Transformation of Traditional Secondary Schools to Sustainable Educational Building

By

Mohammed Osama Rasmy

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the Degree of
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In
ARCHITECTURAL DESIGN

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دراسة لتحويل المدارس الثانوي إلى مدارس مستدامة

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Summary:

Egyptians suffer in the current era from the local educational buildings in spite of the efforts exerted by the government in this field. The aspiration of our future generations cannot be achieved without advanced educational system and well designed educational buildings. The research covers the topic of sustainable educational buildings, since it is considered the new approach for school design.

The thesis is divided into four main sections; The First section covers observations to Egyptian schools, their problems and the deficiencies in the educational process in Egypt. Section two-addressee sustainable architecture, understanding sustainability and how it can be achieved in Egyptian schools. Section three is research framework to design sustainable educational buildings, the Architectural theoretical investigation to build schools to become sustainable buildings. Section four covers the case studies of some international schools and the transformation of Egyptian schools.

In the Name of Allah

To Whom We Owe Our Humanity

To Whom We Owe Our 'Being'

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Finally, this thesis is for every child and youth in the Egypt to learn about the sustainability in his / her school.

Abstract

Egyptians suffer in the current era from the local educational buildings in spite of the efforts exerted by the government in this field. The aspiration of our future generations cannot be achieved without advanced educational system and well designed educational buildings. The research covers the topic of sustainable educational buildings, since it is considered the new approach for school design. It is currently extending to the Middle East Zone as well as some international school facilities in Egypt. Sustainability is a global philosophy applied to all educational systems.

However, the most effective phase of the educational process lies in the secondary schools, so the research will address the secondary educational facilities. It is considered as the intermediate stage for the students after finishing the primary and preparatory schools and before they move on to the university education.

The thesis is divided into four main sections;

The First section covers observations to Egyptian schools, their problems and the deficiencies in the educational process in Egypt. Section two is addressee sustainable architecture, understanding sustainability and how it can be achieved in Egyptian schools. Section three is research framework to design sustainable educational buildings, the Architectural theoretical investigation to build schools to become sustainable buildings. Section four covers the case studies of some international schools and the transformation of Egyptian schools.

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Chapter one

Introduction

Chapter one: Introduction

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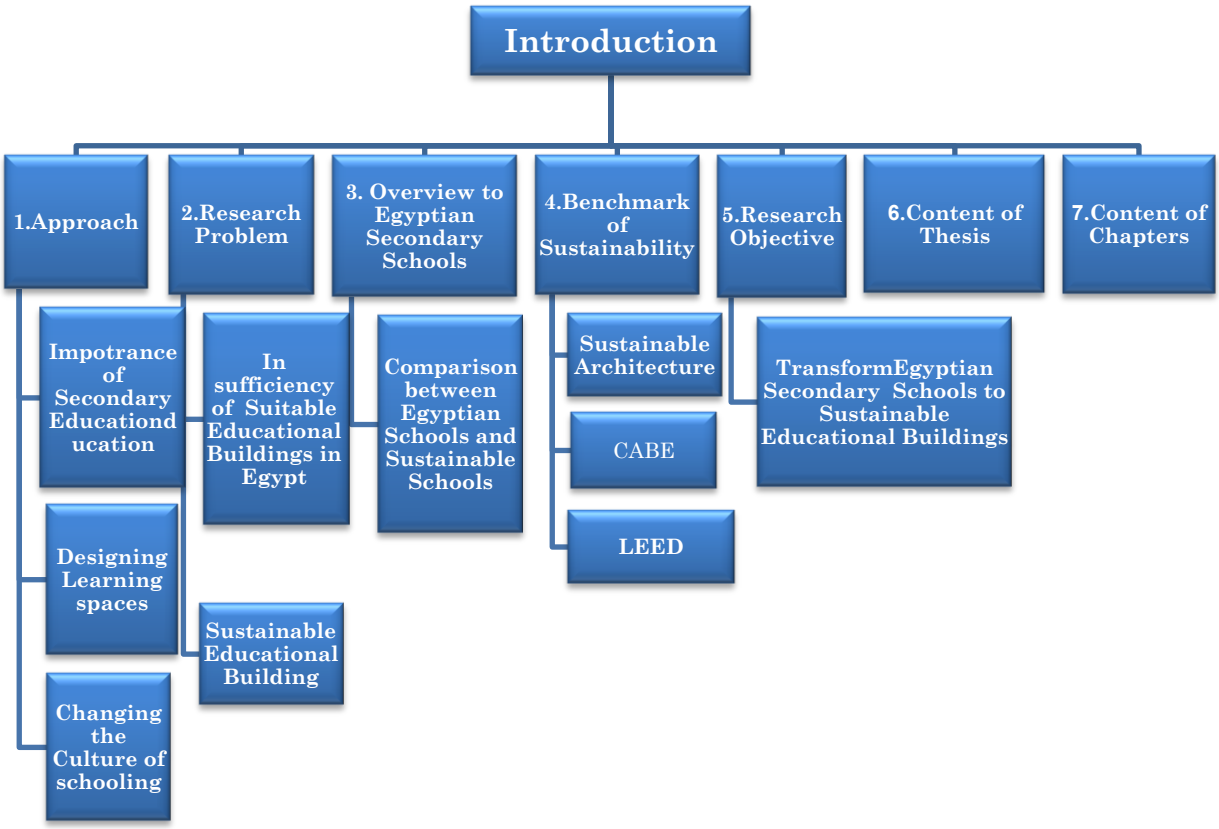


Diagram 1. 1 Introduction. "Researcher".

Introduction

بِسْمِ اللهِ الرَّحْمَنِ الرَّحِيمِ

اقْرَأْ باسْمِ رَبِّكَ الَّذِي خَلَقَ (١) خَلَقَ الإِنسَانَ مِنْ عَلَقٍ (٢) اقْرَأْ وَرَبُّكَ الأَكْرَمُ (٣) الَّذِي عَلَّمَ بِالْقَلَمِ (٤) عَلَّمَ الإِنسَانَ مَا لَمْ يَعْلَمْ (٥)

1.1 Approach

In the present day Egypt's policy regarding Education take a global , Egypt's policy on education, must take a global perspective crisis at 2010 .The governmental as well as private schools in Egypt must become internationally competitive to fulfill the requirements of an open market economy.

Education in Egypt must prepare students to cope with economic challenges and to respond effectively to the daily changing technological market challenges.

The Government of Egypt should take some steps to achieve this goal; where the preparation of suitable school buildings presents itself as one of the first mission to be accomplished. This step is accomplished by up-grading the existing stock of school buildings rather than constructing totally new facilities. This strategy was adopted internationally, and it requires strong non-stopped effort from decision makers to improve the educational framework.

The Educational system in Egypt should capitalize on the development of problem-solving & creative thinking abilities of others working in the international arena.

The design quality of secondary schools completed over last few decades is not good enough to secure the government’s ambition to transform the quality of secondary education to internationally acceptable standards.

1.1.1 Importance of Secondary Education

The first thing about the education is knowledge gaining. Education should give students global knowledge and should help students develop their life vision.

Education in Egypt should include more than just lessons and poems in textbooks. It should also teach lessons about life.

Education is the basis for culture and civilization. It is the basic tool in the development of students' values and virtues. Education is important for the economic growth. It is the backbone of society. [1]

Schools and colleges define the basic framework of education. However, education does not end here. It is a lifelong process. The process of self-learning should continue even after the institutional education ends.

Figure 1. 1 Student should learn the basics at schools like computers for the Career Opportunities. [2]
"http://www.joanganzcooneycenter.org/Cooney-Center-Blog-107.html"

Figure 1. 2 Students are applicable science lessons in lab. Single student using microscope on Science Adventure Lab.
"http://www.flickr.com/photos/adventurelab/3929664055/".

Figure 1. 3 Egyptian computer classroom at Elsaedyah secondary school is a classic education in our schools. "Researcher (2006)".

Figure 1. 4 Elmasryah School science lab.
"Researcher (2006)".

[1]Manali Oak, Why is Education So Important?, (Buzzle.com), Available: http://www.buzzle.com/chapters/education-and-higher-learning.asp (Accessed: December 2009).

[2] Scott Traylor**, (**Oct 6, 2010), Back to School – Learning and Growing in a Digital Age, Available : http://www.joanganzcooneycenter.org/Cooney-Center-Blog-107.html, (Accessed: December 2009).

Youth is that phase of life (Age 14-18) Egyptian students at secondary education where dreams are built, hope is kindled, and a bright future is foreseen.

Youth is a beautiful phase of life where a child turns into an energetic, confident individual. It is the growing phase of life, the stage to achieve a complete physical and mental growth. [1]

The importance of Egyptian education to youth at secondary education manifests itself in terms of the need to cultivate the youth of society into mature individuals.

It is the time to develop the principles of life, make career decisions and begin the pursuit of one's goals at university.

It is important that the education to Egyptian youth aim at developing a social awareness in these adults-to-be. It is important that the training given to they consist of environmental education.

Education to youth should bring forth the critical social issues and encourage the youngsters to resolve them. Education should motivate the youth to come forward to work for society.

"A person that gets a good education will become a more dependable worker, a better citizen, and a stronger consumer. For example, people would rather higher a well-educated person rather than a week-educated person. When looking at the long-term effects of an education, our economy needs these educated people to know how to keep the economy efficient and not get into a bind in the future."[2]

Secondary Education in Egypt consists of three tracks: general, vocational/technical and the dual system vocational education. The secondary stage will be the target in the research.

[1] Manali Oak, Why is Education So Important?, (Buzzle.com), Available: http://www.buzzle.com/chapters/education-and-higher-learning.asp (Accessed: December 2009).

[2] Manali Oak, Importance of education to youths, (Buzzle.com), Available: http://www.buzzle.com/articles/importance-of-education-to-youths.html (Accessed: December 2009)

Figure 1. 5 Children study in the mosque. It replaced the school building. "Researcher (2005)".

Figure 1. 6 Egyptian youth (14-18 years old) are the future for Egypt. "Researcher (2006)".

Figure 1. 7 Egyptian Students at Elmasryah school are looking for the future. "Researcher (2006)".

1.1.2 Designing Learning Spaces

"Any new learning space should be built with the assumption that it will last 30 times longer than any technology that would sit inside it"[1] Learning spaces in the 21st Century are both physical and virtual.

"Schools of the past have become learning communities required to change and repurpose themselves to provide an education suited to a new, digital society. The connection between learning environments and the outcomes they produce has been in evidence for as long as formal education has been recognized". [2]

Learning spaces in Egypt are not suited for the current era and not ready for future challenges and are not even compatible with the global educational system. learning spaces in Egypt need to be more coordinated with the new technology and sustainable to the environment."To design new learning environments we need to consider the student or learner at the heart of the design. We must also consider the need to change and support change in the nature of schooling for 21st century learners".[3]

1.1.3 Changing the Culture of Schooling

"Schools have traditionally been made up of a series of individual rooms designed to hold a group of students and a teacher. These were "private" spaces, behind walls and

[1] William Ford Gibson (Born March 17, 1948) is an American-Canadian writer who has been called the "noir prophet" of the cyberpunk subgenre of science fiction.
[2] Diane Brook-Head eLearning-Archdiocese of Sydney Catholic Education Office, (2009) Designing Learning Spaces for 21st Century Learners.
[3] Dian , (Jun 14, 2009), University of Oregon, Eugene , Brook.

closed doors, where the teacher worked alone, preparing instruction to students. One room per class therefore the space is called a "classroom". This design suited an industrial model of education"[1], it is still the style seen in most of Egyptian Secondary Schools.

The model is containing classrooms, corridor and stairs. The design has spaces 8 X 5.5.the space functions as a lab or classroom or computer room based on the school needs in each location.

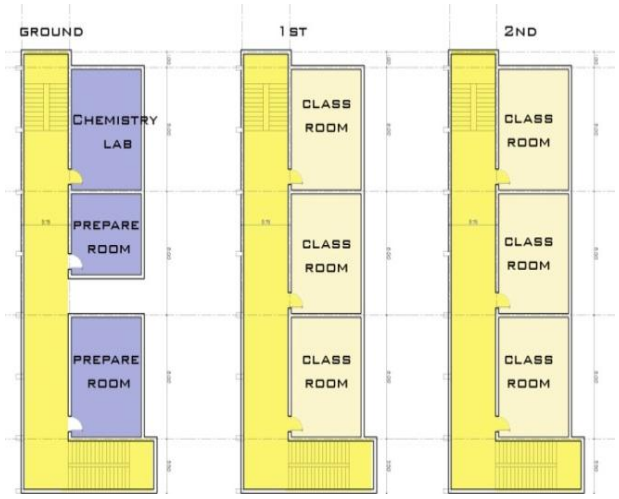


Figure 1. 8 Example plan in Imbabah secondary school is the industrial model. It is at most Egyptian schools. "Researcher (2008)".

