	0.29	0.10	2.90	**0.000**
School capacity -> sustainability	0.26	0.12	2.14	**0.006**

Through the results from Table (4.13), we reject the null hypothesis, which means, there are statistically significant mean differences at the level of (α=0.05) due to the impact of sustainability according to the total average score, economic aspect indicators, and social aspect indicators for schools to be used in the local Palestinian context by specialty.

To know the significant mean differences at the level of (α<=0.05) due to the impact of sustainability according to the total average score and social aspect indicator, (LSD) least square differences in SPSS 25- test used. Table (4.14) tabulates the results.

Table (4.14): LSD significant differences means due to the impact of the total average sustainability and social aspect indicators by school capacity

Economic indicators	Lower basic	secondary	0.7235
		higher basic	0.5883
Social indicators	Lower basic	secondary	0.8035
		higher basic	0.6983
Sustainability	Lower basic	secondary	0.7118
		higher basic	0.5595

Referring to Table (4.14) we conclude the significant mean differences due to the impact of sustainability according to the total average score, economic aspect indicators, and the social aspect indicator by school capacity to the favor of lower basic schools.

On the other hand, we accept the null hypothesis according to the (environmental) aspect indicators for schools to be used in the local Palestinian context by specialty. Referring to Figure (4.7) we conclude the different path coefficient (p) values for sustainability dimensions with respect to school capacity.

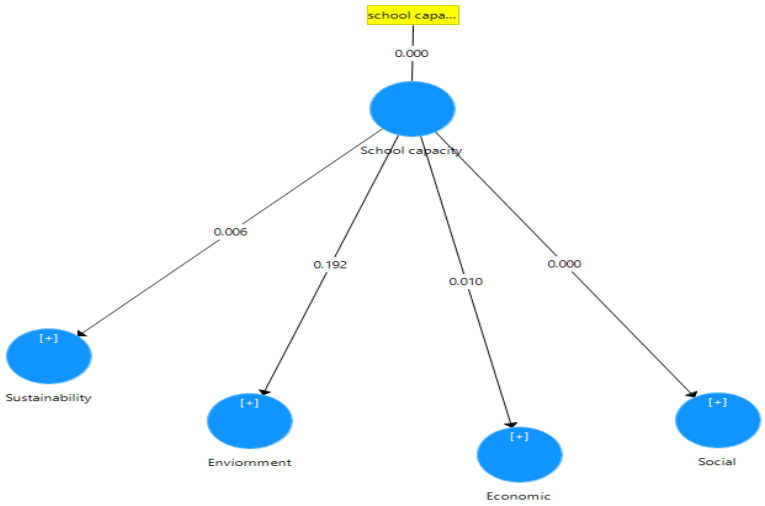

Figure (4.8) Path coefficient shows (p) value for sustainability dimensions by school capacity

4.5.5 Hypothesis 5: There are no statistically significant mean differences at the level of (α=0.05) due to the impact of sustainability according to (environmental, economic,

and social) aspect indicators for schools to be used in the local Palestinian context by school building area. To test this hypothesis, we use the significant differences means for independent samples. Table (4.15) summarizes the results.

Table (4.15): Significant differences means for independent samples among the participants according to school building area

School building area* Sustainability Aspect	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
School building area -> economic	-0.29	0.13	2.25	**0.025**
School building area -> environment	-0.32	0.11	2.79	**0.004**
School building area -> social	-0.42	0.11	3.76	**0.000**
School building area -> sustainability	-0.39	0.12	3.31	**0.000**

Through the results from Table (4.15), we reject the null hypothesis, which means, there are statistically significant mean differences at the level of (α=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators and the total average score for schools to be used in the local Palestinian context by school building area.

To know the significant mean differences at the level of (α=0.05) due to the impact of sustainability according to (environmental, economic, and social) aspect indicators and the total average score for schools to be used in the local Palestinian context by school building area**,** (LSD) test used. Table (4.16) summarizes the results.

The significant mean differences due to the impact of sustainability according to (environmental, economic, and social) aspect indicators and the total average score by school building area to the favor of less than 2 acres. Referring to Figure (4.8) we

conclude the different path coefficient (p) values for sustainability dimensions with respect to school building area.

Table (4.16): LSD Significant differences means due to the impact sustainability according to (environmental, economic, and social) aspect indicators and the total average score by school building area

Dependent Variable	**school building area (I)**	**school building area (J)**	**Mean Difference (I-J)**
Environment	Less than 2 Acres	Between 2 and 4 Acres	0.4803
		More than 4 Acres	0.5649
Economic	Less than 2 Acres	Between 2 and 4 Acres	0.1407
		More than 4 Acres	0.4325
Social	Less than 2 Acres	Between 2 and 4 Acres	0.3379
		More than 4 Acres	0.5412
Sustainability	Less than 2 Acres	Between 2 and 4 Acres	0.3007
		More than 4 Acres	0.4829

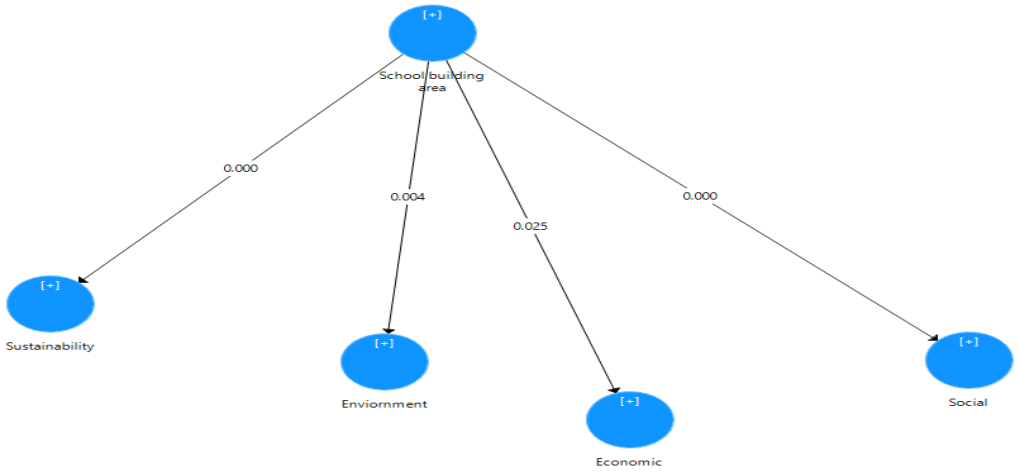

Figure (4.9): Path coefficient shows (p) value for sustainability dimensions by school building area

4.5.6 Hypothesis 6: There are no statistically significant correlation at the level of (α=0.05) between sustainability and achieving the objectives of the educational process in line with the policies of the Ministry of Education.

To test this hypothesis, we use the correlation test between sustainability and achieving the objectives of the educational process in line with the policies of the Ministry of Education. Table (4.17) summarizes the results.

Table (4.17): The correlation between Sustainability and achieving the objectives of the educational process in line with the policies of the Ministry of Education

Dimension	**Original Sample (O)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
achieving the objectives of the educational process -> Sustainability	0.811	0.063	12.96	**0.00**

We reject the null hypothesis, which means, there are statistically significant correlation at the level of (α=0.05) between sustainability and achieving the objectives of the educational process in line with the policies of the Ministry of Education, this correlation equals (0.811) which is high. The researcher attributes this result to the importance of the role of teachers in the sustainability of the school and the achievement of the objectives of the educational process, which indicates the need to Prepare them for the educational process, motivate them, develop their abilities, and provide everything necessary for the educational process that facilitates their important work and humiliation has a great impact on the satisfaction of the local community and parents alike, in order to achieve goals The educational process is in line with the policy of the Ministry of Education.

4.5.7 Hypothesis 7: There are no statistically significant correlation at the level of (α=0.05) between sustainability and the satisfaction of the local community and partners about the school's performance and its role in the community. To test this hypothesis, we use the correlation test sustainability and partners about the school's performance and its role in the community. Table (4.18) presents the results.

Table (4.18): The correlation between sustainability and the satisfaction of the local community

Dimension	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
the satisfaction of the local community-> sustainability	0.907	0.028	32.353	**0.00**

We reject the null hypothesis, which means there are statistically significant correlation at the level of (α=0.05) between sustainability and the satisfaction of the local community and partners about the school's performance and its role in the community. This correlation equals (0.907).

