Sustainability Assessment of the School Building Site (Case Study: Schools Built After 2003 in Karbala)

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Abstract Sustainable schools are schools that aim to raise environmental awareness among students and teachers through positive environmental practices. The aim of these school is to reduce the negative environmental impacts, especially in the areas of buildings, water, energy, air and waste. The problem of the research lies in absence of application of sustainability concepts in the Karbala city school buildings, which negatively affects the performance of schools environmentally, economically and socially as well as on the grade of scientific students and their awareness of the sustainability dimensions and its role in the establishment of environmentally friendly communities. The research focuses on schools in Karbala where the education in Karbala schools has been determined. The researcher then studies the concept of the sustainable school, its principles and applications on the school site to be used in line with the reality of Karbala city. An analysis of building sites for multiple schools in the city was conducted and an assessment of their sustainability using the SBAM method was undertaken to identify elements that represent weaknesses in order to describe and provide solutions to sustainability problems. At the end of the study, the researcher found that Karbala school sites are at a level of non-sustainability but not far from achieving them.

Keywords Sustainability · School building · Karbala · Urban designs · Construction designs

1 Introduction

Sustainability aims to grant all people around the world to obtain their basic needs and enjoy a better life without endangering the basic needs of future generations. It is a comprehensive development concept for the benefit of present generations without endangering the lives of future generations [1].

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An environment that set up sustainability is a sustainable environment, and since there is no sustainable environment without sustainable urbanization, sustainability in urbanization is of great importance at the environmental, economic and social level. Traditional building applications often ignore the interrelationships between the building, its surroundings and its inhabitants. Standard buildings consume too much resources and adversely affect the environment and generate large amounts of waste.

On the contrary, sustainable building applications offer an opportunity to access environmentally and resource efficient buildings through an integrated approach of design. Sustainable buildings priorities conservation of resources, including energy efficiency, renewable energy use and water conservation, as well as access to a healthy and convenient environment. In addition, reducing operating and maintenance costs, and taking care of several issues such as historical preservation and community infrastructure systems.

Therefore, it was important to focus on the implementation of the sustainability concepts in the urban environment. Because schools are one of the most important architectural projects, it is important to achieve sustainability in order to increase their environmental, economic and social efficiency, and to provide them with the knowledge and skills they need to guide their behavior and become active members of society. Through sustainable schools, sustainable development can be built in the learning experience of each pupil to encourage innovation towards the preservation of the ecosystem.

Sustainable schools are schools that aim to raise environmental awareness among students and teachers through positive environmental practices aimed at reducing negative environmental impacts, particularly in buildings, water, energy, air and waste. In order to be a sustainable school, the school has to implement the concepts of green architecture to reduce environmental impacts, as well as to build the skills of teachers to promote the environmental guidance and guidance burden to enable students to identify important environmental issues not addressed in the curriculum.

2 The Concept of Sustainable School

The high-performance school is a facility that improves and develops the learning environment through energy, resources and money savings [2]. In other words, a sustainable school embraces not only the concept of sustainability but the sustainable school itself is a learning tool for sustainability [3]. A sustainable school prepares young people for a lifelong sustainable living, through the process of teaching and structural behaviors day after day [4]. A sustainable school can also be defined through its guidance by the principles of self-care through promoting health and well-being, caring for others across cultures and generations, and preserving the environment [5]. If sustainability is achieved in the environmental aspect of sustainability, the concept of eco-school is thus realized as a great way to make

sustainable development part of the life and spirit of school [6]. The sustainable design of the school is defined as the design that provides a better physical environment for students and staff, at lower costs for different stages [7].

2.1 Sustainability in Urban Design School

Objectives of sustainable buildings as contained in a research paper on sustainable design include the following stages [7]:

Increasing energy and water conservation and efficiency.
Increased use of renewable energy resources.
Improve internal and external environment; improve internal air quality which leads to increasing human productivity and performance, and improving human health.
Use resources and materials efficiently.
Use of local materials.
The wise use of natural light.
Use green features.

2.2 Elements of the School and Its Surroundings

In order to achieve sustainability goals in urban design in general and in the school site in particular, the elements of sustainability must be studied in the levels of urban design of schools. All elements of the school and its surroundings will be addressed, as indicated in a guide to the school assessment program [8]:

The surrounding of the school building: public location, surrounding streets, neighboring building sizes, adjacent land uses.
School building: function, visual appearance, block diversity, sustainable design of the building.
Entrance: School contact with outside, safety and security, privacy.
Motion routes: Outside and inside the school of sidewalks, streets, corridors and paths.
Spaces community participation: function spaces, a central area to participate.
Green areas: schoolyard, school garden, green belts.
External elements (outdoor): play areas, social interaction arena.
Facilities and Services: School canteen, playground, garden, toilets.
Internal and external learning spaces: classrooms, library, laboratories and vocational training rooms, external education.