Figure 1. 9 Same school building is located in Helwan. "Researcher (2006)".

Figure 1. 10 School Building is located at Imbabah secondary school. "Researcher (2006)"

Figure 1. 11 Same school Building is located in a preparatory school. "Researcher (2006)"

Figure 1. 12The same Building is located in elsaedyah school. . "Researcher (2006)".

Identical school buildings are located in any place in Egypt. The school design must be responsive to the local community, the environment and the overall context.

1.2 Research problem

Defective traditional Egyptian schools design is critical problem, which the development in Egypt cannot start without solving this problem.

[1] Diane Brook-Head ELearning-Archdiocese of Sydney Catholic Education Office, (2009) Designing Learning Spaces for 21st Century Learners.

Lack of interaction between the school and its environment in Egypt needs to be studied in the future schools.

Improper use of environmental and human resources is an important issue to move Egyptian resources in the right way.

1.2.1 Insufficiency of Sustainable Educational Buildings in Egypt

There are many persistent questions that worry any person who is concerned with the progress of education in Egypt. As Egyptian youth, constitute 30% of the population,[1] they are truly a force that could either pull down or push the foundation of the country forward. Problems of education reflect on private lessons, where we lose the importance of educational buildings with the support of private tutors. Educators have given up on their professionalism by revealing the questions, where to make their students' life easier in many situations.

The Egyptian Law of Education No 139/ 1981 is state among its goals that, secondary education should be based on the adequate preparation of students for the demands of the labor market, or for joining universities.[2] However, we noticed that the secondary

Figure 1. 13 Advertisings for private lessons is at the school's wall. "Researcher (2006)".

[1]Ghada Abdel-Kader, (2008, November 26), When looks don't count, Issue No. 923 On Education.

[2] Samir Sobhi and Malak Luka with Ramzi Abdel-Malek, (2007), an expert in the educational process and educational planning, (Alharam weekly).

school graduate is qualified only for joining university and has no experience or skills that allow students to cater to the needs of the labor market.

The Ministry of Education measured the Performance of school buildings, at most of Egyptian governorates.

And found that, the accepted schools Buildings are "35%"[1] of Egyptian schools as shown in the table (1-1) below:

	Governorate	Number of schools	Accepted schools	Ratio
1	Cairo	215	120	55%
2	Dakahlia	147	44	29.90%
3	Qalyubia	121	58	48%
4	Alexandria	122	53	43.50%
5	Sharqia	107	36	33.60%
6	Asyut	83	18	21.70%
7	Sohag	85	21	24.70%
8	Gharbia	73	26	35.60%
9	Kafr el shikh	90	23	25.60%

Table 1. 1 The Performance of school buildings at Egypt at 2010

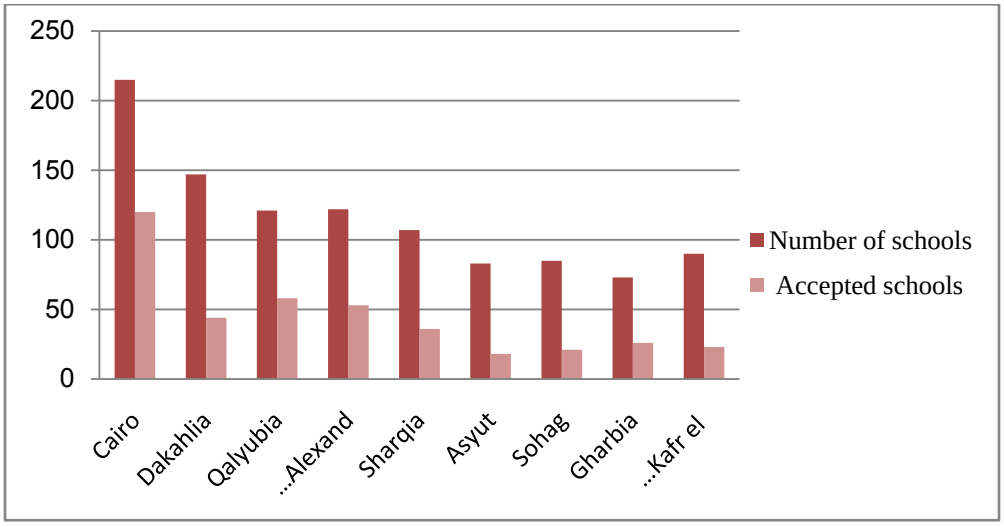


Figure 1. 14 Ministry of education statistics for school performance is 35% school buildings accepted at 2010.[2]

[1] Ministry of Education Statistics Report, (2010), Avilable at : http://www.emoe.org.

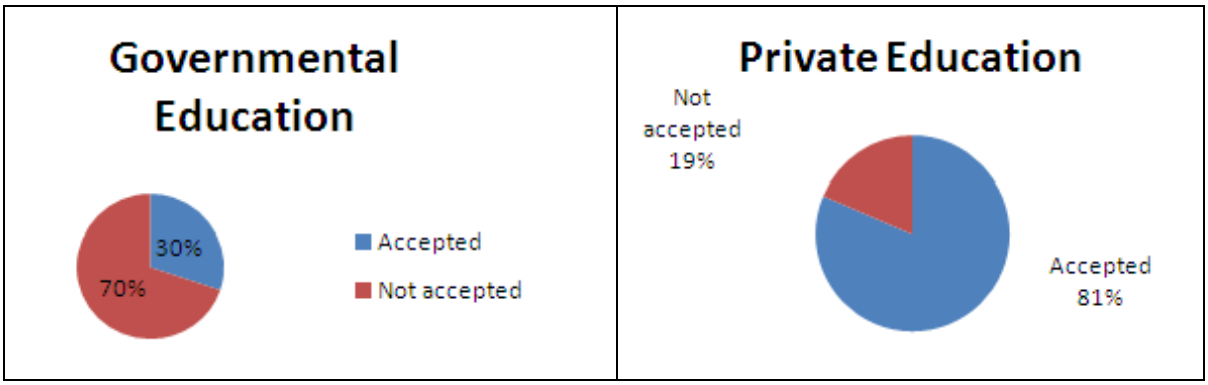


Figure 1. 15 Ministry of Education Statistics at 2010[1]

	Governmental Education	Private Education
Accepted	306	70
Not accepted	714	16

Table 1. 2 School Efficiency Quality[2]

Figure 1. 16 Orman secondary school Building. "Researcher (2006)".

Figure 1. 17 Imbabah secondary school Classroom. "Researcher (2006)".

Figure 1. 18 Private lessons in Ezbat elwalda, Helwan. It's considered the current education. . "Researcher (2006)".

Figure 1. 19 Egyptian Students leaves the school. "Researcher (2007)".

[1] Ministry of Education Statistics for School Performance, (2010). http://www.giza.gov.eg/Companies/Buildings/default.aspx

[2] Ministry of Education Statistics for School Performance, (2010). Avilable at : http://www.emoe.org.

1.2.2 Sustainable Educational Building:

The current model of development is changing the culture of all the schools around the world to become sustainable, the current schools in Egypt need to be sustainable for the future.

In order to secure the future of youth, many schools in the world started to make a decisive movement towards sustainable development.

Empowering young people to take responsibility for their own future is not only desirable: it is a crucial feature of their education.

Figure 1. 20 Application of sustainability in the schools is students starting bush regeneration. Rose Bay Secondary College
"www.teachernet.gov.uk".

Figure 1. 21 St Catherine's girls conducting a waste audit.
"www.teachernet.gov.uk".

Figure 1. 22 Sustainable school is the target. Longley academy.
"www.topboxdesign.com".

"The sustainable school brings respect in the future for its country & the student. Schools, as stewards of our next generation, need to understand and embrace sustainability in order to help students build a healthy future for their communities and the planet".[1]

1.3 Overview to Egyptian Secondary Schools

Egypt is suffering from financial crisis, but the educational sector needs a larger percentage of the National Economic Budget, in order to update/establish schools,

[1]Docstoc,(2007, February 28),What is Sustainability.(docstoc documents of small business & proffesionals),Available: www.docstoc.com/docs/2280777/What-is-Sustainability (Accessed: 2009, March)

about 70% of governmental educational buildings[1] from shortage in governmental funds, which is considered a critical problem for Egypt's future and development.

The world is trending these days in architectural design to the sustainable design and renewable energy. Sustainable design proved its success in many architectural buildings, through saving energy and money. In the best case scenarios using renewable energy help the building to gain money, like cases in Germany where the government gives pays to the owners for their photovoltaic's panels, in refunds for purchasing their excess the electrical energy.

Sustainable Schools should save energy, this dependent on the type of renewable energy used, the school operating hours, and its involvement with the surrounding community.

The sustainable school design offers a good solution for Egyptian schools. Egypt needs to apply sustainability in the existing as well as new schools. Some sustainability is considered a new design approach in the Egyptian educational buildings; this research is focusing on the study of the sustainable design and its application in Egyptian schools.

1.3.1 Comparison between Egyptian Schools and Sustainable Schools

There are several points to be addressed while comparing Egyptian with international schools:

A- Site Design concepts

1- Compact versus finger layout

The problem at Egyptian Schools is separate classroom buildings or science facilities, similar to a college campus. In deciding to create a campus school, the design should consider whether it enhances the school's educational objectives and

[1] Alahram newspaper from Ministry of education

whether the climate is appropriate for walking from building to building. Security must also be addressed.

The international schools are a single structure with a single or limited number of access points, it is clearly easier to secure and monitor than an open campus setting. Campus settings, or separate buildings, are typically found where one or more of the following conditions are present:

• Private residential school.
• Preparatory school desirous of a college image.
• Community schools where kindergarten through 12th grade are housed on a single site.
• Schools with large enrollments in developing an organizational strategy for a school, the designer must consider many factors. Adjacencies between school program elements are contingent on the following major issues:

2- **Internal circulation**: During the school day, where do students have to go and how often? Do some travel the corridors as a class, how much time is allotted between periods, and how far are distances travelled in the corridors?[1]

Egyptian school buildings follow one prototype design, with single loaded corridors serving and spaces like classrooms, labs, library or administration. Buildings with same shape surround the courtyard. Schools are designed as separate buildings, allowing students to move from one building to another by crossing through corridors and courts.

[1]Bradford Perkins & Stephen Kliment, (December 12, 2000), Building type basics for elementary and secondary schools Book, Publisher: Wiley (December 12, 2000)

Sit e design

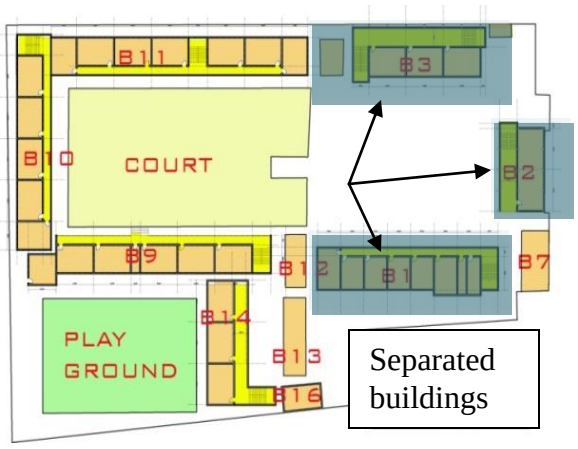


Figure 1. 23 Imbabah secondary school Layout is no. of separate buildings that surrounded by a courtyard. "Researcher (2009)".

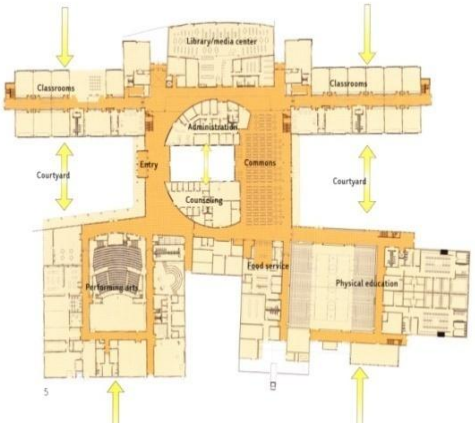


Figure 1. 24 Clackamas secondary school is a main building has internal clear circulation; Courtyards are forming an open air outdoor learning spaces. "Sustainable school book"[1].