4.5.8 Hypothesis 8: There are no statistically significant correlation at the level of (α=0.05) between sustainability and the satisfaction of parents with the performance of the school and the performance of their students.

To test this hypothesis, we use the correlation test between sustainability and the performance of their students. Table (4.19) presents the results.

Table (4.19): The correlation between sustainability and the satisfaction of parents with the performance of the school and the performance of their students

Dimension	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Value
the satisfaction of parents> sustainability	0.90	0.022	41.205	**0.00**

We reject the null hypothesis, which means there are statistically significant correlation at the level of (α=0.05) between sustainability and the satisfaction of parents with the performance of the school and the performance of their students, this correlation equals (0.90).

4.5.9 Hypothesis 9: There are no statistically significant correlation at the level of (α=0.05) between sustainability and student achievement.

To test this hypothesis, we use the correlation test between sustainability and student achievement. Table (4.20) summarizes the results.

Table (4.20): The correlation between sustainability and student achievement

Dimension	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
student achievement -> sustainability	0.59	0.069	8.18	**0.00**

We reject the null hypothesis, which means there are statistically significant correlation at the level of (α<=0.05) between sustainability and student achievement, this correlation equals (0.59).

4.5.10 Hypothesis 10: There are no statistically significant correlation at the level of (α=0.05) between sustainability and teachers' motivation to work, affiliation and performance.

To test this hypothesis, we use the correlation test between sustainability and teachers' motivation to work. Table (4.21) presents the results.

Table (4.21): The correlation between sustainability and teachers' motivation to work

Dimension	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Value
teachers' motivation to work -> sustainability	0.879	0.026	34.16	**0.00**

We reject the null hypothesis, which means there are statistically significant correlation at the level of (α=0.05) between sustainability and teachers' motivation to work, affiliation and performance, this correlation equals (0.879).

4.5.11 Hypothesis 11: There are no statistically significant correlation at the level of (α=0.05) between sustainability and school educational quality.

To test this hypothesis, we use the correlation test between sustainability and school quality. Table (4.22) presents the results.

Table (4.22): The correlation between sustainability and school educational quality

Dimension	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
school educational quality ->sustainability	0.941	0.016	57.919	**0.000**

We reject the null hypothesis, which means there are statistically significant correlation at the level of (α=0.05) between sustainability and school quality, this correlation equals (0.941). Figure (4.9) depicts the results.

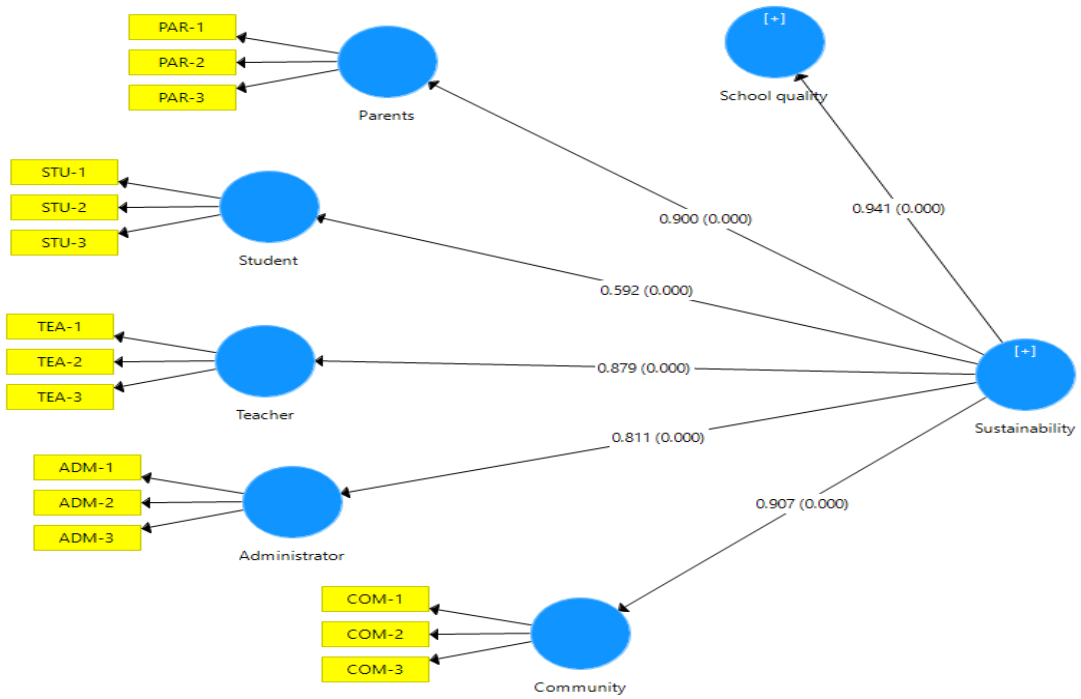

Figure (4.10): The correlation and (p) value between sustainability and the quality of school dimensions

After testing the hypotheses as shown previously, **T**able (4.23) presents a summary of the results of the study's hypotheses testing.

Table (4.23) : Hypotheses Testing Summary (all tested at α=0.05)

Hypothesis	Description	Result
H1	Sustainability pillars and school location	Supported (No difference)
H2	Sustainability pillars and school age	Supported (No difference)
H3	Sustainability pillars and school specialty	Supported (No difference)

H4	Sustainability pillars and school capacity	Supported (No difference, for environment pillar only)
H5	Sustainability pillars and school building area	Not supported (there are differences)
H6	Sustainability and policies of the Ministry of Education.	Not supported (there is correlation)
H7	Sustainability and the satisfaction of the local community	Not supported (there is correlation)
H8	Sustainability and the satisfaction of parents	Not supported (there is correlation)
H9	Sustainability and the students academic achievements	Not supported (there is correlation)
H10	Sustainability and teachers' motivation to work	Not supported (there is correlation)
H11	Sustainability and school educational quality	Not supported (there is correlation)

4.6 Analytic Hierarchical Process (AHP) Results

The Analytical Hierarchy Process (AHP) is a multi-criteria decision-making method (MCDM) as it helps the decision-maker solve a problem that may involve multiple and potentially conflicting criteria (such as site or investment selection, project ranking, etc.). Several research papers have included the success story of AHP in several areas

such as Zahedi (1986); Wasil et al. (1989); Shim (1989); Vargas (1990); Saaty and Forman (1992); Forman and Gass (2001); Kumar and Vaidya (2006); Omkarprasad and Sushil (2006); Ho (2008); Liberatore and Nydick (2008). The research of Saaty (1972) is one of the oldest references and later the modus operandi of the AHP program was accurately described by Saaty (1977) and published in the Journal of Sports Psychology. It is worth noting that the leading software that supports AHP is Expert Choice (http://www.expertchoice.com/). In this study, the Expert Choice 11 program was used to create an analytical hierarchy to find out the weights of the three dimensions of school sustainability. The perceptions (collected via questionnaire) of the principals of the 70 randomly-selected governmental schools in West Bank have been entered to the Expert Choice 11 to determine the weights via AHP. More specifically, firstly, three assessment areas; environmental, economic and social (which represent the sustainability pillars) were coded as A1, A2 and A3 respectively, and they represent level-1 in the AHP. Then, for environmental area, six categories have been considered, namely, water efficiency (coded as A11) and has five questions in the questionnaire (coded as ENV-A-1 to ENV-A-5) each represents an assessment indicator, energy efficiency (coded as A12) and has seven questions (coded as ENV-B-1 to ENV-B-7), site quality (coded as A13) having seven questions (coded as (ENV-C-1 to ENV-C-7), solid waste management (coded as A14) having four questions (coded as ENV-D-1 to ENV-D-4), materials (coded as A15) having three questions (coded as ENV-E-1 to ENV-E-3), and pollution and risks (coded as A16) having seven questions (coded as ENV-F-1 to ENV-F-7). The economic and social areas have been coded similarly as shown in Table (4.24). Running the AHP (based on the methodology explained in Chapter Three), the weights of each question (assessment indicator), each category and

each area have been generated. The last column in Table (4.24) presents the generated weight from the AHP.

Figure (4.10) depicts the net weights of each assessment indicator generated by the Expert Choice 11. Weights are presented in a descending order of weights.