Table 1 Criteria for choosing general site of school building [9]

Criteria for choosing general site of school building		
1	Site selection criteria for flexibility	Topography, soil, structural requirements, site area, land use
2	Site selection criteria for comfort	Thermal comfort, air pollution, noise
3	Site selection criteria for safety and security	road network, fire protection
4	Site selection criteria for infrastructure	Transportation network, water network, electricity network, telephone network

2.3 School Site Selection Criteria

The planning and design of the school building site aims to achieve the educational, psychological, functional and aesthetic environment in order to create a healthy and appropriate environment in which the student receives all knowledge and practices all his activities in a good and safe atmosphere. This is achieved by taking into account all the standards and the planning and design rates for the school buildings during the design [9]. There are several bases and criteria to consider when choosing the general location of the school building. These criteria are shown in Table 1.

3 Study Samples

3.1 Selected Schools

Three different models were chosen from Karbala schools; those schools were built after 2003 AD. These models were replicated in most of the city's schools:

Nazek Almelaka School
Altafuik School
Alriahi School.

3.2 Reasons for Selecting This Sample

These three models were chosen according to the following criteria:

The location of the school; so that these models are in different districts and environments and cultures in the city of Karbala, where a school is located near the city center and the second is located in a random neighborhood and the third in a

popular area, respectively. The general location of those models; the first school was located on the main street of the district, the second was in the middle of the district, and the third was located on the secondary street of the district. Architectural design of the buildings in these models, where the architectural design of each school differs from the other. The area of the site and the availability of items and facilities in the school's private location.

3.3 Choosing the Private Location for Karbala Schools

Since the majority of the schools in Karbala are governmental schools, they often get land either from the government or from donors to build their schools. In the case of donation, the priority of choosing the school location for the purpose of building is based on the population density of the area. The priorities of the education program in Karbala in selection of school sites, where the main task is to provide sites within the residential areas to build schools, especially after increasing population density in the city of Karbala. Thus, the sites of Karbala schools are not selected according to the criteria referred to earlier in Table 1, but are studied and addressed later.

3.4 Methodology of Research

The research depends on the analytical descriptive method in studying the reality of the school site for the schools of Karbala city. And assess the level of sustainability in those schools and know the aspects of default at those levels, and then reach recommendations on the mechanisms of sustainability in the selection of school site for schools in Karbala through the following research tools:

- Access to published research, books, periodicals, and some websites.
- Field visits to a number of schools and conducting some interviews.
- Conducting interviews with the engineers responsible for the design and implementation of schools in Karbala, in addition to the headmasters, teachers and students of the selected schools sample and their parents.
- School Building Assessment Method Program (SBAM) has been selected as a tool to assess the sustainability of the school site and its compatibility with the surrounding environment and its course of urban development.
- Analysis of evaluation results using SPSS, where program questionnaires are distributed to relevant parties with students, teachers, engineers and parents.

3.5 SBAM Program

The program is defined as a collection of information gathering tools and discussion through questionnaires that encourage school administrators, teachers, students, parents and specialists to think carefully and discover the physical characteristics of the school and its buildings to assess the quality of the school environment and its satisfaction with the development needs of environment and students [8].

The program features are summarized [8]:

The program contains several assess axes, and each axis focuses on a particular purpose. The school's inspection visit focuses on assessing the built environment of school, while opinion polls about the school elements are considered as evidence of the school community's sense about the educational places and the elements of school environment and their compatibility with the educational curricula development. This program can be used by ordinary people and professionals. It provides evidence of the typical characteristics of the school's noticeable environment and is necessary to support the sustainable development needs of students at various stages of school. The program is designed for use by students, teachers, parents, citizens, architects and decision-makers.

3.6 Study Community

The results of the study on the assessment of sustainability in schools were presented through the following categories of community:

(1) Students, teachers, staff and the community for each school.
(2) Engineers participated in the design and construction of these schools
(3) Parents.

By providing data on these schools as inputs to the program and then evaluating them to reach and analyze the results to see how sustainability concepts are achieved at the school site for those models.

3.7 Preparation of Questionnaire

The questionnaire form consists of two sections:

Section I: includes personal information from selected respondents such as educational attainment and the job of each of them.
Section II: includes assessment of several axes that branch out from the school evaluation program. These axes are concerned with the urban design levels of the school. It also includes several items under each axis; which analyze to points

directed towards evaluating school elements. Here, the SBAM will be included in the axes of the school site with some arrangement by the researcher:

- Area around school building
- Entrances (place of contact inside school or building with outside)
- Motion systems
- Social participation
- Green areas
- Outdoor learning areas.

3.8 Analysis Program

After collecting information and data that filled out the questionnaire of evaluation program by study community, they were unloaded and analyzed using appropriate statistical tests by SPSS statistical program in order to obtain valuable indications supporting the subject of study.

3.9 Reliability of the Scale

To confirm the reliability of the scale, the researcher calculated the internal consistency by extracting the Alpha Cronbach coefficient. The analysis of the results by SPSS statistical program showed that the scale is reliable, where the value of the Alpha Cronbach for the whole scale (questionnaire) as in Table 2.