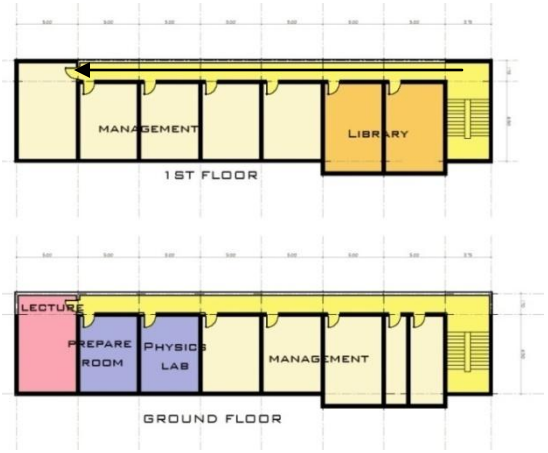


Figure 1. 25 The spaces are from main corridor at Imbabah secondary school. "Researcher (2009)".

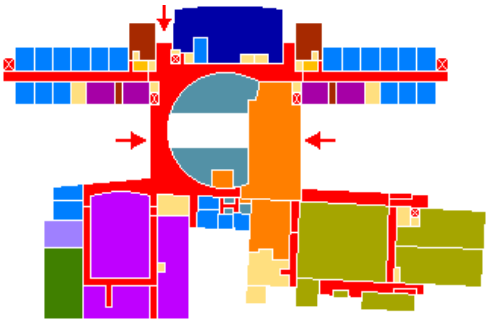


Figure 1. 26 the spaces connected with one clear circulation. At Clackamas high school. "www.designshare.com".

3- **Efficiency/cost:** The amount of corridor space needed to serve each room in the building is a major component in the determination of building efficiency and resultant costs. Different organizational strategies yield varying efficiencies. Compact plans tend to be lower in initial cost but often do not provide the best educational environment.

Some compactly designed school buildings are single structures; students do not leave their building during the day except for physical education.

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

B. Designing Spaces for Learning

Considering the design of the classroom what should we be creating? How do we provide the design and facilities students need for the future when change is so rapid?

To meet the principles of contemporary learning our new and refurbished spaces need to fulfill the following criteria:

1- Flexible.
2- Connected.
3- Collaborative.
4- Multisensory.
5- Graphic.
6- A blend of physical and virtual environments. [1]

Classrooms

Figure 1. 27 Orman secondary school Desks are 60%of disks are broken and old, and no circulation in the class . "Researcher (2006)".

Figure 1. 28 General classroom at international School. " www.designshare.com".

Figure 1. 29 Teacher & students at Sadayah secondary school with old means of education. "Researcher (2006)".

Figure 1. 30 Langley Academy, Slough, United Kingdom classroom. "www.topboxdesign.com"

[1] Diane Brook-Head ELearning-Archdiocese of Sydney Catholic Education Office, (2009) Designing Learning Spaces for 21st Century Learners.

Egyptian school desks are broken and old. If the classroom has means of education like projector and laptops. It reflects that successful educational process. It proves why the students do not go to school.

1.4 Benchmark of Sustainability:

1.4.1 Sustainable Architecture

"Sustainable architecture is a general term that describes environmentally conscious design techniques in the field of architecture. Sustainable architecture is framed by the larger discussion of sustainability and the pressing economic and political issues of our world.

In the broad context, sustainable architecture seeks to minimize the negative environmental impact of buildings by enhancing efficiency and moderation in the use of materials, energy, and space development. Most simply, the idea of sustainability, or ecological design, is to ensure that our actions and decisions today do not inhibit the opportunities of future generations".[1] This term can be used to describe an energy and ecologically conscious approach to the design of the built environment.[2]

The good design means a design that is fit for purpose, sustainable, efficient, coherent, flexible, and responsive to context, good looking with a clear expression of the requirements of the brief, the research attempts to study how a good design can be achieved, and how the school efficient, that is through reviewing the research, which started in England.

1.4.2 CABE "Commission for Architecture and the Built Environment"

"CABE is a national body in UK, almost everything they do is local. They work on behalf of the public and they want to inspire public demand for good design, helping people (student & teachers) to shape the look and feel of places where they live and learn.

[1] Doerr Architecture, 2006, Definition of Sustainability and the Impacts of Buildings
[2] Sustainable Architecture and Simulation Modeling, Dublin Institute of Technology,

They have built a large, strong network of local design advisers, all leaders in their professions – architects, planners, engineers, landscape architects, urban designers and surveyors, who give advice that is specific to each place.

CABE provide expert independent design advice to improve the quality of what gets built in England. For over 80 years, UK governments of all persuasions have believed that it is essential to get independent advice on proposals for significant new buildings and spaces.

But CABE also has a wider role to champion and lead the public and professional debate about how to create great places".[1]

U.K Government is started to change old schools in England to be sustainable schools, Through CABE there measure the school efficiency, the new extension design for each school to be sustainable, the research will measure by 10 assessment criteria to get good sustainable design school.

1.4.3 LEED " Leadership in Energy and Environmental Design"

"LEED is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Developed by the U.S. Green Building Council (USGBC), LEED provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

LEED is flexible enough to apply to all building types – commercial as well as residential. It works throughout the building lifecycle – design and construction,

[1]John Sorrell CBE Chair, (2007), cabe, design champion, Avilable :www.cabe.org.uk (Accessed : 2008).e

operations and maintenance, tenant fit out, and significant retrofit. And LEED for Neighborhood Development extends the benefits of LEED beyond the building footprint into the neighborhood it serves". [1]

Studies to the sustainable Architectural designs.

- **Diagram 1. 2 Benchmark of sustainability.**

[1] http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988(Accessed : 2008).

1.5 Research Objective:

Transformation of traditional secondary schools to sustainable educational building.

The research is studying sustainability of Egyptian schools with the objective of providing; guidelines for architect designers and government officials, the development for current Egyptian Schools to become sustainable in the future.

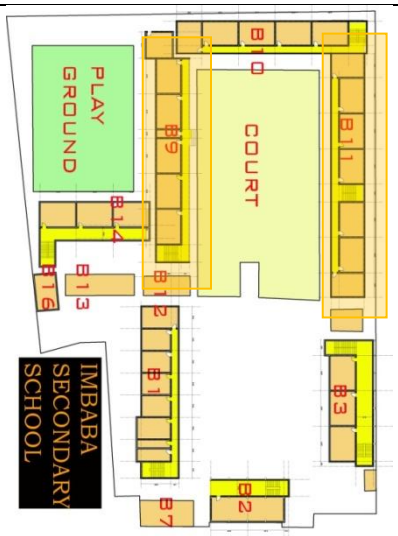


Figure 1. 31 Imbabh Secondary School current Ground floor plan. "Researcher (2008)".

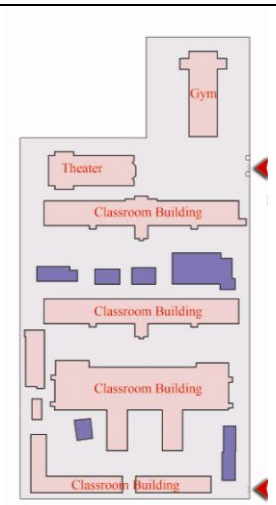


Figure 1. 32 Elsaedyah Secondary School current Ground floor plan. "Researcher (2008)".

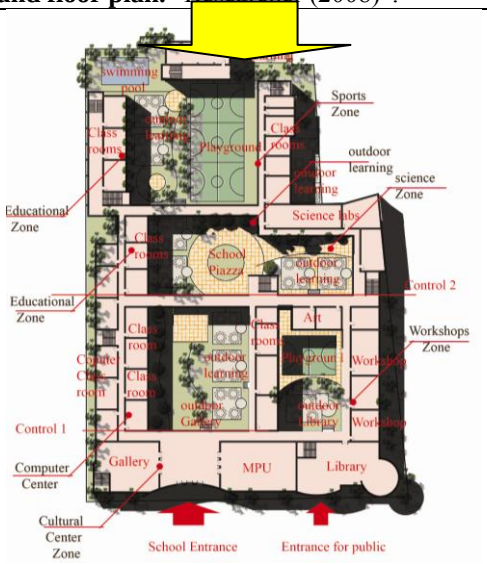


Figure 1. 33 Imbabh Sustainable School. "Researcher (2010)".

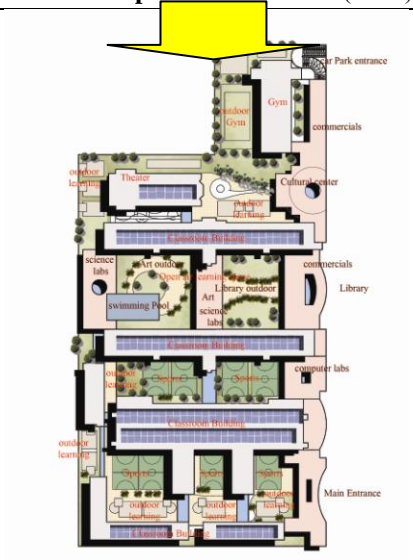


Figure 1. 34 Elsaedyah Sustainable School. "Researcher (2010)".

1.6 Content of Thesis

Part 1 Introduction

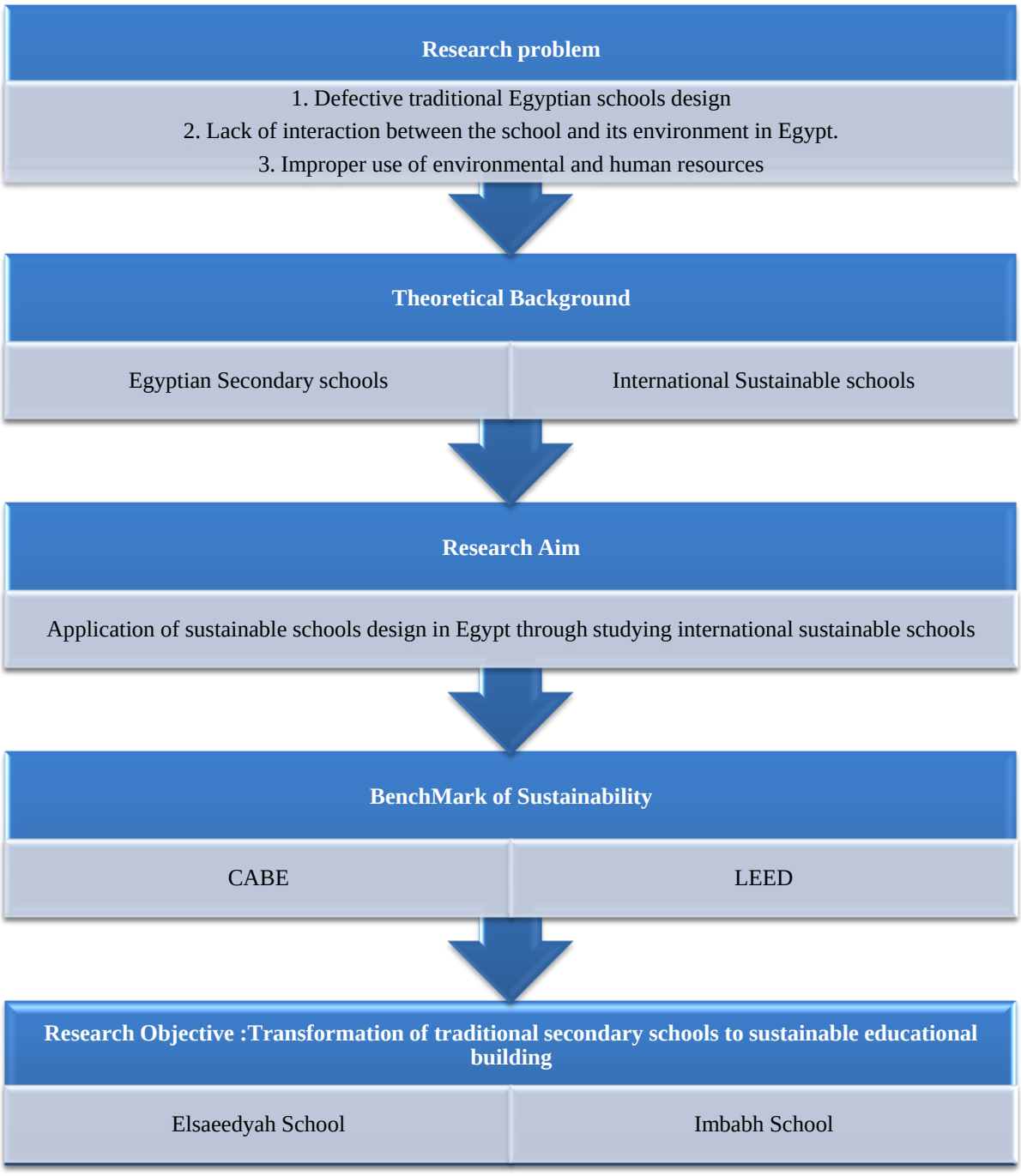


Diagram 1. 3 Part 1 Content of Thesis. "Researcher".