Table (4.24): Sustainability AHP weights

Assessment Areas	Categories	Assessment indicators	Weight
A1 Environmental Area (30.3%)	**A11 Water efficiency (16.7%)**	ENV-A-1	12.5%
		ENV-A-2	14.1%
		ENV-A-3	26.5%
		ENV-A-4	23.1%
		ENV-A-5	23.8%
	A12 Energy efficiency (16.6%)	ENV-B-1	13%
		ENV-B-2	12.1%
		ENV-B-3	10.4%
		ENV-B-4	14.8%
		ENV-B-5	17.8%
		ENV-B-6	15.7%
		ENV-B-7	16.2%
	A13 Site quality (17.3%)	ENV-C-1	16.8%
		ENV-C-2	13.5%
		ENV-C-3	16%
		ENV-C-4	14.1%
		ENV-C-5	10.8%
		ENV-C-6	13.3%

		ENV-C-7	15.5%
	A14 **Solid waste management** **(16.3%)**	ENV-D-1	17.2%
		ENV-D-2	34.4%
		ENV-D-3	25.5%
		ENV-D-4	22.9%
	A15 **Materials** **(17.9%)**	ENV-E-1	35%
		ENV-E-2	35.8%
		ENV-E-3	29.2%
	A16 **Pollution and Risks** **(15.2%)**	ENV-F-1	15%
		ENV-F-2	12.7%
		ENV-F-3	12.4%
		ENV-F-4	10.1%
		ENV-F-5	17.7%
		ENV-F-6	18.4%
		ENV-F-7	13.7%
A2 **Economic Area** **(36.5%)**	**A21** **Human resources** **(47.6%)**	ECO-A-1	35%
		ECO-A-2	36.1%
		ECO-A-3	28.9%
	A22 **Technology** **(52.4%)**	ECO-B-1	24.8%
		ECO-B-2	23.8%
		ECO-B-3	25.2%
		ECO-B-4	26.2%

A3 **Social Area** **(33.2%)**	**A31** **Health and well being** **(33.3%)**	SOC-A-1	7.5%
		SOC-A-2	9.1%
		SOC-A-3	8.6%
		SOC-A-4	8.6%
		SOC-A-5	5.1%
		SOC-A-6	8.1%
		SOC-A-7	5.3%
		SOC-A-8	9%
		SOC-A-9	6.1%
		SOC-A-10	8.4%
		SOC-A-11	6.9%
		SOC-A-12	8.8%
		SOC-A-13	8.5%
	A32 **Flexibility & adaptability** **(32.5%)**	SOC-B-1	47.8%
		SOC-B-2	52.2%
	A33 **Thermal Comfort** **(34.2%)**	SOC-C-1	23.8%
		SOC-C-2	25.2%
		SOC-C-3	26.7%
		SOC-C-4	24.3%

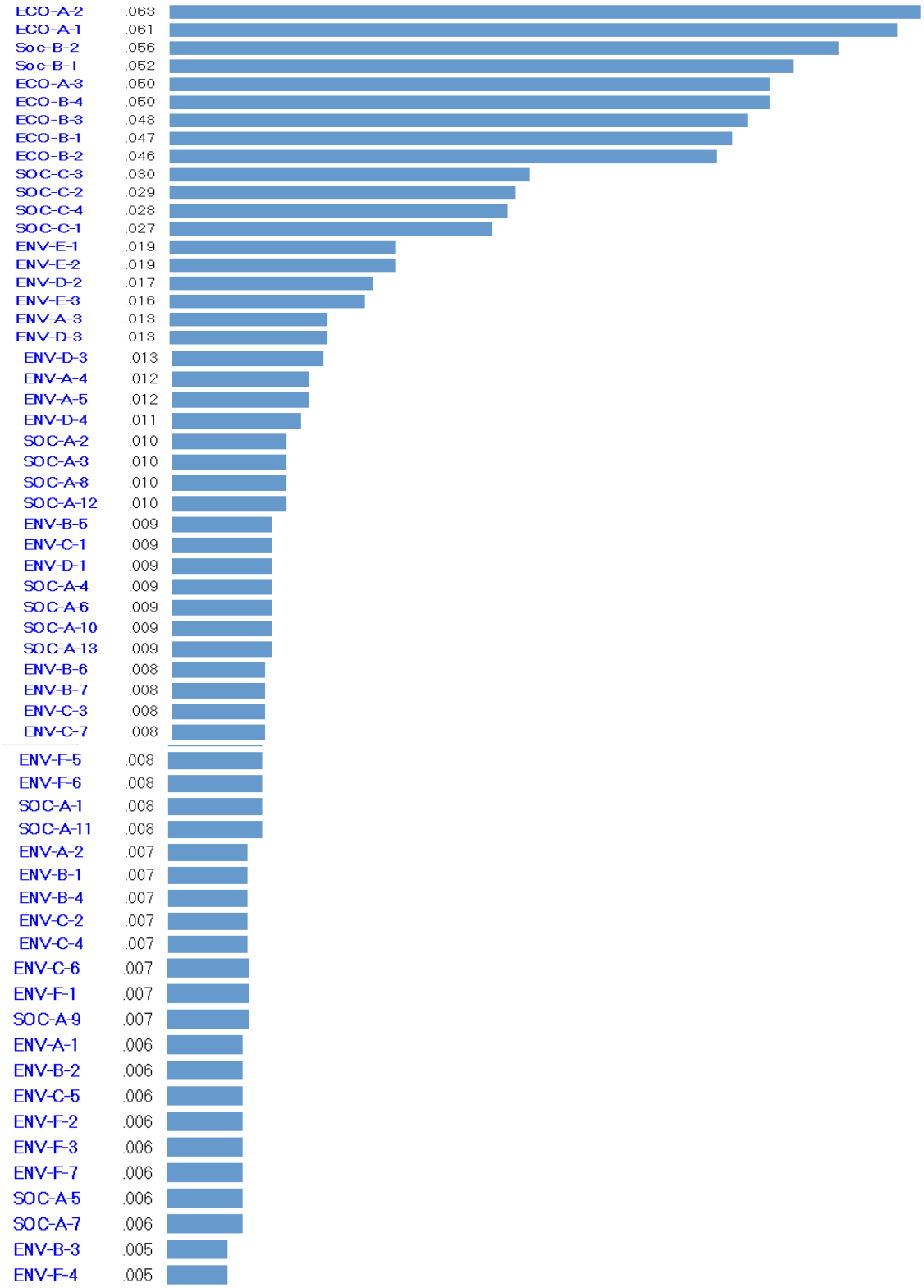

Figure (4.11): Expert Choice AHP-generated weights (in descending order).

The generated weights are used to develop a tool to assess the sustainability of governmental schools in West Bank. We call this tool the School Sustainability Assessment Tool (SSA-Tool).

In the next section, we discuss the development of the SSA-Tool. Now, we compare the AHP-generated weights of the SSA-Tool with other international sustainability rating systems; namely, LEED, Green Star, BREEAM, CASPEE, and GB-Tool. Table (4.25) summarizes the weights for some common assessment sustainability categories.

Table (4.25): Comparison between SSA-Tool Weights and Other International Rating Systems

Sustainability Category	**SSA-Tool**	**LEED(2)**	**Green Star(2)**	**BREEAM(2)**	**CASBEE(2)**	**GB-Tool(3)**
Management	17.3	0	14	12	0	0
Site	5.2	9	0	0	15	21
Indoor Environment Quality	11.3	16	17	0	22	16
Energy	5	35	22	19	21	26
Transport	0	9	10	8	0	0
Water	5	11	12	6	2	0
Materials	5.4	19	14	12.5	13	0
Land Use and Ecology	0	4	6	10	0	0
Emissions (Pollution) & Waste	9.5	0	5	17.5	0	22
Economic	19.5	0	0	0	0	3
Social	21.8	0	0	15	0	0
Innovation(1)	0	6	0	10	0	0

(1) Additional category

(2) Based on weights of systems in Chapter Two

(3) Based on weights of Ali and Nsairat (2009)

Figure (4.12) is a radar diagram that compares the SSA-Tool's weights with other international rating systems based on the results tabulated in Table (4.25).