3.10 Statistical Processors

To achieve objectives of study and to analyze collected data, many appropriate statistical methods were used using Science Social for Package Statistical (SPSS) program. The following is a set of statistical methods within the program used in data analysis:

The data is encoded and entered into the computer, according to the five-dimensional Likert scale (1 strongly disagree, 2 disagree, 3 neutral, 4 agree, 5

Table 2 The reliability statistics for all models (researcher)

School	Nazek Almelaka	Altafuik	Alriahi
Alpha Cronbach	0.867	0.777	0.746

Table 3 Equation of the data entered by statistics program according to five Likert scale (researcher)

Period	1–1.8	1.8–2.6	2.6–3.4	3.4–4.2	4.2–5
Category	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Weight	1	2	3	4	5
Recurrences	A	B	C	D	E

strongly agree), to determine the length of five-dimensional Likert scale period used in the study axes, the range was calculated (5 − 1 = 4), then divide it by the number of five scale periods to get the period length viz (5/4 = 0.8); This value was added to a lower value in the scale (which is the correct one number) to determine the upper limit for the first period and so on Table 3.

Recurrences and percentages were calculated to identify individuals' responses to the key item phrases in the study tool. Relative weight to see how high or low the responses of the study members for each phrase of the basic variables of the study, knowing that it is useful for phrases arrangement according to highest relative weight. Relative weights are defined as the quantitative value obtained by the element for the field to which it belongs to know its effect and its quantitative weight when compared to other elements. The relative weight of 60% is the acceptance rate of the results. Items that achieve a relative weight greater than 60% are considered to be in the acceptance rate, the lower weights are considered at an unacceptable rate, with the reasons being mentioned by the researcher on the analysis results.

The relative weight is calculated according to the data given in Eq. [1] by the following method:

$$((A * 1 + B * 2 + C * 3 + D * 4 + E * 5)/(A + B + C + D + E)) * 10\% \qquad (1)$$

3.11 Assessment of Sustainability in Karbala Schools

Sustainability of school building site will be assessed for each module from the selected schools using the SBAM evaluation questionnaire. Then a comparative study will be carried out between these schools on the verification extent of the sustainability elements under consideration.

Sample Number: 80 questionnaires were distributed to each of the three schools, according to Table 4.

The sample was selected in each school of the headmaster and teachers who have more years of work in the school, and groups of students with higher educational achievement, and their parents who visited the school to evaluate the elements of the school and its appearance and performance; It has also been distributed to a number of engineers working in the school buildings sector, they should make a field visit to the school.

Table 4 Number of questionnaire forms

No.	Name of school	No. of forms distributed	No. of forms received
1	Nazek Almelaka	80	55
2	ALtafuik	80	54
3	Alriahi	80	57

3.12 Study Results and Explanation

Results of questionnaires will be analyzed for each item and for all items under one paragraph. The results are relative weights that reflect the level of community satisfaction for each item.

3.13 Area Around School Building

Table 5 shows the relative weights for each item of the area around school building which are one of the main points of the school site. The weights for each school were shown separately for all schools and relative weight of all items as shown in Fig. 1.

Table 5 Sustainability assessment for area around school building

No	Area around school building	School (relative weight %)				Sort by all schools
		Nazek Almelaka	Altafuik	Alriahi	All schools	
1	Does the building suit the pattern of the surrounding street	53.54	46.3	61.05	53.63	4
2	Does the scale of the building suit the site it sits upon?	54.18	43.33	64.21	53.91	3
3	Does the scale of the building suit the scale of the surrounding buildings?	60.73	50.74	61.75	57.74	2
4	Do the public and private areas relate well to one another?	53.82	43.33	61.4	52,85	6
5	Do the land uses adjacent to the building seem to fit harmoniously with the building?	46.91	37.78	56.14	46.94	7
6	Does the school building and its intended use fit well with the type and uses of adjacent buildings?	56.00	42.2	62.46	53.55	5
7	Does the appearance of the building fit in well with the buildings surrounding it?	61.09	48.15	65.96	58.4	1
	All items	55.2	44.55	61.87	53.87	