Part 2 Sustainable Architecture

Diagram 1. 4 Part 2 Sustainable Architecture. "Researcher".

Part 3 Benchmark of Sustainability

Diagram 1. 5 Part 3 Benchmark of sustainability. "Researcher".

The research will propose the sustainable school guide line to transform the secondary schools to be sustainable educational buildings based on CABE and LEED diractions.

Part 4 Case Studies

The research presents a review to previous analysis of three International Case Studies:

Stanley Park High School, Fossil Ridge High School and Newark Science Park High School are from the perspective of sustainable sustainability.

Two Local Examples ; Imbabah Secondary School and Elaeedyah Secondary School are used as an example of suggesting changes to help change these two schools into more sustainable facilities based on the understanding of the author.

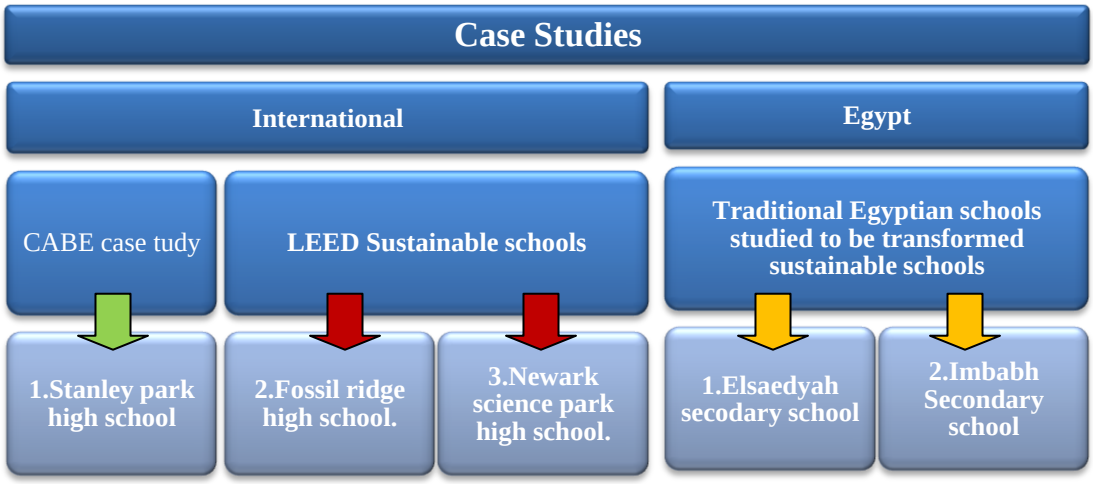


Diagram 1. 6 Case studies. "Researcher".

1.7 Content of Chapters:

Egyptians suffer in the current era from the local educational buildings in spite of the efforts exerted by the government in this field. The aspiration of our future generations cannot be achieved without advanced educational system and well designed educational buildings. The research covers the topic of sustainable educational buildings, since it is considered the new approach for school design. It is currently extending to the Middle East Zone as well as some international school facilities in Egypt. Sustainability is a global philosophy applied to all educational systems.

However, the most effective phase of the educational process lies in the secondary schools, so the research will address the secondary educational facilities. It is considered as the intermediate stage for the students after finishing the primary and preparatory schools and before they move on to the university education.

The thesis is divided into four main sections;

The First section covers observations to Egyptian schools, their problems and the deficiencies in the educational process in Egypt. Section two is addressee sustainable architecture, understanding sustainability and how it can be achieved in Egyptian schools. Section three is research framework to design sustainable educational buildings, the Architectural theoretical investigation to build schools to become sustainable buildings. Section four covers the case studies of some international schools and the transformation of Egyptian schools.

Chapter one: Introduction

It includes the thesis outline. The Egyptian secondary schools' problems are discussed in order to search for proper solutions for the current situation and high light some critical issue. The chapter includes the Research Question: why there is lack of the awareness for developing school performance criteria in Egypt, both public and/or private school systems, The Research introduces the example of: CABE & LEED which are two associations in the UK & the USA respectively concerned with developing performance criteria. A brief discussion to the research, the methodology and the thesis layout is presented.

Chapter Two: Sustainability in Architecture

It will include several definitions to Sustainable Architecture. What is the concept/meaning of sustainability? How is it already applied in the global educational buildings around the globe? How can we apply it in Egypt?

In this chapter presents the most known sustainability solutions to be applied practically on architectural design, through considering several aspects mainly: Renewable Energy, Social Sustainability, Sustainable Materials, Building Placement, Waste management and Water management.

Chapter Three: Design Criteria of Sustainable School

This chapter presents the new vision for schools after applying sustainability solutions and demonstrates how old schools become sustainable through easy & smart sustainable solutions.

The research will adopt "CABE Commission for Architecture and the Built Environment" & "LEED Leadership in Energy and Environmental Design" associations rating systems as guidelines in order to understand how to evaluate school buildings from a sustainable perespective.

Through these criteria, we can apply the sustainability solutions/ideas on schools.

Chapter Four: International schools case studies

This chapter includes an analysis to international sustainable schools. The selected examples fulfill certain objectives such as interaction with community, application of sustainable energy ideas.

Stanley Park High School, UK is an old school developed by CABE to become a sustainable faciities.

Fossil Ridge High School and Science Park High School, two new bilding designed under sustainable diraction located in the USA.The two schools are considered successful sustainable examples and certificated from LEED.

Chapter Five: Applying Sustainability in Egyptian Secondary School

In this chapter, the research will represent 2 case studies in Egypt; both governmental secondary schools.

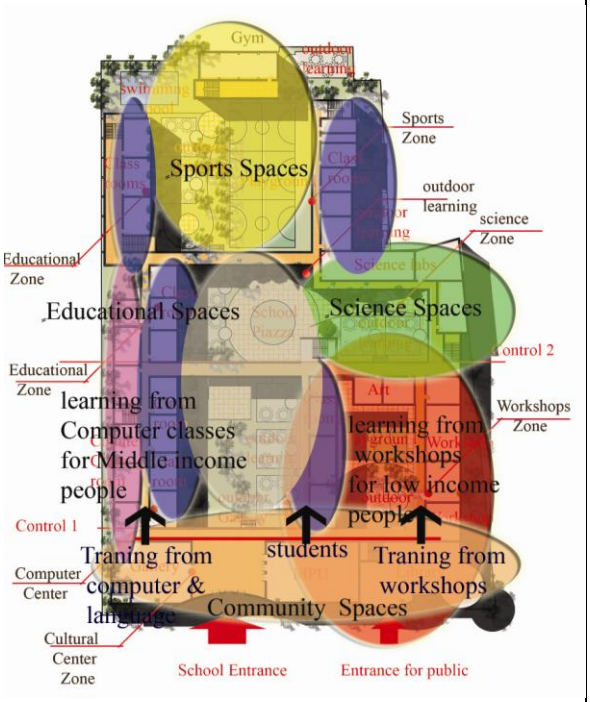
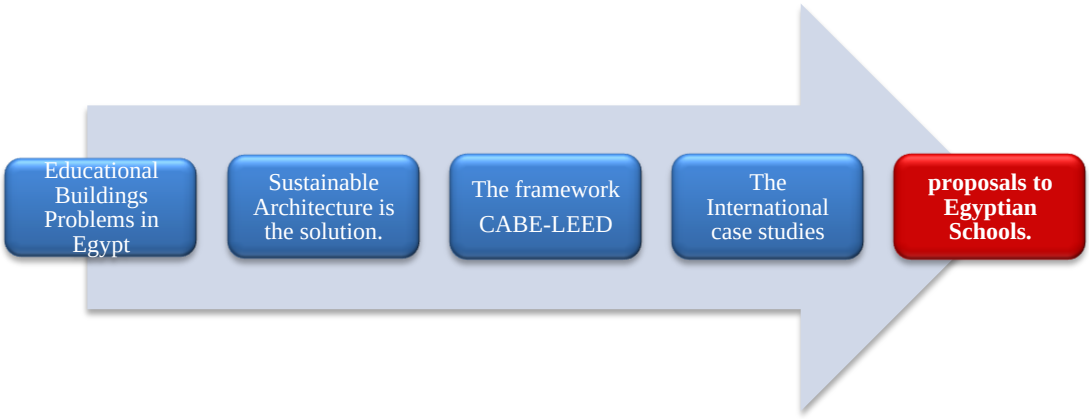
The First example is "El-Sayediyah Secondary School", in Giza governorate, the school is located in a good educational/cultural area, in the Cairo University neighborhood.

The Second example is: "Imbabah Secondary School" in Imbabah, Cairo, as Imbabah is considered one of the most crowded Egyptian districts.

Chapter Six: Conclusion

It includes conclusion of the research. It also introduces the recommendation to Egyptian secondary schools to change to sustainable educational buildings for a better future of schools and education in Egypt.

	Conclusion- Chapter 1	
Introduction		The importance of Egyptian education to youths at secondary education manifests itself in terms of the need to cultivate the youths of society into mature individuals. It is the time to develop the principles of life, make career decisions and begin the pursuit of one's goals at university.
Research problem		Egyptian Students leaves there school. 1. Defective traditional Egyptian schools design. 2. Lack of interaction between the school and it is environment in Egypt. 3. Improper use of environmental and human resources.
Theoretical Background	 The Egyptian school buildings.	 The international school buildings.
Benchmark	 CABE	 LEED

Fram	Application of sustainable schools design in Egypt, through studying international sustainable schools.
Objective	 
	Transformation of traditional secondary schools to sustainable educational building.
Content of Thesis	

Chapter Two

Sustainability in Architecture

Chapter Two: Sustainability in Architecture

2.1 Definition of Sustainability

2.2 Sustainable Design

2.2.1 Main Design principles

2.3 Sustainable in Energy

2.3.1 Renewable Energy

2.3.1.1 Renewable energy in Egypt

2.3.1.2 Solar Energy

2.3.1.2a Solar Electricity Panels

2.3.1.2b solar water heating

2.3.1.2c solar chimney

2.3.1.3 Wind Energy

2.3.1.4 Heat pumps

2.3.2 Heating, Ventilation & Cooling Systems Efficiency

2.3.3 A zero energy building (ZEB)

2.3.3.1 First Zero Energy School Richard Ville

2.4 Social Sustainability in Architecture

2.4.1 Case study for school with community

2.4.2 Case study for Social Spaces in the school

2.4.3 Case study- It is a museum and a school.

2.5 Sustainable Materials

2.5.1 Reduce, Reuse, Recycle

2.6 Waste management

2.7 Water Management

2.7.1 Rainwater management

2.7.1.1 Case study- sidwell friend's school

2.7.2 Cold Seawater Air Conditioning

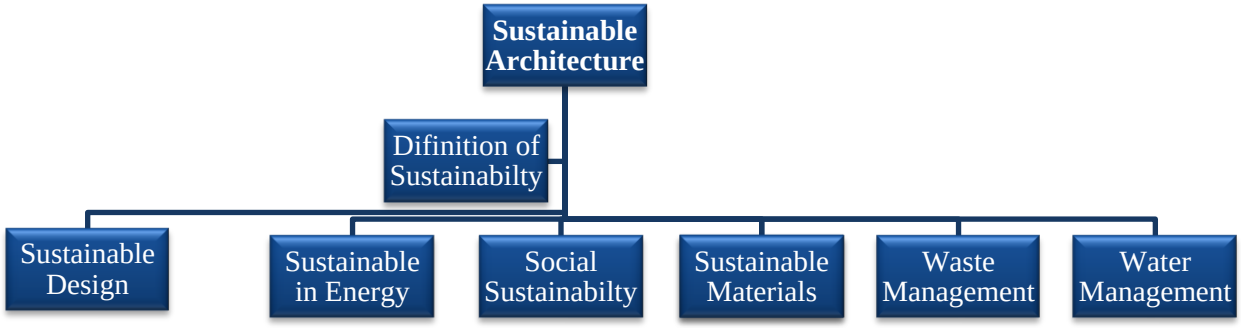


Diagram 2. 1 Sustainable Architecture

Sustainability in Architecture

2.1 Definition of Sustainability

The word sustainability is derived from the Latin sustainer (tenere, to hold; sus, up). Dictionaries provide more than ten meanings for sustain, the main ones being to "maintain", "support", or "endure".[1]

Sustainable Architecture

"First word is "**sustainability**" is a general agreement that the concept refers to the use of recycled materials, material that use resources efficiently, materials produced from renewable resources, and non-toxic materials. It also refers to the process of designing and building a process in which the component parts can be removed without destroying them for reuse"[2].