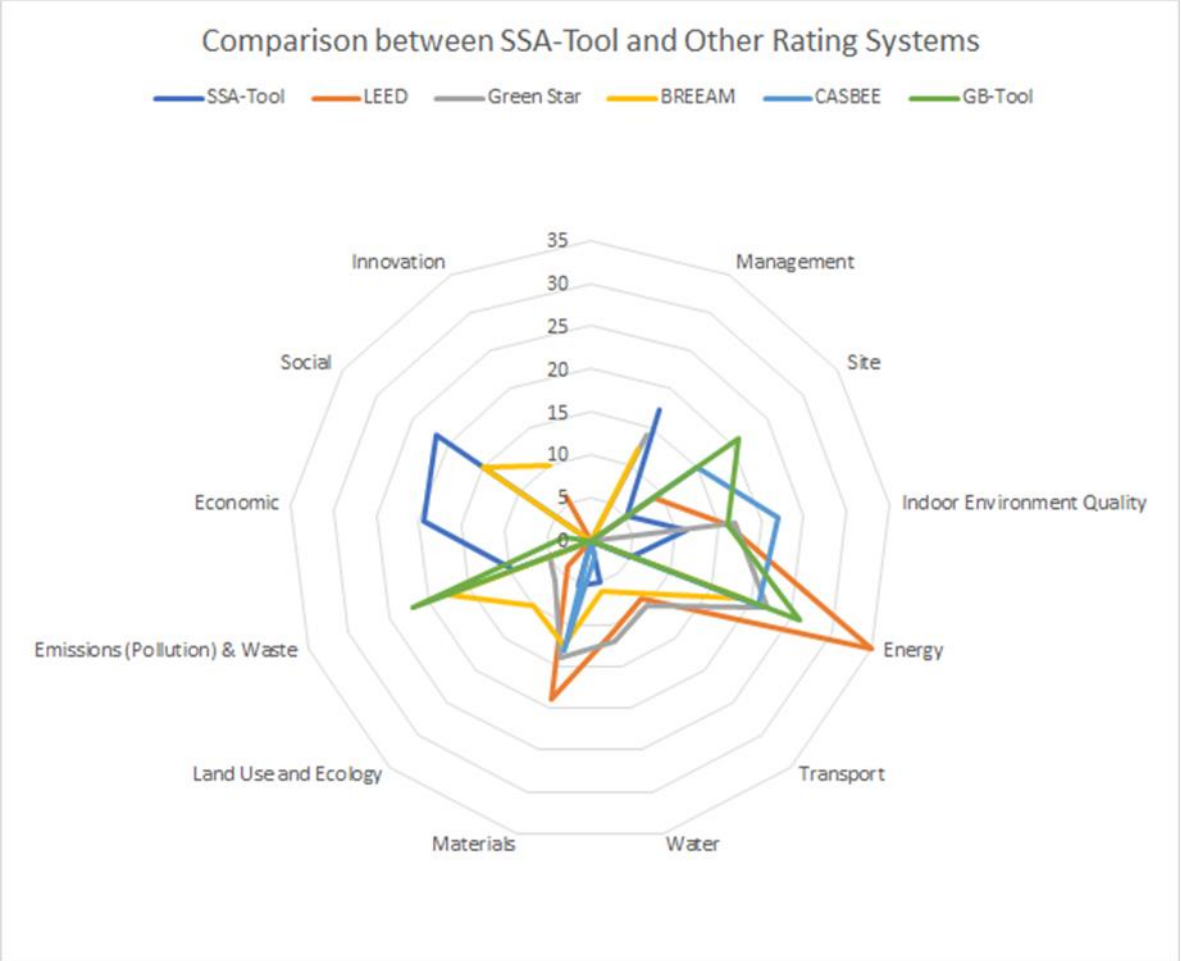

Figure (4.12): Radar diagram of weights comparison

4.7 SSA-Tool Development

We adopted all weights generated by the AHP (shown in Figure (4.10)) to develop the SSA-Tool. More specifically, an Excel sheet template was designed where each question in the questionnaire was coded according to the coding system we adopted before (from ENV-A-1 all the way till SOC-C-4) covering all assessment indicators.

Each question will be reported by a participant representing the school's top management (usually the school principal) who will report hi/her answers for the assessment indicators using a five-point Likert scale. Once entered to the Excel sheet, the SSA-Tool was programmed to automatically compute the weighted sustainability

score out of 5 (as 5 is the maximum weight that could be obtained). Then, the weighted score is normalized by dividing the weighted score by 5 and converting it to percentage from 100%. Having the quantitative normalized weighted score is not enough for sustainably rating. International rating systems mentioned in Chapter Two have suggested different qualitative sustainability rating. Other scholars like Castro (2017), Ali and Nsairat (2009) and Alyami et al. (2015) have suggested different qualitative rating systems, In this study, the rating system employed by Alyami et al. (2015) was adopted as the rating system was used in the Saudi Arabian context which is close to the Palestinian context. Specifically, Table (4.26) summarizes the qualitative rating system of Alyami et al. (2015). Appendix B includes the Excel template of the SSA-Tool.

Table (4.26): Qualitative Rating System in the SSA-Tool

Sustainability Qualitative Level	Normalized Weighted Score%
UNCLASSIFIED	[0,35)
PASS	[35,45)
BRONZE	[45,55)
SILVER	[55,75)
GOLD	[75,85)
DIAMOND	[85,100]

To validate the SSA-Tool, five governmental schools from the 70 randomly-selected schools used in the study, have been selected and their respective responses on sustainability collected by the questionnaire have been entered to the Excel sheet template. The normalized quantitative normalized weighted scores were generated and the corresponding qualitative sustainability levels were identified based on Table (4.26). Table (4.27) summarizes the results.

Table (4.27) : SSA-Tool Validation

Sustainability Qualitative Level	Normalized Weighted Score %	School.#.1	School.#.2	School.#.3	School.#.4	School.#.5
UNCLASSIFIED	[0,35)					
PASS	[35,45)			37.5		
BRONZE	[45,55)	51.4			43.2	
SILVER	[55,75)		68.6			59.7
GOLD	[75,85)					
DIAMOND	[85,100]					

Finally, we conclude that during this study, a quantitative method study approach was followed, data were collected, and work was done to analyze and interpret them. The methodology used to achieve the objectives of this study included five steps. Initially, the study focused on creating the first draft of the evaluation items. After that, the evaluation components were analyzed and weighed with reference to the use of the expertise of experts according to its importance in evaluating and improving the sustainability of the school building in the West Bank. Then, the tool was finalized. The last step of this study was the creation of tool to assess and improve the sustainability of school buildings in the West Bank (Ramallah and Al-Bireh Governorate as a case study).

Chapter Five

Conclusions and Recommendations

5.1 Overview

This chapter presents the conclusions, recommendations, some managerial implications and limitations and future research directions. More specifically, it includes the conclusions that could be drawn from the sustainability assessment of schools, the relationship between sustainability and quality of education, as all perceived by school principals, as they represent the top management in the schools and are knowledgeable about the schools' administrative and technical issues, and finally, the SSA Tool – related conclusions. In accordance with conclusions, a set of specific recommendations are provided. Then, some managerial implications divided into short-, medium- and long-term time horizons are presented. Finally, the limitations of the current study as well as some future research works are given.

5.2 Conclusions

Based on the results, analysis and discussion given in the previous chapter, the following conclusions could be drawn:

1. It is concluded that sustainability assessment of governmental schools in Ramallah and Al-Bireh province, as perceived and evaluated by these schools' principals is generally high, as the environmental dimension was found to be of medium level whereas social and economic dimensions were found to be of a high level.

2. The correlation of the environmental dimension indicators on sustainability is the highest, followed by social aspect indicators and the lowest related to the economical aspect indicators.

3. It is concluded that the expected impact of sustainability in schools on educational quality is high as it is related to environmental sustainability high level.

4. According to the analysis, it is found that school sustainability and its three pillars (environmental, economic and social) have no significant differences with respect to school's age, location and specialty.

5. It is concluded that school sustainability and its three pillars (environmental, economic and social) have significant differences with respect to the school's building area, whereas school sustainability and its economic and social pillars only have significant differences with respect to the school's capacity.

6. It is recognized that there is significant correlation between sustainability and objectives of educational policies in line with Ministry of Education policies.