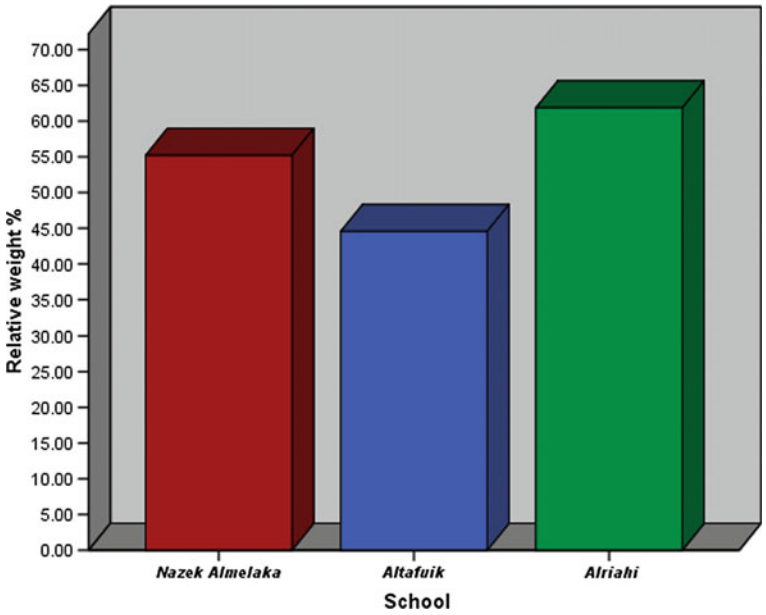

Fig. 1 Relative weights of the area around school building

Nazek Almelaka School has a relative weight (55.2%) and has ranked second. Altafuik School has a relative weight (44.55%) and has ranked third. Alriahi School has a relative weight (61.87%) and has ranked first. In general, the relative weight of all schools was 53.87%, less than 60%, which means that area around school building is generally unacceptable to the study community. Table 5 shows that the level of satisfaction of the study community with regard to item No. 5 concerns with the land uses adjacent to the building, if seem to fit harmoniously with the building is very low in Altafuik School. The researcher explains this because the school is located in a random residential neighborhood of the city, where blocks of buildings surrounding the school are irregular blocks consisting of informal buildings, mostly poor housing.

3.14 Entrances

It shows school's contact areas with the outside. Table 6 and Fig. 2 show the relative weights of each paragraph for this item:

Nazek Almelaka School has a relative weight (63.4%) and has ranked first.
Altafuik School has a relative weight (48.22%) and has ranked third.
Alriahi School has a relative weight (58.11%) and has ranked second.

Table 6 Sustainability assessment for entrances

No.	Entrances(school's contact areas with the outside)	School (relative weight %)				Sort by all schools
		Nazek Almelaka	Altafuik	Alriahi	All schools	
1	Does the exterior of the building indicate its interior Functions?	72	57.04	64.21	64.42	1
2	Are the exits and entrances easily accessible?	67.27	48.89	61.05	59.07	2
3	Are the various openings related to thoughtful planning of the interior? (Consider entry of light, view, privacy, noise, heat glare, atmosphere, etc.)	59.27	45.19	58.25	54.24	3
4	Are the exits appropriate from a safety point of view?	60.36	45.19	55.79	53.78	4
5	How pleasant is the experience when you move from the exterior of the building to the interior by means of the main entrance?	57.82	44.81	51.23	51.29	5
	All items	63.4	48.22	58.11	56.58	

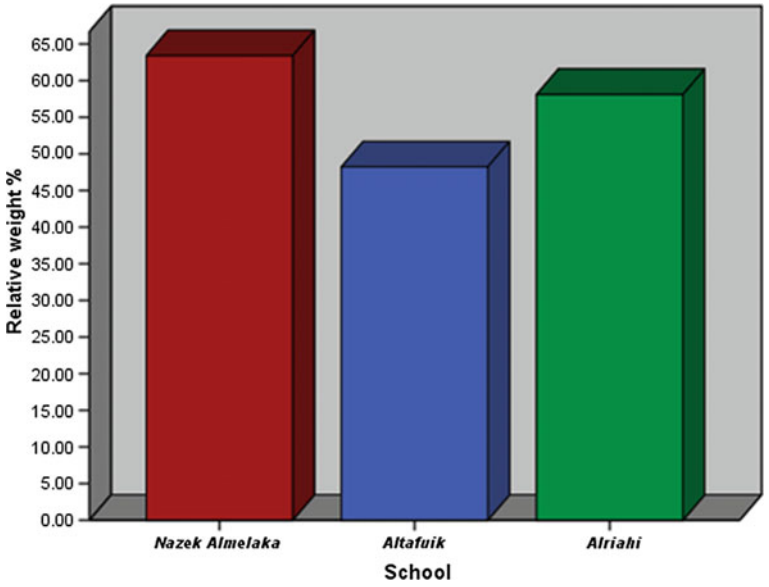

Fig. 2 Relative weights of entrances

In general, the relative weight of all schools was 56.58%, it is less than 60%, which means that entrances are generally unacceptable to the study community. It is noted in paragraph no. 1 that the level of evaluation is high in all schools compared to other paragraphs; this is because the school building specialists in Karbala pay great attention to the exterior design of the facades, as well as paint this facades periodically. It is noted in paragraph no. 5 that the level of satisfaction of the study community with regard to the enjoyment of mobility in and out of school at the Altafuik School is not acceptable. The researcher is referring to the fact that the school is located on a secondary street that is not paved and not serviced by infrastructure. It is noted in item no. 2 that the level of evaluation is acceptable in Nazek Almelaka and Alriahi schools, while the level of Altafuik School is low. This is due to the way of planning movement paths within the school, in addition to the role of the school administration in enhancing the ease of movement through internal traffic paths.