The second word is, "**architecture**", is building, which, by its very nature and by the feeling and emotions it evokes, is elevated to the realm of art addressing.

When the two words is a presence in our built environment, which stands as a work of art for many generations to enjoy, created in a way, which does not diminish the choices of "future generations"[3] .Sustainable building can be defined as those building that have minimum negative impact on natural and built environment.

What is Sustainability?

There are multiple ways to define sustainability, but all include a respect for the future. Schools, as stewards of our next generation, need to understand and embrace sustainability in order to help students build a healthy future for their communities and the planet. [4]

[1] Onions, Charles, T. (ed) (1964). The Shorter Oxford English Dictionary. Oxford: Clarendon Press. p. 2095.
[2] Doerr Architecture, Definition of Sustainability and the Impacts of Buildings.
[3] Fred Harris, the president of Harris Originals Inc, an Olympia firm, specializing in sustainable architecture
[4]Available :www.docstoc.com/docs/2280777/What-is-Sustainability(Accessed:2009)

Below are several different approaches to understanding sustainability:

- Since the 1980s sustainability has been used more in the sense of human sustainability on planet Earth and this has resulted in the most widely quoted definition of sustainability and sustainable development, that of the Brundtland[1] Commission of the United Nations on March 20, 1987. [2]

- "Sustainable development is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."[3]

- In (1992), in Rio de Janeiro, endorsed the Brundtland Commission's of sustainable development and popularized the term to an international audience of government leaders. [4]

Agenda 21: Agenda 21 is a program run by the United Nations (UN) related to sustainable development and was the planet's first summit to discuss global warming related issues. It is a comprehensive blueprint of action to be taken globally, nationally and locally by organizations of the UN, governments, and major groups in every area in which humans directly affect the environment.

The principles of sustainability were developed and approved in agenda 21.[5]

"Architecture presents a unique challenge in the field of sustainability. Construction projects typically consume large amounts of materials, produce tons of

[1] Gro Harlem Brundtland is a Norwegian politician, diplomat, and physician, and an international leader in sustainable development and public health.
[2] United Nations General Assembly, (1987), Report of the World Commission on Environment and Development: Our Common Future. It's transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment. It's retrieved on: (2009-02-15).
[3] United Nations General Assembly, (March 20, 1987), "Report of the World Commission on Environment and Development: Our Common Future; Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment; Our Common Future, Chapter 2: Towards Sustainable Development; Paragraph 1". United Nations General Assembly. http://www.un-documents.net/ocf-02.htm. It's Retrieved 1 March 2010.
[4] Markus J., Milne M.K., Kearins, K., & Walton, S. (2006). Creating Adventures in Wonderland: The Journey Metaphor and Environmental Sustainability.
[5] Agenda 21 is a program run by the United Nations (UN) related to sustainable development and was the planet's first summit to discuss global warming related issues. It is a comprehensive blueprint of action to be taken globally, nationally and locally by organizations of the UN, governments, and major groups in every area in which humans directly affect the environment.

waste, and even involve preservation of existing buildings that have historical significance against the desire for the development of newer, more modern designs".

- In Australian Government Publishing Service, Canberra, Dec. 1992

"Ecologically sustainable development means using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life now and in the future can be increased" .[1]

- "In (1994), the charter of European cities for sustainable development is for monitoring the achievements of local agenda 21.

- In (1996), the conference of sustainable European cities was organized at Lisbon[2], and different countries declared their principles and strategies of work and started the sustainable development.

- In (1997), was known as the Kyoto Climate Agreement to protect the earth's atmosphere and climate.

- In (2000), Hanover Expo is addressing humankind, nature, and technology raising the issue: How different countries understand and implement the principles of sustainable architecture." [3]

- "The Earth Charter"[4] speaks of "a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace."[5]To add complication the word sustainability is applied to not only human sustainability on Earth, but too many situations and contexts over many scales of space and time, from small local ones to the global balance of production and consumption

[1] National Strategy for Ecologically Sustainable Development- Available :www.docstoc.com/docs/2280777/What-is-Sustainability.(Accessed :2007)
[2]Lisbon is the capital and largest city of Portugal.
[3] Master thesis -Cairo university- contemporary environmental architecture-chapter 2-page91
[4] The Earth Charter is an international declaration of fundamental values and principles considered useful by its supporters for building a just, sustainable, and peaceful global society in the 21st century.
[5] The Earth Charter Initiative (2000). "The Earth Charter." Retrieved on: 2009-04-05.

- In (2005), World Summit it was noted that this requires the reconciliation of environmental, social and economic demands –the "three pillars" of sustainability.[1]

- In (2005), the Forum for the Future in Bahrain (Forum for the Future is a British non-profit organization with a mission to promote sustainable development).[2]

- "A dynamic process, which enables all people to realize their potential and improve their quality of life in ways which simultaneously protect and enhance the Earth's life support systems".[3]

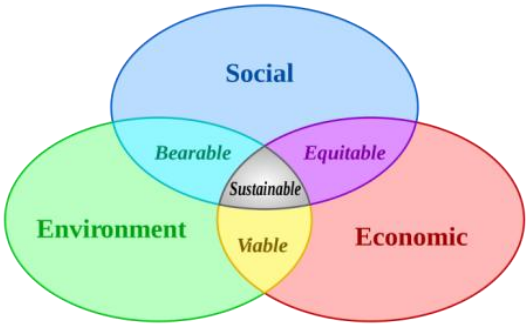


Diagram 2. 2 Definitions of sustainability often refer to the "three pillars" of social, environmental and economic sustainability. "www.wikipedia.org"

The UN definition is not universally accepted and has undergone various interpretations.[4] For many environmentalists the idea of sustainable development is an oxymoron as development seems to entail environmental degradation. [5] Ecological economist Herman Daly[6] has asked, "What use is a saw mill without a forest?" From this perspective, the economy is a subsystem of human society, which is itself a

[1] United Nations General Assembly, (2005). 2005 World Summit Outcome, Resolution A/60/1, adopted by the General Assembly on 15 September, (2005). Retrieved on: 2009-02-17.
[2] United Nations General Assembly, (2005). 2005 World Summit Outcome, Resolution A/60/1, adopted by the General Assembly on 15 September (2005) Retrieved on: 2009-02-17.
[3] Forum for the Future, UK

[4] International Institute for Sustainable Development (2009). What is Sustainable Development?. Retrieved on: 2009-02-18.]
[5] Holling, C. S. (2000). "Theories for Sustainable Futures" Conservation Ecology 4(2): 7. Retrieved on: 2009-02-24.
[6] Herman Daly (born 1938) is an American ecological economist and professor at the School of Public Policy of University of Maryland, College Park in the United States.Ott, K. (2003). "The Case for Strong Sustainability." In: Ott, K. & P. Thapa (eds.) (2003).Greifswald's Environmental Ethics. Greifswald: Steinbecker Verlag Ulrich Rose. ISBN 3931483320. Retrieved on: 2009-02-16.

subsystem of the biosphere and again in one sector is a loss from another.[1] This can be illustrated as three concentric circles.[2]

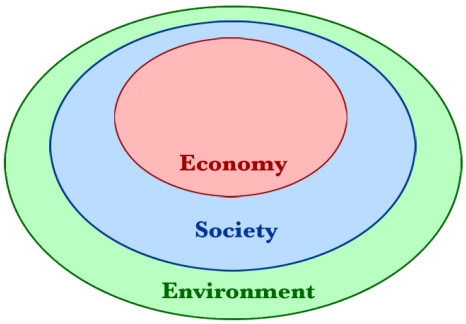


Diagram 2. 3 Definitions of sustainability often refer to the "three pillars" of social, environmental and economic sustainability. "www.wikipedia.org"

A universally accepted definition of sustainability is elusive because it is expected to achieve many things. On the one hand it needs to be factual and scientific, a clear statement of a specific "destination".

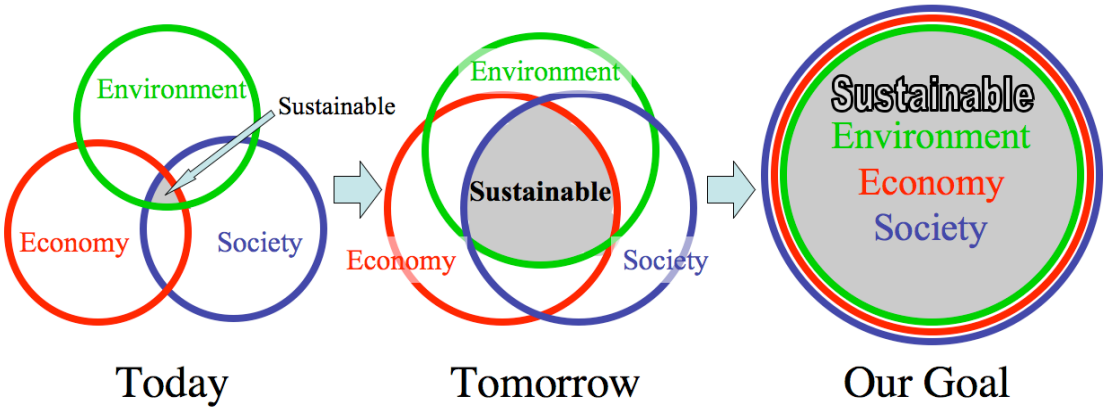


Diagram 2. 4 The Triple Bottom Line" www.sustainableschools.org"

The simple definition "Sustainability is improving the quality of human life while living within the carrying capacity of supporting eco-systems".[3] Though vague, conveys the idea of sustainability having quantifiable limits. However, sustainability

[1] Porritt, J. (2006). Capitalism as if the world mattered. London: Earthscan. p. 46.
[2] Redclift, M. (2005). "Sustainable Development (1987–2005): an Oxymoron Comes of Age." Sustainable Development
[3] IUCN/UNEP/WWF (1991). "Caring for the Earth: A Strategy for Sustainable Living." Gland, Switzerland. Retrieved on: 2009-03-29.

is also a call to action, a task in progress or "journey" and therefore a political process, so some definitions set out common goals and values.[1]

The Earth Charter speaks of "a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace." [2]

To add complication the word sustainability is applied to not only human sustainability on Earth, but too many situations and contexts over many scales of space and time, from small local ones to the global balance of production and consumption.

For all reasons sustainability is perceived, at one extreme, as nothing more than a feel-good buzzword with little meaning or substance but, at the other, as an important but unfocused concept like "liberty" or "justice". It has also been described as a "dialogue of values that defies consensual definition".[3]

2.2 Sustainable Design

1. "Sustainable school design is applied good sense, an aspiration to build to the highest quality and functional standard now and in the future. The maximum environmental and social benefit and with cost assessments that reflect the whole building life cycle such that investment can be properly maintained".[4]

2. Achieving sustainability requires us to live within the limits of the earth's capacity providing the materials for our activities and to absorb the waste and pollution that our activities generate.

3. Sustainable school design means applying a set of design parameters which have often had insufficient attention in the past:

[1] Markus J., Milne M.K., Kearins, K., & Walton, S. (2006). Creating Adventures in Wonderland: The Journey Metaphor and Environmental Sustainability. Organization 13(6): 801-839. Retrieved on 2009-09-23.
[2] Markus J., Milne M.K., Kearins, K., & Walton, S. (2006). Creating Adventures in Wonderland: The Journey Metaphor and Environmental Sustainability. Organization 13(6): 801-839. Retrieved on 2009-09-23.
[3] Marshall, J.D. & Toffel, M.W. (2005). "Framing the Elusive Concept of Sustainability: A Sustainability Hierarchy." Environmental & Scientific Technology 39(3): 673–682.