7. There is significant correlation between sustainability and (a) satisfaction of local community and other partners about school's performance, (b) satisfaction of parents, (c) students' academic achievement, (d) teachers' motivation and (e) school educational quality.

8. It is found after the analysis of AHP that it revealed 30.3% weight for environmental sustainability pillar, 36.35% for economic sustainability pillar and 33.2% for social sustainability pillar.

9. It is concluded that the analysis of AHP revealed all environmental six categories approximately have equal weights of about 16%, while the technology economic category has higher weight than the human resources economic category, whereas all social three categories approximately have equal weights of about 33%.

10. After a comparison was made between the weights resulting from the AHP program and the weights of other international classification systems, the differences were shown with regard to the different evaluation indicators, especially since most of them did not include social or even economic indicators in parallel with the environmental indicators.

11. The developed SSA tool proved to be valid for assessing the sustainability of the school, both quantitatively and qualitatively, especially when five random schools were tested from the sample under study and the results showed the level of sustainability in them.

5.3 Recommendations

In light with the above-mentioned conclusions, the following recommendations are given:

1-The Ministry of Education in Palestine should pay more attention to the importance of sustainability assessment of schools in Palestine as it is positively-correlated with the school's educational quality.

2-The Ministry of Education should revisit the policies of the educational system in Palestine to take into consideration sustainability policies as both policies are highly-correlated.

3-The Ministry of Education should take into consideration the local community and other partners' satisfaction, parents' satisfaction, teacher's motivation and students' academic performance while drafting the educational polices as these factors are correlated with sustainability which in turn is correlated with school's educational quality.

4-It is recommended to update the AHP-generated weights periodically by collecting data from other schools from other cities and provinces for the purpose of results generalizability.

5-The developed, tested and validated SSA-Tool is highly recommended to be adopted and used by the Ministry of Education for assessing the sustainability of different existing as well as future schools in Palestine.

6-It is recommended to integrate the developed SSA-Tool with other assessment tools used by the Ministry of Education to monitor and evaluate and monitor the sustainability and performance of schools.

7-To entice schools to be more sustainable, the Ministry of Education is highly-recommended to adopt a rewarding system for schools having sustainability level of gold and diamond as assessed by the SSA-Tool.

5.3 Managerial Implications

From a practical point of view, the current research enriches the limited literature on the sustainability in school buildings, especially in the Palestinian context, in several ways. First, this study bridges the gap between the three pillars of sustainability in school buildings, especially governmental schools in Palestine. In other words, it assesses the sustainability in governmental schools in an integrative way via investigating the environmental, economic and social dimensions of sustainability. As shown previously, previous studies and international rating systems basically focus on the environmental assessment of buildings in different sectors; healthcare, education and industrial. However, our study considers the three pillars of sustainability in assessing it in governmental schools in West Bank. The study also supports the argument of proponents of scaling up sustainability indicators because it has a significant impact on

the sustainability of schools and strengthens your impact on raising the quality of school education. Second, this research verifies the validity of the SSA-Tool that can be used now to measure sustainability, which was rarely conducted before. Third, the study expresses the role of administrators and the local community as well as parents in raising the level of quality of school education through raising sustainability level, which is a rare relationship in the previous literature.

This prompts us to take some strategic measures at several levels, which are explained as follows:

Short-term:

1- Disseminating the information from this study through presenting the main findings to the Ministry of Education in Palestine for the purpose of convincing them to approve and adopt the use of the SSA-Tool in sustainability assessment of schools in Palestine.

2- Organizing awareness workshops by the Ministry of Education to both governmental and private schools' principals about the importance of sustainability sand assessment in schools

3- Asking all principals of existing schools in West Bank and Gaza strip, both private and governmental to report (via questionnaire) the sustainably status of the schools. From these responses, the sustainability status would be identified for each school via the SSA-Tool.

4- Deciding on needed quick interventions for schools having a sustainability level less than the bronze level such as needed maintenance projects.

Medium-term:

1- Adopting the SSA-Tool as part of the planning, monitoring and evaluation process in the Ministry of Education to periodically assess the sustainability of schools and preparing relevant periodic reports.

2- Developing and periodically updating obligatory requirements that should be fulfilled in building new schools based on the SSA-Tool rating.

3- Organizing awareness workshops on sustainability in schools for different stakeholders (local community, parents, teaching staff, students) and its important role in promoting sustainable development and improving the quality of education.

4- Follow up on the implementation of urgent and specialized programs to rehabilitate schools as necessary.

Long-term:

1. Evaluating modern schools to know the level of sustainability in them and working to preserve it in the long term
2. Adopting educational programs regarding sustainability and its impact on the quality of education in schools
3. Developing a sustainable national strategy for governmental schools to determine their resources and to include a follow-up and control plan for them.
4. Creating a separate unit or department in the Ministry of Education that handles all sustainability issues in schools.
5. Making joint partnerships between the Ministry of Education and other international schools having good profiles and success stories in sustainability.

5.4 Limitations and Future Research Works

Like other researches, the current study also has some limitations:

First, the data for this research were collected under the Covid-19 pandemic, which may have reflected on the performance of the schools under study and influenced the generalizability of the results. **Second**, the data were produced only from governmental schools in the Ramallah and Al-Bireh district in Palestine. **Third**, the study focused on the direct relationship between education quality and stakeholders and accountability to them (principals, teachers, community, parents and students), and ignored the role of the Palestinian Ministry of Education, which plays an important role**. Fourth**, the current study succeeded in a developing an SSA-Tool for assessing the sustainability in schools, however, the preventive and/or corrective interventions needed to be taken for raising the level of sustainability is another research direction.

Therefore, in future studies researchers can incorporate the key role of the ministry to further explore this factor. Fourth, the data was obtained only from the school principals themselves, and they did not take into account the teachers and counselors whose opinion could provide more information. Therefore, in the future, studies should expand the range of responders. Finally, in this dynamic and modern work, the technological revolution has increased the importance of the effective use of knowledge. In future studies, we suggest investigating the relationship between integrating the impact of sustainability indicators with the quality of school education, especially e-learning.

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Appendix (A)

Questionnaire

تطوير نموذج لتقييم الاستدامة وتأثيرها على جودة التعليم في المدارس الحكومية في فلسطين: محافظة رام الله والبيرة كحالة دراسية

السلام عليكم ورحمة الله وبركاته

يشرفنا مشاركتكم في تعبئة هذه الاستبانة والتي تهدف إلى جمع بيانات عن المدارس الحكومية في محافظة رام الله والبيرة لاستكمال نيل درجة الماجستير في التخطيط الاستراتيجي وتجنيد الأموال، ومناقشة رسالة بعنوان **" تطوير نموذج لتقييم الاستدامة وتأثيرها على جودة التعليم في المدارس الحكومية في فلسطين: محافظة رام الله والبيرة كحالة دراسية"** من كلية الدراسات العليا – الجامعة العربية الامريكية، والتي تستغرق مدة لا تزيد عن 10 دقائق من وقتكم، علما ان البيانات والمعلومات التي تحتوي عليها الاستبانة سيتم استخدامها لاغراض البحث العلمي فقط وسيتم التعامل معها بكل سرية أمانة علمية.

وتفضلوا بقبول وافر التقدير والاحترام

الباحثة

م.أمان عمر عدس

القسم الاول: المعلومات الديموغرافية

أولًا: معلومات شخصية:

الرجاء الاجابة عن الفقرات التالية من خلال وضع اشارة (√) بجانب الاجابة التي ترونها مناسبة.