3.15 Motion Systems

It shows the contact areas of school blocks with each other, Table 7 and Fig. 3 show the relative weights of each paragraph for this item:

Nazek Almelaka School has a relative weight (63.8%) and has ranked first.
Altafuik School has a relative weight (59.44%) and has ranked third.
Alriahi School has a relative weight (61.49%) and has ranked second.

Table 7 Sustainability assessment for motion systems

No.	Motion systems (rows, paths, corridors)	School (relative weight %)				Sort by all schools
		Nazek Almelaka	Altafuik	Alriahi	All schools	
1	Are sufficient routes, pathways, streets and passageways provided to and around the building?	59.27	53.7	59.65	57.54	4
2	Do the routes link the building to the surrounding building or structures?	63.27	60.37	60.7	61.45	2
3	Are all the circulation routes within the building easily understood by newcomers, visitors, and service people?	66.55	62.59	62.81	63.98	1
4	Are all the circulation routes understandable and convenient?	66.18	61.11	62.81	63.37	3
	All items	63.8	59.44	61.49	61.58	

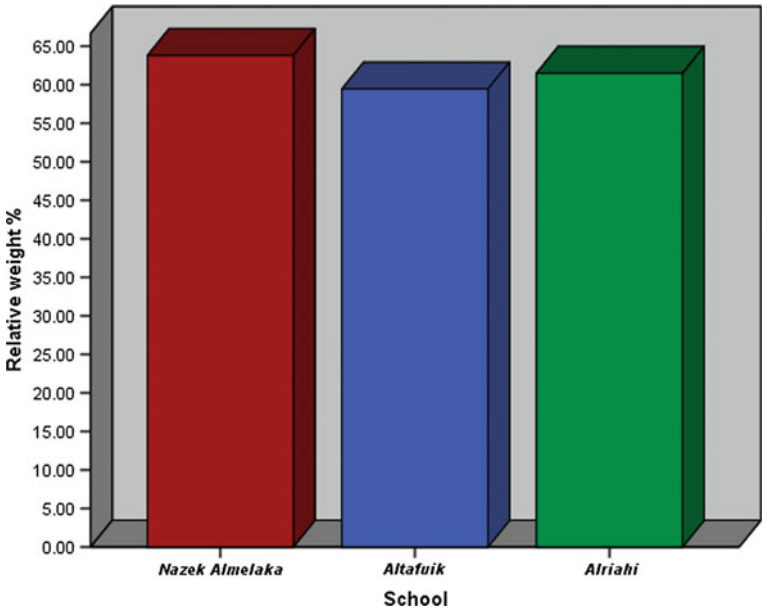

Fig. 3 Relative weights of the motion systems

In general, the relative weight of all schools was 61.58%, it is greater than 60%, which means that motion systems are generally acceptable to the study community. It is noted in paragraph no. 1 that the level of evaluation is lower than other paragraphs in all schools; the reason is that the school plans were designed for fewer students than actually exists.

3.16 Social Participation

It means the ability of the school environment to meet the diverse human needs. Table 8 and Fig. 4 show the relative weights of each paragraph of this item:

Nazek Almelaka School has a relative weight (48.8%) and has ranked first.
Altafuik School has a relative weight (47.89%) and has ranked second.
Alriahi School has a relative weight (39.69%) and has ranked third.

In general, the relative weight of all schools was 45.46%, it is less than 60%, which means that social participation is generally unacceptable to the study community. It is noted in paragraph no. 4 that the level of evaluation is high in Nazek Almelaka School and Altafuik School because of the location of the school management rooms in an average location accessible by students and visitors. It is noted in paragraph no. 5 that the level of satisfaction of the study community in providing

Table 8 Sustainability assessment for social participation

No.	Social participation	School (relative weight %)				Sort by all schools
		Nazek Almelaka	Altafuik	Alriahi	All schools	
1	Does the building arrangement allow for casual contact among students and teachers?	62.18	58.15	40.35	53.56	3
2	Does the building arrangement allow for a centralized area of information exchange?	61.09	58.15	48.42	55.89	2
3	Are there exhibition spaces to display student work?	52.73	50.74	43.51	48.99	4
4	Is the location of teachers' offices accessible?	72.36	69.26	47.72	63.11	1
5	Does the building suit the students' ability to personalize their workspace?	38.55	39.63	36.49	38.22	7
6	Public areas fostering a sense of community	42.18	42.22	37.54	40.65	5
7	Outside quiet areas for eating	38.82	34.07	29.82	34.24	9
8	Accessibility for people with disabilities	37.45	40	34.74	37.4	8
9	Building designed and built to the scale of children	38.55	38.89	38.6	38.68	6
	All items	48.8	47.89	39.69	45.46	