[4] Gaia Research, (2004), A Client's Guide to Sustainable Schools, Glossary available at www.gaiagroup.org/research/glossary

- The functional requirements are needed now and in the future.

- The user needs and aspirations, resource consumption, material sourcing, location and access, impacts on stakeholders including building users and the local community, life cycle operation and costs, maintainability, building life and end-of-life, pollution, waste, biodiversity and health.

4. The process of procurement, design, tendering, construction and handover is a vitally important aspect of delivering buildings that can be sustained.

- There are many school buildings that suffer from a failure to think through design consequences in cost and management terms. [1]

5. The intended outcome is buildings that:

- "Minimize adverse social, environmental and economic impacts by being efficient to operate, effective in their use of resources, minimizing waste & pollution and protecting occupant health and the wider environment during construction, operation, re-use and at the end of their useful life". [2]

- "Enhance positive social and economic impacts by providing an environment that is fit for purpose, more responsive to individual, business and community needs and aspirations, more flexible and functional, maintainable and cheaper to run, and more respectful of the environment on which we all ultimately depend". [3]

[1] Sustainable Construction CPD – Module 9 Site Issues & Construction Processes Gaia Research 2002.
[2] Richard Feilden OBE, (2007),CABE Commissioner , Client Guide Achieving well designed schools through PFI-cabe.Available: http://webarchive.nationalarchives.gov.uk/20110118095356/ Available: http://www.cabe.org.uk/files/achieving-well-designed-schools-through-pfi.pdf, page 8, (Accessed: 2007,February 20).
[3] Richard Feilden OBE, (2007),CABE Commissioner , Client Guide Achieving well designed schools through PFI-cabe.Available: http://webarchive.nationalarchives.gov.uk/20110118095356/http://www.cabe.org.uk/files/achieving-well-designed-schools-through-pfi.pdf, page 8, (Accessed: 2007,February 20).

2.2.1 Main Design Principles

This simple list of 10 indicators helps identify a well designed school and forms a valuable checklist when measuring design quality. It is recognized that they do not in themselves lead to good design, which is a combination of skills and inspiration.[1]

1. Clear Organization**,** an easily legible plan, fully accessible.

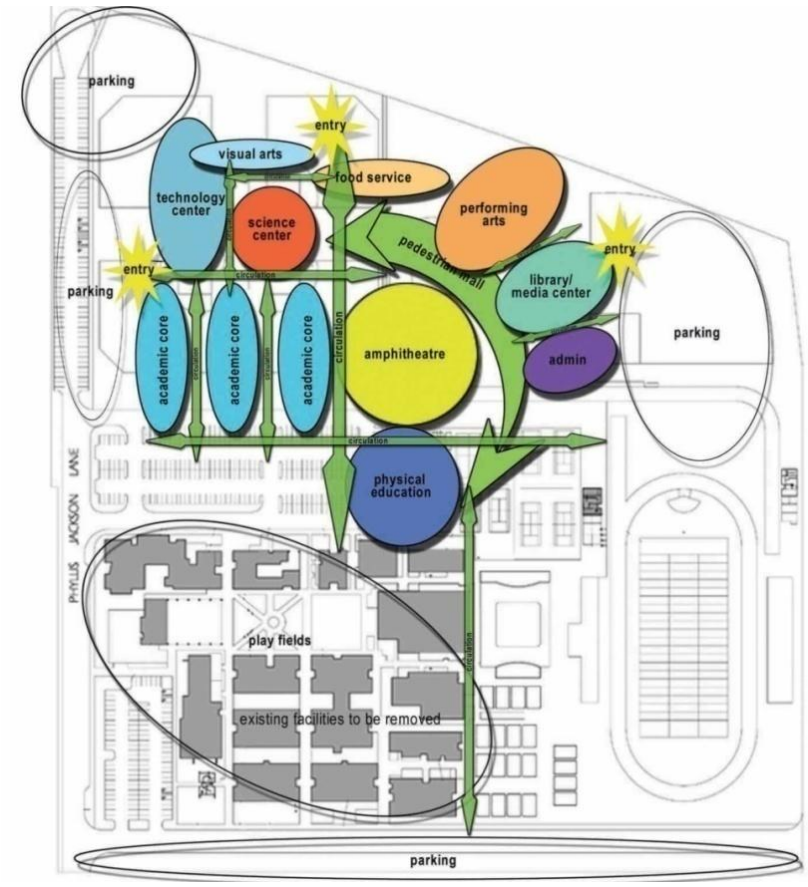


Figure 2. 1 Good clear organization for the schools. "www.images.google.com/imghp".

2. Spaces are well-proportioned, efficient, fit for purpose and meet the needs of the curriculum.

The types of Spaces, for secondary schools include, but are not limited to:

[1]Richard Feilden OBE, (2007) CABE Commissioner, and Client Guide Achieving well designed schools through PFI-cabe.Available: http://webarchive.nationalarchives.gov.uk/20110118095356/http://www.cabe.org.uk/files/achieving-well-designed-schools-through-pfi.pdf, page 8, (Accessed: 2007, February 20).

- Administrative Offices.
- Auditorium/Performing Arts.
- Art Facilities.
- Cafeteria in secondary schools, the cafeteria often doubles as the auditorium.
- Classroom.
- Common areas/courtyards.
- Gymnasium.
- Health Services.
- Lobby Schools often showcase team trophies in the foyer.
- Media Center Schools are changing traditional libraries into media centers, adapting to new technology, as well as to other issues such as comfort, flexibility, and maximum use of space.
- Multipurpose Rooms
- Music Education
- Restrooms
- Science Facilities
- Swimming Facilities.[1]

Figure 2. 2 Computer Lab space Wide space without columns and the teacher in the central point. "www. Cabe.org.uk".

Figure 2. 3 A chemistry lab/classroom "www.insideoutarch.com".

Figure 2. 4 Workshop is at Lick-Wilmerding High school. Wide structural span is making the space has different types of machines. "Sustainable school book". [2]

The design of Classrooms is suited to teaching which is:

1.Teacher is centric and designed for a "single to many " communication style.

[1]Available: www.wbdg.org/design/secondary.php (Accessed:2008)
[2] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

2. Focused on the individual and does not promote collaboration and communication between students.

3. Using digital resources, lacks adequate network connectivity, and power infrastructure.

The classroom to enable change in teaching we need to change from the "classrooms" of the past to learning spaces for 21st century learners.

Placing the student at the heart of the design means, we need to understand learning

Spaces to accommodate a new generation who[1]:

1. Prefer multitasking and quick, non linear access to information
2. Are visually- oriented?
3. Are highly networked, interactive and social Increasingly mobile.
4. Have a low tolerance for lecture style teaching.
5. Prefer active learning rather than passive learning.
6. Rely heavily on communications technologies to access information to carry out social and professional interactions. For classroom meet, the needs of learners we need to move to contemporary learning strategies, which provide students with opportunities to be collaborative, connected and creative.

3. Circulation is well organized, and sufficiently generous.

to foster students' sense of community and individuality:

- Cluster classrooms around common areas.
- Connect spaces visually with colors and patterns.
- Provide platform spaces for gathering, sitting, and presenting and alcoves for reading and studying.
- Decentralize administrative spaces to encourage active leadership and maximize interaction with students.
- Provide a "home base" for each student and teacher.

[1] Prensky, (2001), Oblinger 2003.

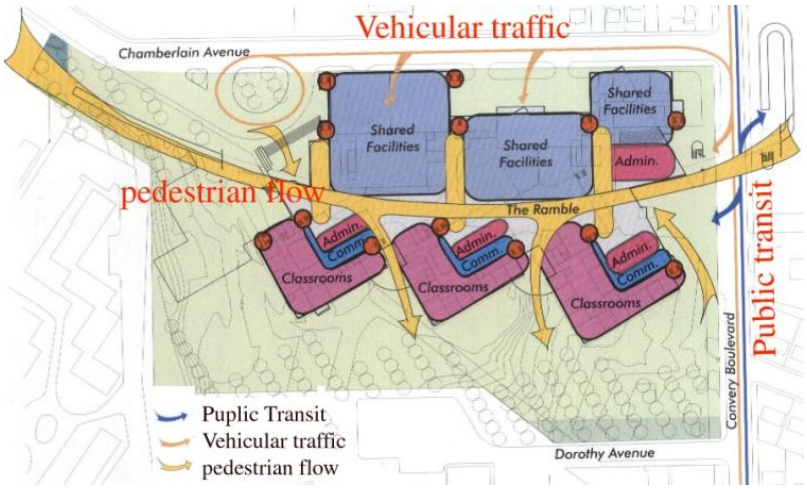


Figure 2. 5 The Perth Amboy High School concept design in Competition –the design concept for the main circulation and the access points to the school. "Educational Facilities Book"[1].

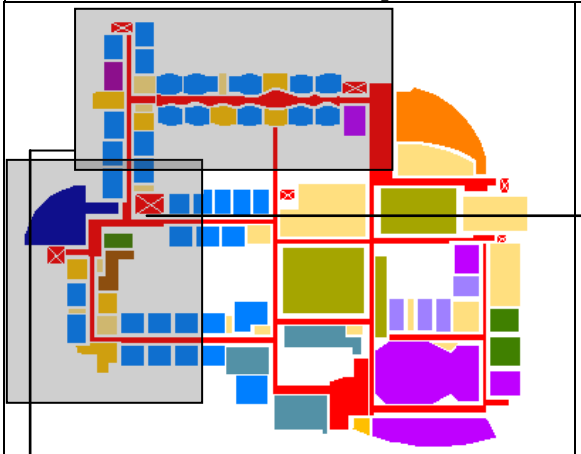


Figure 2. 6 The internal circulation and space zoning is at Saxe school. "Available: www.designshare.com (Accessed 2009)".

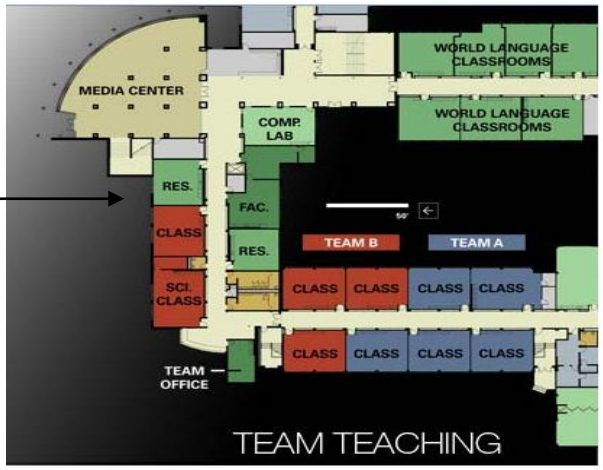


Figure 2. 7 Classrooms Zone Bellow up. "Available: www.designshare.com (Accessed 2009)".

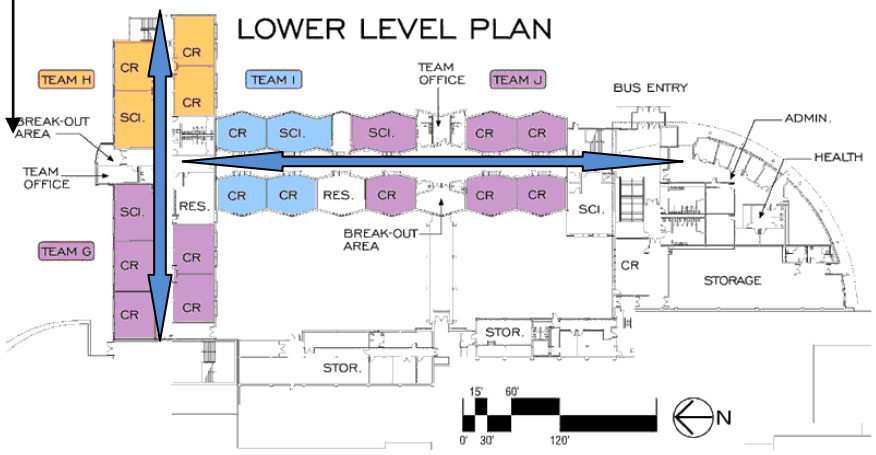


Figure 2. 8 Ground Floor Plan- Saxe School. "Available: www.designshare.com (Accessed 2009)".

[1] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com

4.Good environmental conditions throughout, it is including appropriate levels of natural light, ventilation, wind and rain water collection.