الرمز	الفقرة
1	**العمر بالسنوات** ☐من 25 الى اقل من 35 ☐ من35 الى اقل من45 ☐ من 45 الى اقل من 55 ☐ اكثر من 55
2	**الجنس:** ☐ ذكر ☐ انثى
3	**المؤهل العلمي**: ☐ دبلوم ☐ بكالوريوس ☐ دبلوم عالي ☐ ماجستير ☐ دكتوراة
4	**التخصص:** ☐ علوم تربوية ☐ علوم ادارية ☐ علوم هندسية ☐ غير ذلك(يرجى التحديد):.....
5	**سنوات الخبرة كمدير في المدرسة الحالية وما قبلها:** ☐ سنة الى اقل من 5 سنوات ☐ من 5 سنوات الى اقل من 10 سنوات ☐ من 10 سنوات الى اقل من 15 سنة ☐ اكثر من 15 سنة
6	**موقع المدرسة:** ☐ مدينة ☐ قرية ☐ مخيم

ثانيًا: معلومات عن المدرسة:

الرمز	الفقرة
1	هل المدرسة مختلطة؟ ☐ نعم ☐ لا اذا كان الجواب نعم، ما هي نسبة الطلبة الذكور(تقريبا):.....
2	المدرسة مصنفة على انها: ☐ ثانوية ☐ اساسية عليا ☐ اساسية دنيا
3	عدد الطلبة في المدرسة: ☐ أقل من 500 طالبا ☐ بين 500 – 1000 طالبا ☐ أكثر من 1000طالبا
4	عمر المدرسة: ☐ أقل من25 سنة ☐بين 25 – 50 سنة ☐ أكثر من 50 سنة
5	عددالعاملين في المدرسة من هيئة ادارية وتدريسية وموظفين: ☐ أقل من 50 ☐ بين 50- 100 ☐ اكثر من 100
6	عدد الغرف في المدرسة (الصفية والغرف الاخرى): ☐ أقل من 20 ☐ بين 20- 30 ☐ اكثر من 30
7	المساحة التقريبية المقامة عليها المدرسة: ☐ أقل من 2 دونم ☐ بين 2- 4 دونم ☐ اكثر من 4 دونم

القسم الثاني: فئات ومؤشرات التقييم

س1.3) لكل مجال من مجالات الاستدامة المدرجة ادناه ، هناك عدد من الفئات ، ولكل فئة مؤشراتها الخاصة التي يجب مراعاتها عند تقييم استدامة أداء المدرسة ، يرجى الإشارة إلى مستوى أهمية هذه المؤشرات.

ملاحظة: يرجى وضع علامة (√) على إجاباتك

الجانب البيئي	أوافق	أوافق لحد ما	محايد	لا أوافق لحد ما	لا أوافق
أ) كفاءة استخدام المياه					
- تتم إعادة تدوير المياه الرمادية وحصاد مياه الأمطار لتقليل استخدام مياه الشرب في المدرسة					
-يتم تركيب نظام مراقبة المياه (قياس المياه ، نظام كشف التسرب ، نظام مراقبة جودة المياه، تركيب حساسات رطوبة، ري المزروعات بالتنقيط في المدرسة					
-تتم الصيانة الدورية لشبكة المياه في المدرسة للمحافظة على كفاءة الشبكة					
-توضع لوحات ارشادية في مرافق المدرسة المختلفة لتشجيع الطلبة والعاملين على ترشيد استهلاك المياه في المدرسة					
-يتم عمل مداخلات خلال الحصص الدراسية مجدولة من خلال ادارة المدرسة والمدرسين لكل الصفوف في كل فصل دراسي بضرورة ترشيد استهلاك المياه في المدرسة.					
ب) كفاءة استخدام الطاقة					
-تستخدم أنظمة مراقبة وإدارة استهلاك الطاقة الكهربائية (مراقبة استهلاك الطاقة واستخدام البيانات الناتجة) في المدرسة					
- تتوفر خلايا شمسية على سطح المدرسة لزيادة قدرة مصادر الطاقة المتجددة (الطاقة الشمسية الكهروضوئية والحرارية الشمسية)					
الجانب البيئي.....					
- يستخدم نظام تدفئة وتهوية فعال للتدفئة (HVAC) (التصميم ، عزل الأنابيب ، الموقع ، ... إلخ) في المدرسة					
- يستخدم في المدرسة نظام إضاءة فعال (مفهوم إضاءة متكامل ، نظام إضاءة آلي) والاستفادة من الاضاءة الطبيعية لانارة الغرف الصفية					

-تـتم الصـيانة الدوريـة للشـبكة الكهربائيـة فـي المدرسـة للمحافظة على كفاءة الشبكة					
-توضـع لوحـات ارشـادية فـي مرافـق المدرسـة المختلفـة لتشجيع الطلبة والعاملين على ترشيد استهلاك الكهربـاء فـي المدرسة من خلال اطفاء الانارة عند الخروج للاستراحة او الانتهاء من اليوم الدراسي					
-يـتم عمـل مـداخلات مجدولـة مـن خـلال ادارة المدرسـة والمدرسين لكل الصفوف في كـل فصـل دراسـي بضـرورة ترشيد استهلاك الكهرباء في المدرسة					
ج) جودة الموقع					
- موقـع المدرسـة مناسـب لوصـول الطـلاب والمسـتخدمين والمراجعين					
- هناك تقليـل لتـأثير الجـزر الحراريـة (الأسـقف ، منـاطق الرصـف) في المدرسة					
- النقل وإمكانية الوصول (الوصول إلى وسائل النقل العام ، والمسـافة إلـى وسـائل الراحـة ، ومسـارات الوصـول إلـى المدرسة) سهلة					
- توفر المدرسة مساحات خارجية عاليـة الجـودة (حـدائق ، ممرات ، ملاعب رياضية)					
- يـتم اسـتخدام السـيارات الهجينـة التـي تعمـل بـالوقود والكهرباء للمجئ والذهاب					
-توضع لوحات ارشادية في مرافق المدرسة المختلفة					
-يـتم عمـل مـداخلات مجدولـة مـن خـلال ادارة المدرسـة والمدرسين لكل الصفوف في كـل فصـل دراسـي بضـرورة المحافظة على جودة الموقع					
د) ادارة المخلفات الصلبة					
-توفر المدرسة نظام إدارة النفايات وفرزها وتخزينها حسب نوعهـا (تقليـل و تـدوير واعـادة اسـتخدام ، صـيانة مجـاري النفايات)					
يتم وضع عدد كاف من سلال النفايات في مرافق المدرسة					
توضع لوحات ارشادية في مرافق المدرسة المختلفة لتشجيع الطلبة والعاملين للتعامل الامثل مع النفايات الصلبة وفرزها					
يـتم عمـل مـداخلات مجدولـة مـن خـلال ادارة المدرسـة والمدرسين لكل الصفوف في كل فصل دراسي بكيفيـة فـرز النفايات الناتجة وتخزينها					
ه) المواد					
- تسـتخدم مـواد منخفضـة التـأثير علـى البيئـة (الـدهانات ، الأسقف ، الجدران والأرضـيات، المنظفـات ، ... إلـخ) فـي المدرسة ومرافقها					

- تستخدم مواد متينة لمرافق المدرسة من ساحات وملاعب (مواد عالية القوة تتطلب صيانة أقل)					
- تستخدم المدرسة المواد المتلفة في استخدامات اخرى (مثل الاثاث الخشبي والمعدني)					
و) التلوث والمخاطر					
-يتم العمل على تقليل انبعاثات غازات الاحتباس الحراري (مثل ثاني أكسيد الكربون) المنبعثة من المقصف والمختبرات التابعة للمدرسة					
-تحتوي المدرسة على مجسات للحرائق والغازات والدخان في مرافقها المختلفة					
-تستخدم في المدرسة شفاطات كهربائية لشفط الروائح والغازات المنبعثة من المقصف والمختبرات ويتم توفير طفايات حريق فيها وفي كل طابق					
-تستخدم المدرسة مواد ماصة للصوت في التشطيبات كقصارة الاسقف الماصة للصوت وألواح الفلين الخاصة بتثبيت الوسائل التعليمية والإعلانات					
الزام جميع الطلبة والمدرسين بضرورة استخدام وسائل السلامة والصحة المهنية (قفازات، مرايل للمختبرات، نظارات، قبعات واقية وغيرها)في المختبرات					
-توضع لوحات ارشادية في مختبرات المدرسة عن مخاطر المواد الكيماوية وكيفية التعامل معها					
-توضع لوحات ارشادية ذات اضاءة ذاتية من اجل الاخلاء السريع وعمل مناورات وانذارات كاذبة وتجارب اخلاء للطلبة والعاملين بالتعاون مع الدفاع المدني					
الجانب الاقتصادي					
ز) الموارد البشرية					
- يتم العمل على تأهيل المدرسين والعاملين في المدرسة من خلال بناء قدراتهم في مجالات مختلفة (خطط التوظيف ، فرص التعلم وتبادل الخبرات)					
- تتم عملية تقييم التكنولوجيا (عملية لتحسين جودة التعليم ، وتحسين تخصيص الموارد) في المدرسة باستمرار					
-يتم تخصيص ميزانية او مخصصات (من الوزارة) لبناء و لتحسين القدرات الفنية والادارية والتدريسية للعاملين في المدرسة					
ح) التكنولوجيا					
-يتم استخدام تقنيات المعلومات والاتصالات (الكاميرات ، والوصول عبر الإنترنت إلى الخدمات التعليمية) لضبط العملية التعليمية في المدرسة					
- يتم التغلب على معيقات تكنولوجيا التعليم (عمر المعدات ، استبدال المعدات، اعتماد تقنيات جديدة) في المدرسة					
-يوجد مختبر للحاسوب و مكتبة حديثة في المدرسة لاستخدامات الطلبة المختلفة					
-يتم توفير وتطبيق برامج ذات كفاءة عالية للتعلم عن بعد في ظل وجود واستمرار جائحة كورونا (مثل برنامج الزوم والتيميز وغيرها من البرامج) لطلبة ومدرسي المدرسة					