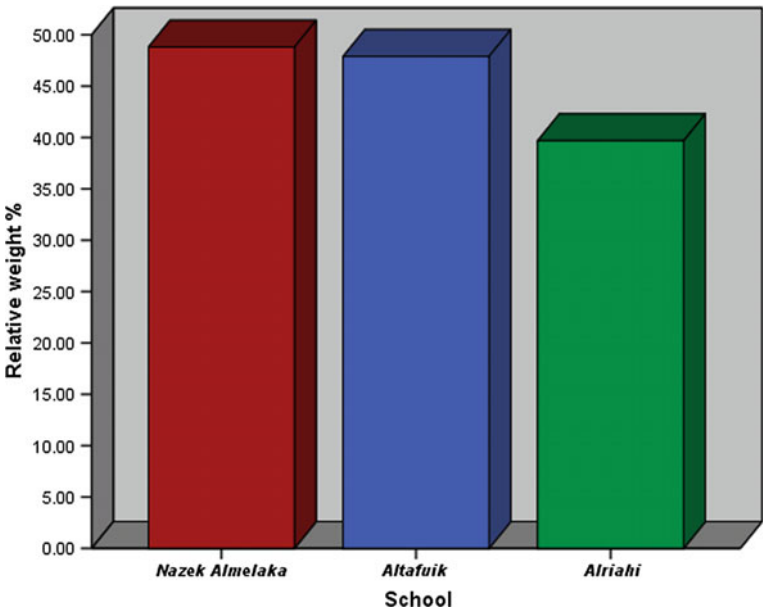

Fig. 4 Relative weights of the social participation

special spaces for students in the school yard is very unacceptable in all schools, the reason, according to the researcher is the absence of green places isolated and far from the places of play. Note that the relative weight of paragraph [7] is very low in all schools, especially Alriahi School, because of the overcrowding in the school as students number is greater than school capacity. Note that the relative weight of item number 8 is lower in the three schools; the researcher believes that is because of leaving large parts of the school yard without paving.

3.17 Green Areas

It is concerned with the green structure of the school, which includes green gardens and their integration with buildings, as well as biodiversity and use of rainwater. Table 9 and Fig. 5 show the relative weights of each paragraph of this item:

Nazek Almelaka School has a relative weight (50.4%) and has ranked first.
Altafuik School has a relative weight (48.7%) and has ranked second.
Alriahi School has a relative weight (47.73%) and has ranked third.

In general, the relative weight of all schools is 48.94%, which is less than 60%, which means that the achievement level of this sample of schools for sustainability is unacceptable for green zone component. The level of assessment of the green structure is very low in the Alriahi School and Altafuik School. The researcher considers that the reason is due to the scarcity of green areas within the school and its surrounding

Table 9 Sustainability assessment for green areas

No.	Green areas	School (relative weight %)				Sort by all schools
		Nazek Almelaka	Altafuik	Alriahi	All schools	
1	Are there enough green areas for students?	54.55	52.59	50.88	52.67	2
2	Are there special areas for agriculture?	66.91	62.22	62.81	63.98	1
3	Is there integration between green areas and built-up elements?	51.64	50.37	48.77	50.26	3
4	Is the school surrounded by a green belt?	48	46.67	48.42	47.7	4
5	Does biodiversity promote green areas of the school?	49.82	47.78	42.81	46.8	5
6	Is there a system for the drainage and use of rain water in the school?	31.27	32.59	32.63	32.16	6
	All items	50.4	48.7	47.73	48.94	

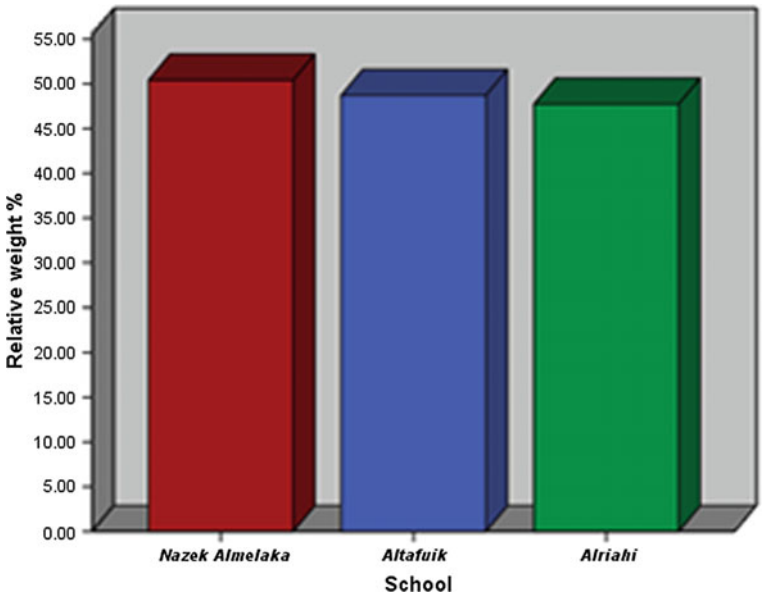

Fig. 5 Relative weights of the Green areas

environment significantly, therefore, the level of evaluation of all paragraphs is affected. It also notes the relative weight of the green building at Nazek Almelaka School is low, despite the appearance of school, which hints a lot of green areas in the school. The researcher points out that there is no central garden for students, but that green areas are distributed over small areas, which reduces their use as a rest or place to encourage biodiversity. It is noted in paragraph no. 6 that there is no system for the collection and use of rainwater in a well thought out method, but the assessment of the study community for this paragraph based on runoff of rainwater and discharge by the slopes of the ground green areas, which enhances their use.