Provide an interior environment that is visually comfortable and stimulating by providing ample natural light and incorporating colors that stimulate or soothe, depending on the space function. Design for diffuse, uniform daylight throughout classrooms. Avoid glare and direct-beam sunlight. Use day lighting analysis tools to model the interaction of lighting and materials that reflect or absorb light.

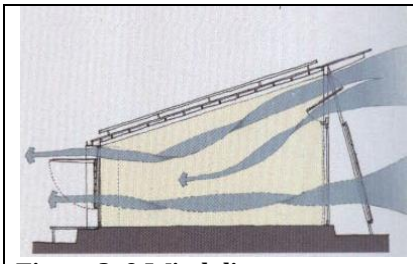


Figure 2. 9 Wind diagram at classrooms and educational spaces at the school:
Building section encourages air flow.Operable apertures allow for multiple configurations.
"Reference: Educational facilities book[1]"

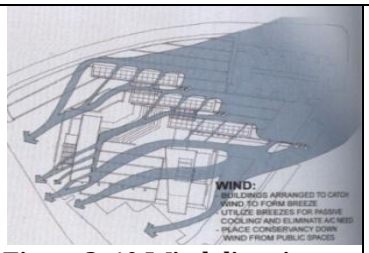


Figure 2. 10 Wind directions:
Buildings arranged to catch wind to form breeze. Utilize breezes for passive cooling and eliminate A/C need.
Place conservancy downwind from public spaces. "Reference: Educational facilities book[2]".

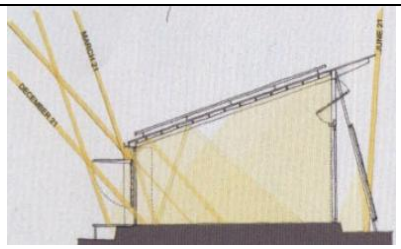


Figure 2. 11 Sun diagram:
Lines indirect sun angle at noon. Light shelf and shading devices area used to control direct sun and encourage day lighting of the classrooms.
"Reference: Educational facilities book[3]".

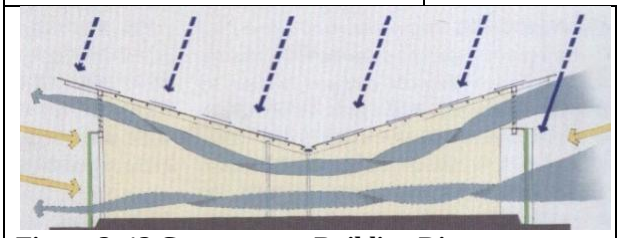


Figure 2. 12 Conservancy Building Diagram.
Sun- Green vine walls are grown to the east and west to control sun.
Wind- vine walls allow filtered breeze from the northeast.
Rain- butterfly roof shape collects water in central gutter and water is used locally for irrigation and bathroom needs. "Reference: Educational facilities book".

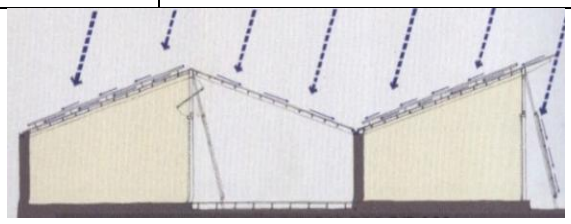


Figure 2. 13 Rain water collation diagram. Collect and reduce runoff. Treat black/gray water at wetlands.
Use collected water for irrigation and low flush toilets. "Reference: Educational facilities book". [4]

[1] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. page 119 http://www.archiworld-pa.com
[2] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. . page 119 http://www.archiworld-pa.com
[3] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. . page 119 http://www.archiworld-pa.com
[4] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com

5. Attractiveness in design is comparable to that found in other quality public buildings, to inspire pupils, staff and parents.

Aesthetics: The importance of the physical appearance of a public school should not be minimized. A school building that is attractive and responds to and is consistent with the design and context of the neighborhood, builds a sense of pride and ownership among students, teachers, and the community. The exterior should complement the neighborhood and reflect the community's values. The interior should enhance the learning process.

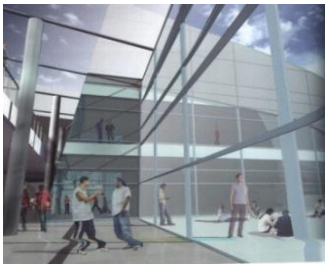


Figure 2. 14 Attractiveness in design is found in the educational spaces to inspire pupils in the school. This design is for John Ronan. "Reference: Educational facilities book".[1]

6.Good use of the site and public presence is as a civic building wherever possible to engender local pride.

Figure 2. 15 The ethos of the Bromley Garden Project helped students and staff to develop their schools and to feed this information and ideas into wider discussions on sustainability in education. "Available: www.teachernet.gov.uk (Accessed: 2010)".

7. Attractive external spaces with a good relationship to internal spaces and offering appropriate security and a variety of different settings.

Interior and Exterior Vistas: Given that so much of learning in school happens in enclosed places, there is great benefit to expanding a student's horizons (literally) by creating visible lines of sight that extend as far as possible outside the room.

[1] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com

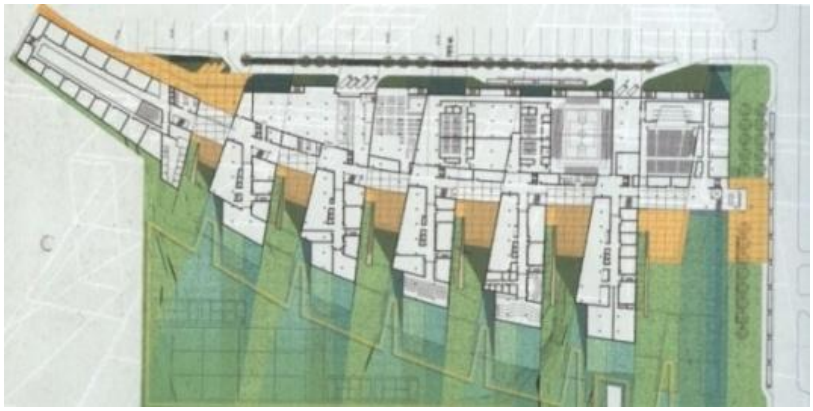


Figure 2. 16 Internal Educational spaces with external attractive spaces are offering appropriate security and a variety of different settings. Design for John Ronan. "Educational facilities book". [1]

Good internal educational space is connected with classrooms. "Educational facilities book". [2]

8. A layout that encourages broad community access and use out of hours, where appropriate.

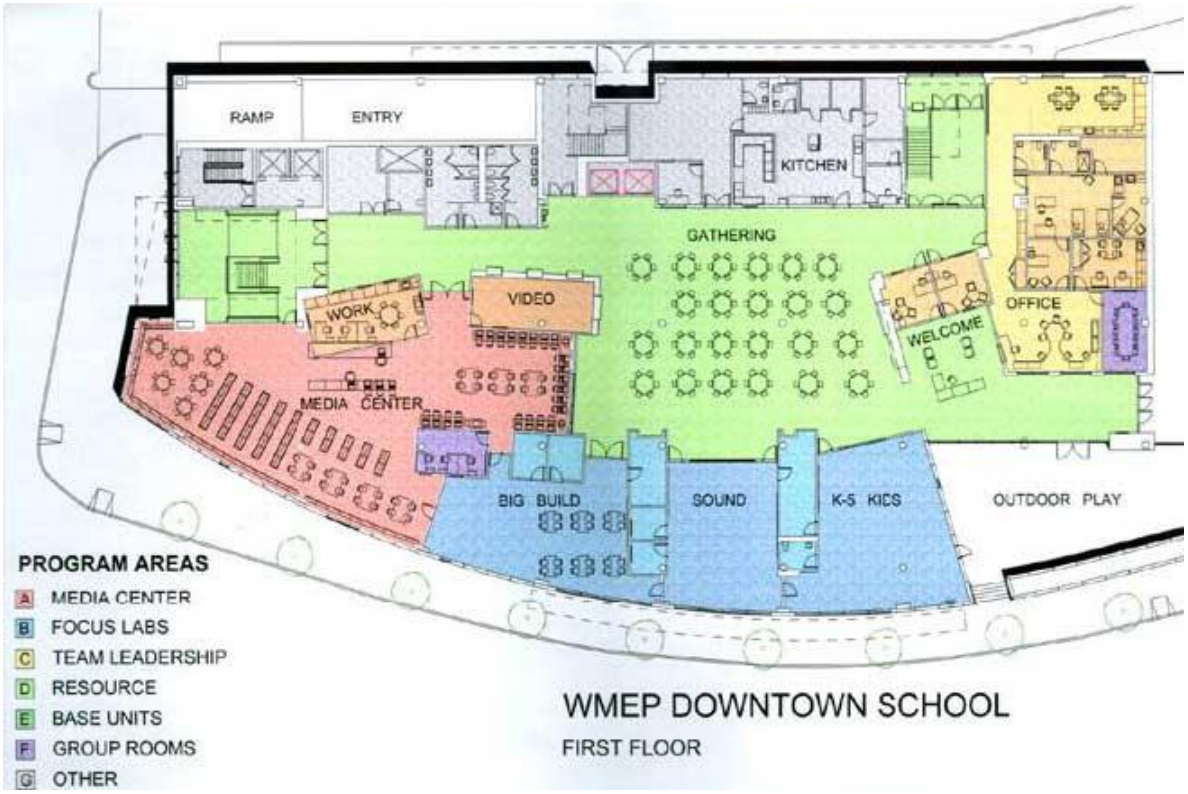


Figure 2. 17 WMEP Interdistrict Downtown school is shared spaces between the community and the school are at the main street and the gathering spaces are in the middle of school building. "Available: http://archrecord.construction.com/projects/bts/archives/K-12/04_WMEP/photos.asp, (Accessed:2010)".

[1] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com
[2] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com

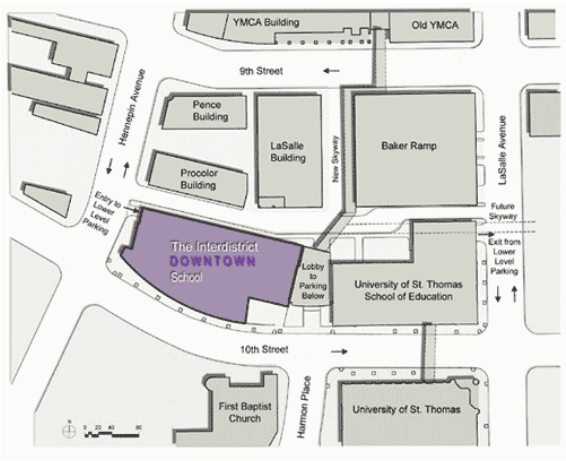


Figure 2. 18 WMEP school General Layout. "Available:http://archrecord.construction.com/projects/bts/archives/K-12/04_WMEP/images/a_lg.gif (Accessed: 2010)."

Figure 2. 19 Main Elevation. "Available:http://archrecord.construction.com/projects/bts/archives/K-12/04_WMEP/images/2_lg.jpg (Accessed:2010)."

Building Placement

"Where the school building is placed can have a great influence on the effectiveness of passive design strategies, particularly as they relate to solar radiation and wind. In southern climates, buildings should be oriented to minimize the sun's radiation on the structure and to maximize the potential for cooling breezes.

Effective passive design is possible; however, compromises are often required regarding sun and wind orientation strategies. In low structures such as homes, wind orientation is not as important as avoiding solar radiation.

Air flow through a building is more dependent upon the use of windbreaks and the proper location of window and door openings than the buildings orientation.