الجانب الاجتماعي					
ط) الصحة والرفاهية					
-هناك تقليل لاستخدام المواد الخطرة (ساحات الأسفلت ، قذائف البولي كربونات ، الدهانات والطلاء ، الأرضيات الصلبة ، أنظمة الأسقف) في مرافقها					
-توفر المدرسة الأمن / السلامة والنظافة الكافية (مراقبة أمنية ، كاميرات ، ... إلخ) في مرافقها					
-توفر المدرسة في مرافقها منحدرات وممرات لذوي الاحتياجات الخاصة					
-توفر المدرسة وجبات صحية في مقصف المدرسة لدعم صحة الطلبة الذهنية والجسدية					
-توفر المدرسة نظام مواصلات (عام او خاص) لتمكين الطلبة من القدوم الى ومغادرة المدرسة باوقات محددة					
-توفر المدرسة مرافق خاصة لعمل نشاطات لا منهجية كالمسرحيات والمعارض والمسابقات الرياضية والثقافية					
- توفر المدرسة مصفات لسيارات الكادر الاداري والاكاديمي والزوار واولياء امور الطلبة خارج أسوار المدرسة					
-تعطي المدرسة الاهتمام المطلوب بالبيئة التعليمية للطلبة (الراحة: الألوان ، المواد ، المرافق ، تهوية وانارة جيدة، وانظمة صوتيات مساندة.. الخ)					
-توفر المدرسة عيادة للصحة البدنية والنفسية للطلبة والموظفين للتعامل مع وتنمر وسلوكيات (تدخين)					
-هنالك تشكيل دوري و وتفعيل لدور مجلس من اولياء الامور التابع للمدرسة					
- تعزز المدرسة النوع الاجتماعي من المدرسين بحيث تحتوي المدرسة على كادر من المدرسين الذكور والاناث					
- تنظم المدرسة نشاطات ترفيهية للمدرسة (رحلات و مسابقات وغيرها) عن طريق لجان اجتماعية من الطلبة والمدرسين					
-تحرص المدرسة على المشاركة الدائمة للطلبة والكادر التدريسي والاداري المجتمع المحلي بالمناسبات والمواسم المختلفة (قطف الزيتون، الاعياد الوطنية والفعاليات الوطنية وغيرها) بهدف تعزيز المسؤولية المجتمعية للمدرسة					
-لدى المدرسة شراكات مع مؤسسات المجتمع المدني والخاص (مصانع وشركات وجامعات وبلديات ووزارات وغيرها) بهدف الارتقاء بالدور االمجتمعي للمدرسة					
ي) مساحة المرونة والقدرة على التكيف					
-هناك زيادة مرونة المساحة (توسيع أفقي أو رأسي ، مساحات خالية ، وجود أثاث معياري) في المدرسة					
- تحتوي المدرسة على التوزيع المناسب للكتل (المسافة بين قاعات الدرس وغرفة الإدارة)					

ك) الراحة					
-هناك تحسين على الراحة الحرارية (درجة الحرارة الداخلية) في مرافق المدرسة					
-هناك تحسين على جودة الهواء الداخلي (التحكم في التدخين، والتحكم بالغاز) في مرافق المدرسة					
-هناك تحسين في التحكم في الإضاءة (التوزيع الجيد لضوء النهار ، أداء تركيبات الإضاءة) في مرافق المدرسة					
-هناك تطوير للتحكم بالراحة البصرية والصوتية (توزيع مناسب لضوء الشمس، اداء مناسب لوحدات الانارة، وتقليل الضوضاء) في المدرسة					

القسم الثالث: تأثير الاستدامة على جودة التعليم المدرسي

يهدف هذا القسم الى قياس مدى التأثير المتوقع للاستدامة بانواعها الثلاث على جودة التعليم المدرسي.

يرجى وضع علامة (√) على إجاباتك

اصحاب الشأن (المنفعة) في العملية التعليمية	أوافق	أوافق لحد ما	محايد	لا أوافق لحد ما	لا أوافق
أ) التحصيل العلمي للطالب					
- تحقيق الاستدامة البيئية للمدرسة يزيد من نسب ومعدلات التحصيل الاكاديمي للطلبة					
-- تحقيق الاستدامة الاقتصادية للمدرسة يزيد من نسب ومعدلات التحصيل الاكاديمي للطلبة					
-- تحقيق الاستدام ةالاجتماعية للمدرسة يزيد من نسب ومعدلات التحصيل الاكاديمي للطلبة					
ب) المدرس					
- تحقيق الاستدامة البيئية للمدرسة يزيد من حافزية المدرسين للعمل وانتمائهم واداءهم					
- تحقيق الاستدامة الاقتصادية للمدرسة يزيد من حافزية المدرسين للعمل وانتمائهم واداءهم					
- تحقيق الاستدامة الاجتماعية للمدرسة يزيد من حافزية المدرسين للعمل وانتمائهم واداءهم					
اصحاب الشأن (المنفعة) في العملية التعليمية					
ج)ادارة المدرسة					
- تحقيق الاستدامة البيئية للمدرسة يزيد من قدرة الادارة على تحقيق اهداف العملية التعليمية بما ينسجم مع سياسات وزارة التربية والتعليم					
تحقيق الاستدامةالاقتصادية للمدرسة يزيد من قدرة الادارة على تحقيق اهداف العملية التعليمية					
تحقيق الاستدامة الاجتماعية للمدرسة يزيد من قدرة الادارة على تحقيق اهداف العملية التعليمية بما ينسجم مع سياسات وزارة التربية والتعليم					
د) اولياء الامور					
- تحقيق الاستدامة البيئية للمدرسة يزيد من الرضا لدى					

اولياء الامور عن اداء المدرسة واداء ابناءهم الطلبة					
- تحقيق الاستدامة الاقتصادية للمدرسة يزيد من الرضا لدى اولياء الامور عن اداء المدرسة واداء ابناءهم الطلبة					
- تحقيق الاستدامة الاجتماعية للمدرسة يزيد من الرضا لدى اولياء الامور عن اداء المدرسة واداء ابناءهم الطلبة					
ه) المجتمع المحلي والشركاء					
- تحقيق الاستدامة البيئية للمدرسة يزيد من رضا المجتمع المحلي والشركاء عن اداء المدرسة ودورها في المجتمع					
- تحقيق الاستدامة الاقتصادية للمدرسة يزيد من رضا المجتمع المحلي والشركاء عن اداء المدرسة ودورها في المجتمع					
- تحقيق الاستدامة الاجتماعية للمدرسة يزيد من رضا المجتمع المحلي والشركاء عن اداء المدرسة ودورها في المجتمع					

أي ملاحظات اخرى تودون اضافتها:

شكراً لتعاونكم

Appendix (B)

School Sustainability Assessment Tool (SSA-Tool)