3.18 Outdoor Learning Areas

The existence of outdoor educational spaces enhances the educational process in the school, especially if supported by natural elements. These places help to relax and link the curriculum to the natural environment [8]. Table 10 and Fig. 6 show the relative weights of each paragraph of this item:

Nazek Almelaka School has a relative weight (43.2%) and has ranked first.
Altafuik School has a relative weight (39.63%) and has ranked third.
Alriahi School has a relative weight (41.98%) and has ranked second.

Table 10 Sustainability assessment for outdoor learning areas

No.	Outdoor learning areas	School (relative weight %)				Sort by all schools
		Nazek Almelaka	Altafuik	Alriahi	All schools	
1	Appropriate outdoor areas for learning	42.55	39.26	41.4	41.07	2
2	Outdoor play areas for students	51.64	45.93	48.07	48.55	1
3	Outdoor learning environments with natural elements	35.64	33.7	36.49	35.28	3
	All items	43.2	39.63	41.98	41.6	

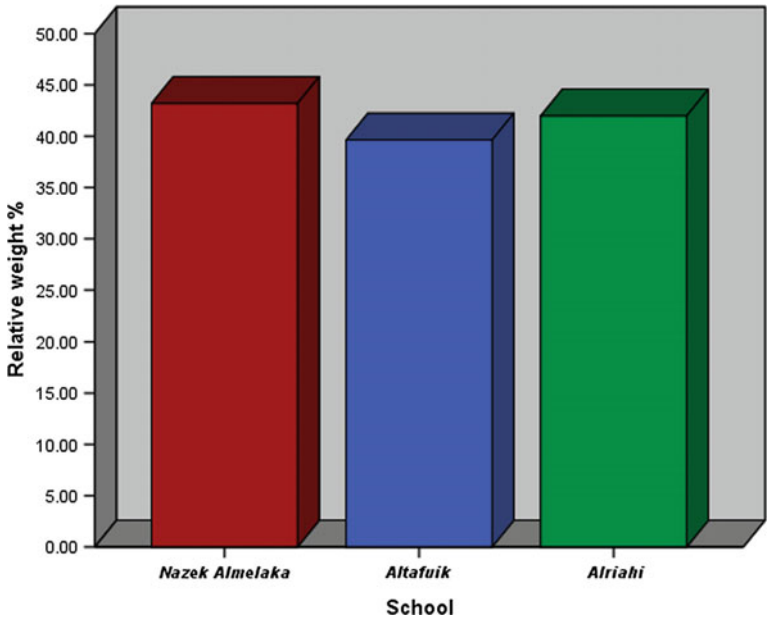

Fig. 6 Relative weights of the outdoor learning areas

In general, the relative weight of all schools was 41.6%, which is less than 60%. This means that the total of the three schools is not sustainable with the provision of outdoor educational facilities. This reduces the support for the development of curricula and methods in the educational process. It is noted that the level of evaluation of outdoor learning areas in all schools is very bad. The researcher believes that there are not enough gardens used by teachers as a vacuum for some classes, such as science, arts and geography, and there are no green spaces to practice some sports, artistic and recreational activities.

3.19 Compare All Items in the Three Models

Table 11 and Fig. 7 show the relative weights of each major assessment item for each school separately and for all schools as follows:

Table 11 Relative weights of each major assessment item

No.	Item	School (relative weight %)				Sort by all schools
		Nazek Almelaka	Altafuik	Alriahi	All schools	
1	Area around school building	55.2	44.55	61.87	53.87	3
2	Entrances	63.4	48.22	58.11	56.58	2
3	Motion systems	63.8	59.44	61.49	61.58	1
4	Social participation	48.8	47.89	39.69	45.46	5
5	Green areas	50.4	48.7	47.73	48.94	4
6	Outdoor learning areas	43.2	39.63	41.98	41.6	6
	All items	54.13	48.07	51.81	51.34	