	A	B	C	D	E	F	G	H	I	J
1	Assessment Indicators	Weights	Response	Weighted Score(WS)	Normalized WS			Sustainability Qualitative Level	Normalized WS%	
2	Environmental (0.303)							UNCLASSIFIED	[0,35)	
3	Water Efficiency (0.167)							PASS	[35,45)	
4	ENV-A-1	0.125	4	0.0253005	0.50601			BRONZE	[45,55)	
5	ENV-A-2	0.141	3	0.021404223	0.42808446			SILVER	[55,75)	
6	ENV-A-3	0.265	4	0.05363706	1.0727412			GOLD	[75,85)	
7	ENV-A-4	0.231	4	0.046755324	0.93510648			DIAMOND	[85,100]	
8	ENV-A-5	0.238	5	0.06021519	1.2043038					
9	Energy Efficiency (0.166)									
10	ENV-B-1	0.130	4	0.02615496	0.5230992					
11	ENV-B-2	0.121	5	0.03043029	0.6086058					
12	ENV-B-3	0.104	4	0.020923968	0.41847936					
13	ENV-B-4	0.148	4	0.029776416	0.59552832					
14	ENV-B-5	0.178	3	0.026859132	0.53718264					
15	ENV-B-6	0.157	2	0.015793572	0.31587144					
16	ENV-B-7	0.162	1	0.008148276	0.16296552					
17	Site Quality (0.173)									
18	ENV-C-1	0.168	4	0.035225568	0.70451136					
19	ENV-C-2	0.135	2	0.01415313	0.2830626					
20	ENV-C-3	0.160	4	0.03354816	0.6709632					
21	ENV-C-4	0.141	3	0.022173237	0.44346474					
22	ENV-C-5	0.108	4	0.022645008	0.45290016					
23	ENV-C-6	0.133	5	0.034858635	0.6971727					
24	ENV-C-7	0.155	3	0.024374835	0.4874967					
25	Solid Waste Management (0.163)									
26	ENV-D-1	0.172	4	0.033979632	0.67959264					
27	ENV-D-2	0.344	4	0.067959264	1.35918528					
28	ENV-D-3	0.255	2	0.02518839	0.5037678					
29	ENV-D-4	0.229	3	0.033930243	0.67860486					
30	Materials (0.179)									
31	ENV-E-1	0.350	4	0.0759318	1.518636					
32	ENV-E-2	0.358	4	0.077667384	1.55334768					
33	ENV-E-3	0.292	4	0.063348816	1.26697632					
34	Pollution & Risks (0.152)									
35	ENV-F-1	0.150	5	0.034542	0.69084					
36	ENV-F-2	0.127	4	0.023396448	0.46792896					

37	ENV-F-3	0.124	3	0.017132832	0.34265664
38	ENV-F-4	0.101	3	0.013954968	0.27909936
39	ENV-F-5	0.177	4	0.032607648	0.65215296
40	ENV-F-6	0.184	2	0.016948608	0.33897216
41	ENV-F-7	0.137	3	0.018929016	0.37858032
42	**Economic (0.365)**				
43	Human Resources (0.476)				
44	ECO-A-1	0.350	4	0.243236	4.86472
45	ECO-A-2	0.361	4	0.25088056	5.0176112
46	ECO-A-3	0.289	4	0.20084344	4.0168688
47	Technology (0.524)				
48	ECO-B-1	0.248	2	0.09486496	1.8972992
49	ECO-B-2	0.238	3	0.13655964	2.7311928
50	ECO-B-3	0.252	4	0.19279008	3.8558016
51	ECO-B-4	0.262	4	0.20044048	4.0088096
52	**Social (0.332)**				
53	Health and Well Being (0.333)				
54	SOC-A-1	0.075	2	0.0165834	0.331668
55	SOC-A-2	0.091	3	0.030181788	0.60363576
56	SOC-A-3	0.086	4	0.038031264	0.76062528
57	SOC-A-4	0.086	4	0.038031264	0.76062528
58	SOC-A-5	0.051	3	0.016915068	0.33830136
59	SOC-A-6	0.081	4	0.035820144	0.71640288
60	SOC-A-7	0.053	5	0.02929734	0.5859468
61	SOC-A-8	0.090	4	0.03980016	0.7960032
62	SOC-A-9	0.061	4	0.026975664	0.53951328
63	SOC-A-10	0.084	3	0.027860112	0.55720224
64	SOC-A-11	0.069	4	0.030513456	0.61026912
65	SOC-A-12	0.088	2	0.019457856	0.38915712
66	SOC-A-13	0.085	4	0.03758904	0.7517808
67	Felxiblity & Adaptabiltiy (0.325)				
68	SOC-B-1	0.478	3	0.1547286	3.094572
69	SOC-B-2	0.522	4	0.2252952	4.505904
70	Thermal Comfort (0.342)				
71	SOC-C-1	0.238	4	0.108093888	2.16187776
72	SOC-C-2	0.252	5	0.14306544	2.8613088
73	SOC-C-3	0.267	4	0.121264992	2.42529984
74	SOC-C-4	0.243	4	0.110364768	2.20729536
75			Averages	3.66	73.15
76					

الملخص

تكتسب الاستدامة وأهداف التنمية المستدامة السبعة عشر (SDGs17) أهمية متزايدة في مختلف القطاعات في العالم. من بين أهداف التنمية المستدامة السبعة عشر الهدف الرابع المتعلق بالتعليم وينص على " التعليم الجيد الشامل والمنصف ويعزز فرص التعلم مدى الحياة للجميع" للمساهمة في تعزيز هذا الهدف في فلسطين، تهدف هذه الدراسة إلى تقييم الركائز الثلاث (الاقتصادية والبيئية والاجتماعية) للاستدامة في المدارس الحكومية في فلسطين مع الأخذ بمحافظة رام الله كدراسة حالة. تحقيقا لهذه الغاية، تم اعتماد نهج بحثي اختبار الفرضيات الكمية. تم جمع البيانات الأولية من عينة عشوائية من 70 مدرسة حكومية عبر استبيانات يديرها شخصياً وعبر الإنترنت أجاب عنها مديرو المدارس أنفسهم. هذا الاستبيان يتألف من ثلاث أجزاء؛ أحدهما للتركيبة السكانية لبيانات المدارس، والثاني للبيانات المتعلقة بركائز الاستدامة، والآخر لقياس تأثير الاستدامة على جودة التعليم المدرسي.

تم تحليل البيانات التي تم جمعها إحصائيًا باستخدام كل من SPSS و Smart SEM-PLS وبشكل أكثر تحديدًا، تم إجراء بعض الإحصائيات الوصفية والاستنتاجية من خلال SPSS بينما تم إجراء تقييم النماذج ذات الصلة (الخارجية) والهيكلية (الداخلية) بواسطة Smart SEM-PLS وتكشف النتائج أن ارتباط مؤشرات البعد البيئي بالاستدامة هو الأعلى، تليها مؤشرات البعد الاجتماعي والأدنى بالنسبة لمؤشرات الجانب الاقتصادي. كما وجد أن التأثير المتوقع للاستدامة في المدارس على جودة التعليم سيكون عالياً. بالإضافة إلى أن أداة SSA المطورة أثبتت صلاحيتها لتقييم استدامة المدرسة من الناحيتين الكمية والنوعية. علاوة على ذلك، تم تطوير أداة التقييم المستدام للمدرسة أداة (SSA) بناءً على أوزان معايير الاستدامة والمعايير الفرعية الناتجة عن العملية التحليلية الهرمية (AHP) باستخدام برنامج Expert Choice 11. وكشفت نتائج برنامج AHP عن أن الأوزان الرئيسية للاستدامة البيئية والاقتصادية والاجتماعية وُجدت تساوي 30.3٪ و 36.5٪ و

33.2٪. أيضًا تم إجراء مقارنة بين أوزان أداة SSA مع أوزان أنظمة التصنيف الأخرى وهي LEEDو CASBEE و BREEAM و GP- tool. ولتسهيل استخدام أداة SSA للتقييم، تم تطوير نموذج Excel لها والتحقق من صحته على عينة عشوائية من المدارس من 90 مدرسة مستهدفة. تم تقديم مجموعة من المضامين الإدارية لواضعي السياسات في نظام التعليم المدرسي الفلسطيني، أحدها أن البيانات تم الحصول عليها فقط من مديري المدارس أنفسهم، ولم يأخذوا بعين الاعتبار المعلمين والمستشارين الذين يمكن أن توفر آرائهم مزيدًا من المعلومات. كما تم وضع بعض التوصيات مثل ضرورة قيام وزارة التربية والتعليم بإعادة النظر في سياسات النظام التعليمي في فلسطين لمراعاة سياسات الاستدامة حيث أن كلا السياستين مترابطتان بشكل كبير.