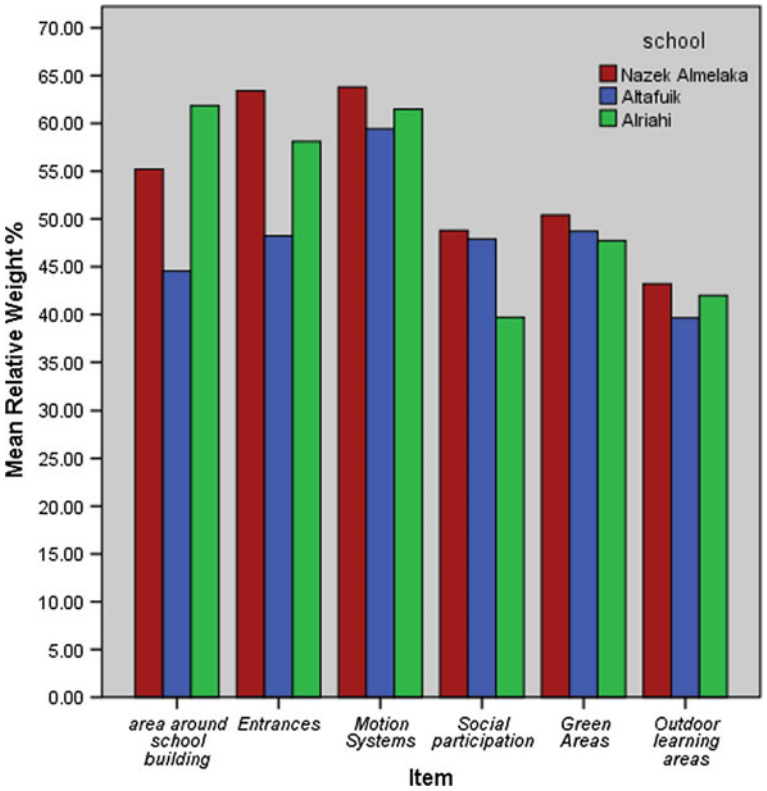

Fig. 7 Relative weights of each major assessment item

Nazek Almelaka School has a relative weight (54.13%) and has ranked first.
Altafuik School has a relative weight (48.07%) and has ranked third.
Alriahi School has a relative weight (51.34%) and has ranked second.

In general, the relative weight of all schools was 51.34%, this relative weight was less than 60%. Thus Karbala schools are at the level of non-acceptance, but not far from acceptance.

In Fig. 7, there were some results:

- A number of items have not been achieved sustainability in all schools, and other items have been achieved sustainability in some others, as illustrated below:
- All schools have not achieved sustainability on social participation, green areas and outdoor learning areas items.
- Only Alriahi School has achieved sustainability on area around school building item.
- Only Nazek Almelaka School has achieved sustainability on entrances item.
- Both Nazek Almelaka and Alriahi School have achieved sustainability on motion systems item.

4 Conclusions

Sustainability aims to grant all people around the world to obtain their basic needs and enjoy a better life without endangering the basic needs of future generations. It is a comprehensive development concept for the benefit of present generations without endangering the lives of future generations [1]. An environment that set up sustainability is a sustainable environment, and since there is no sustainable environment without sustainable urbanization, sustainability in urbanization is of great importance at the environmental, economic and social level. Traditional building applications often ignore the interrelationships between the building, its surroundings and its inhabitants. Standard buildings consume too much resources and adversely affect the environment and generate large amounts of waste. On the contrary, sustainable building applications offer an opportunity to access environmentally and resource efficient buildings through an integrated approach of design. Sustainable buildings priorities conservation of resources, including energy efficiency, renewable energy use and water conservation, as well as access to a healthy and convenient environment. In addition, reducing operating and maintenance costs, and taking care of several issues such as historical preservation and community infrastructure systems. Therefore, it was important to focus on the implementation of the sustainability concepts in the urban environment. Because schools are one of the most important architectural projects, it is important to achieve sustainability in order to increase their environmental, economic and social

efficiency, and to provide them with the knowledge and skills they need to guide their behavior and become active members of society. Through sustainable schools, sustainable development can be built in the learning experience of each pupil to encourage innovation towards the preservation of the ecosystem. Sustainable schools are schools that aim to raise environmental awareness among students and teachers through positive environmental practices aimed at reducing negative environmental impacts, particularly in buildings, water, energy, air and waste. In order to be a sustainable school, the school has to implement the concepts of green architecture to reduce environmental impacts, as well as to build the skills of teachers to promote the environmental guidance and guidance burden to enable students to identify important environmental issues not addressed in the curriculum.

References

1. Al-Mekati S (2007) Personal interviews in the educational field. Ministry of Education, KSA
2. Al-Nemra N (2004) Planning and design standards for basic education buildings in the Gaza Strip. Al-Azhar University, PhD
3. Deeb R, Muhanna S (2009) Planning for sustainable development. J Damascus Univ Eng Sci 25:1
4. Gough A (2006) Sustainable schools in the UN decade of education for sustainable development: meeting the challenge? South Afr J Environ Edu 23:48–63
5. Innovative Design (2008) Reedy Fork Elementary School
6. Kushek M (1996) Principles and uses of statistics in the fields of social service. Alhurra, Alexandria
7. Rob S (2007) Sustainable Schools Toolkit. Hackney Resource Pack, Sustainable Schools Guide
8. Sanoff H, Celen P, Mine H (2001) School building assessment methods (SBAM)
9. The Brendle Group, Inc (2005) With assistance from the institute for the built environment. Sustain Des Guidel, Colorado