All buildings, no matter what climate, perform better if the longest wall faces the south."[1]

Site Analysis: Any site analysis should begin with the identification of the prominent features such as existing vegetation and topography. Preservation of the sites natural features can result in cost savings associated with:

[1] http://www.cce.ufl.edu/current/green_building/site.html

1. Reduced landscaping cost
2. Energy conservation from shading
3. Reduced water use (Xeriscaping)

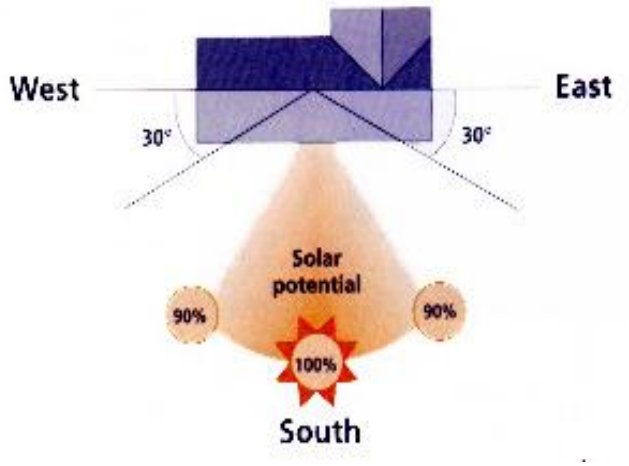
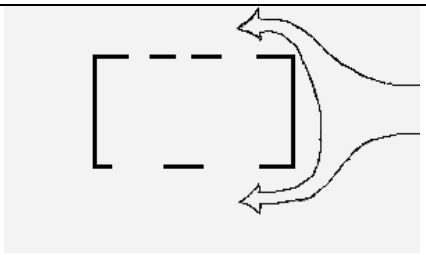
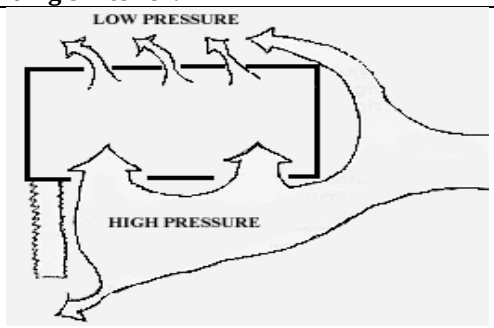


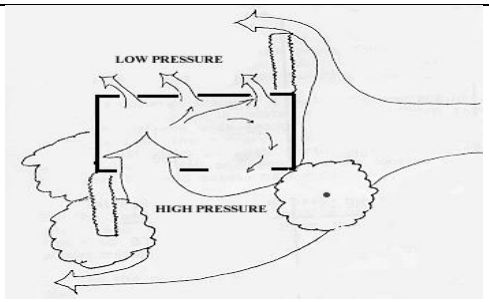
Figure 2. 20
The rule for ventilation with regards to building orientation is that air flow is often better captured when the school is placed off the cardinal (north-south) directions by approximately 30 degrees. "Available: http://www.cce.ufl.edu/current/green_building/site.htm(Accessed:2011)."



Palm trees are good choices for landscaping next to building, because their canopy provides shade but they do not block the natural airflow near the ground. Trees can also be planted to either create windbreaks or to channel the wind into a building. Windbreak plantings diminish wind within a distance three times their height. Vegetation can be a valuable tool used to direct and a PCCElerate natural breezes into a building's interior.



Effects of a vegetation less landscape on the natural ventilation of a residence.



Effects of medium to high hedges in aiding to direct breezes through a home.

9. Robust materials that are attractive, that will weather and wear well and that are environmentally friendly.

Figure 2. 21 Willow school master plan addressed site issues including woodlands, wetlands, setbacks and circulation. "Sustainable School Book". [1]

Figure 2. 22 The school building echoes the site's existing agrarian structures. The willow school was carefully designed to harmonize with its woodland setting. "Sustainable School,". [2]

10. Flexible design that will facilitate changes in the curriculum and technology

and which allows expansion or contraction in the future where appropriate.

To ensure flexibility and adaptability for changing programs and enrollments:

- Use operable walls to increase the efficiency of large, multipurpose spaces, such as the cafeteria and gymnasium.
- Accommodate technology upgrades.
- Allow classrooms to change with the activity and group size. This is particularly important in primary schools, where students typically stay in one room with one teacher throughout much of the day.[3]

Figure 2.23 Newberg High School Addition/Renovation Newberg, Oregon
Sustainable features in this flexible, multi-use Student Commons area include ample daylighting, natural ventilation, recycled materials, and exterior sunshades. Available: http://www.wbdg.org/design/secondary.php

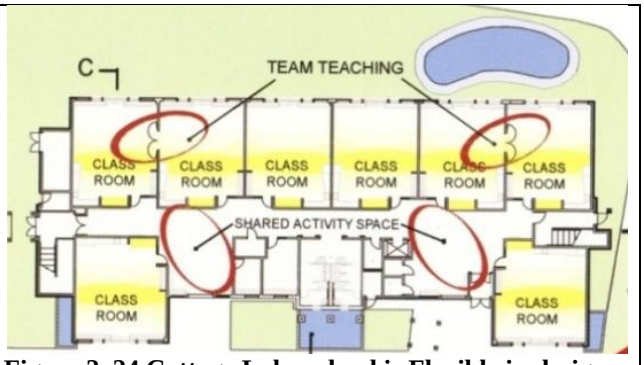


Figure 2. 24 Cottage Lake school is Flexible in design and you can open two classrooms to be one Educational space. "Sustainable school book". 4

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group, p.225.
[2] Alan ford, (2007), Desining the Sustainable School: The Images publishing group, P.225.
[3] www.wbdg.org/design/secondary.php
[4] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

2.3 Sustainable in Energy

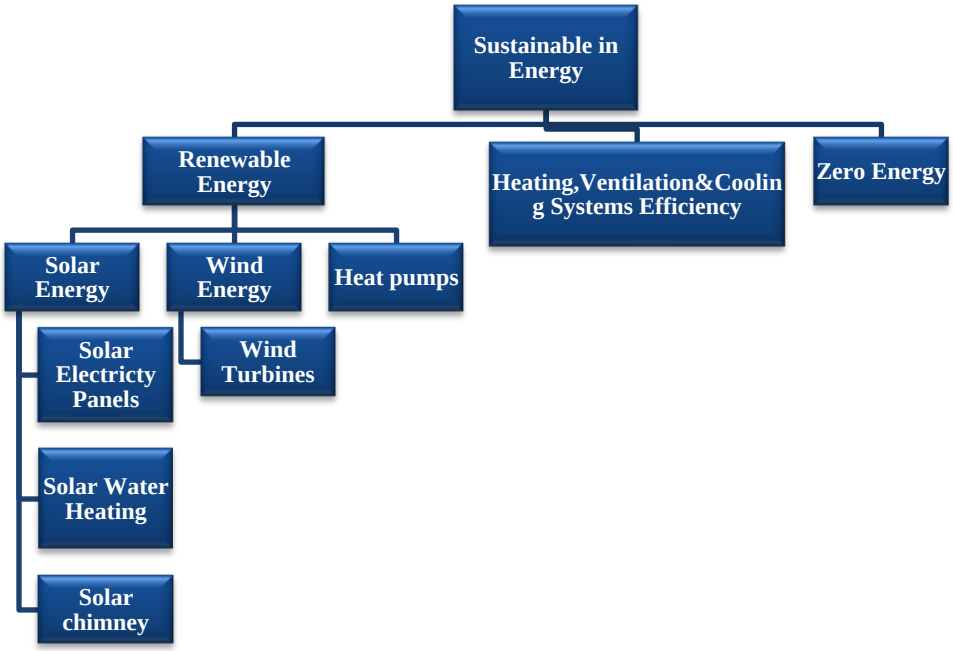


Diagram 2. 5 Sustainable in Energy. "Researcher".

Energy efficiency over the entire life cycle of a school building is the single most important goal of sustainable architecture school. Designers for schools should use many different techniques to reduce the energy needs of school buildings and increase their ability to capture or generate their own energy. [1]

2.3.1 Renewable Energy

Renewable energy is energy which comes from natural resources such as sunlight, wind, rain, ocean, hydropower, tides, and geothermal heat, which are renewable (naturally replenished).[2] Many renewable energy projects are large-scale, renewable technologies are also suited to rural and remote areas, where energy is often crucial in human development.[3]

[1] Baden, S., et al., "Hurdling Financial Barriers to Lower Energy Buildings: Experiences from the USA and Europe on Financial Incentives and Monetizing Building Energy Savings in Private Investment Decisions." Proceedings of 2006 ACEEE Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Washington DC, August 2006.
[2] REN21 (2010). Renewables 2010 Global Status Report p. 15-16.
[3] www.wikipedia.org/wiki/Sustainable_architecture#cite_note-18

Egyptian government needs to start applying the renewable energy in the future buildings especially at schools buildings, that's to face the Climate change concerns, coupled with high oil prices. The governments at the entire world are driving increasing renewable energy legislation, incentives and commercialization.[1] Most of the government spending, regulation and policies helped the industry weather the 2009 economic crisis better than many other sectors.[2]

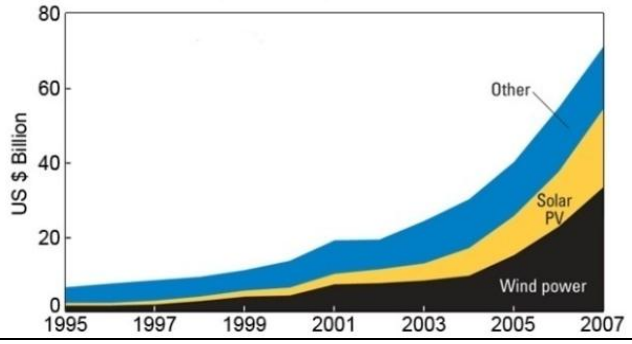


Figure 2. 25 Global renewable energy investment growth is increased at USA from year 1995to2007.

The USA government encourages the designers to use the renewable energy and increase the investment to the renewable energy from $5 Billion at 1995 to be $70 billion at 2007.[3]

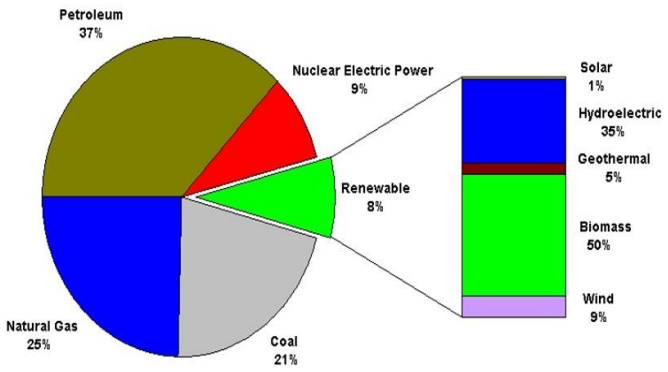


Figure 2. 26 Renewable Energy Consumption in the Nation's Energy Supply, 20094.(Available: www.eia.doe.gov(Accessed :2008)

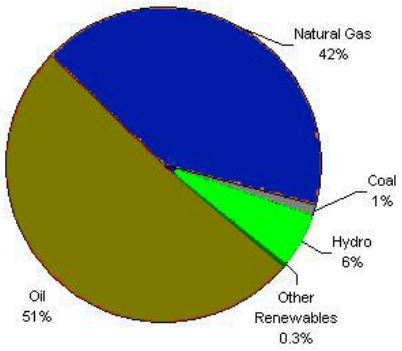


Figure 2. 27 Total Energy consumption in Egypt, by type (2007) (Available: www.eia.doe.gov (Accessed :2008)

The Renewable Energy Consumption in The Nation's Energy Supply= 8% Egypt = 0.3%

[1] United Nations Environment Programmer Global Trends in Sustainable Energy Investment 2007: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency in OECD and Developing Countries (PDF), p. 3.
[2] Clean Edge (2009). Clean Energy Trends 2009 pp. 1-4.
[3] http://en.wikipedia.org/wiki/Energy_policy_of_the_United_States (Accessed:2010).
[4] http://www.eia.doe.gov/cneaf/alternate/page/renew_energy_consump/rea_prereport.html

2.3.1.1 Renewable Energy in Egypt

Egypt plans to use $300 million in concessional financing from the fund, blended with financing from the World Bank Group, private sector and other sources to spur wind power development and introduce clean transport options - enabling the country to meet its target of 20 % of energy from renewable sources by 2020.

Electricity and transport contribute over 70 % of the greenhouse gas emissions in the country. However, Egypt considered a leader in the region on renewable energy and energy efficiency, hopes to change that scenario by realizing a 7200 MW wind power capacity by 2020, cutting vehicle emissions in heavily populated regions through improved public transportation systems and making industry more energy efficient.

Egypt is also a participant in a proposed CTF[1] co-financed regional program to scale up concentrating solar power plants in the Middle East and North Africa (MENA).

Figure 2. 28Egypt night lighting, population almost completely concentrated along the Nile Valley, just a small percentage of the country's land area. "Available: www.earthobservatory.nasa.gov(Accessed :2010)".

From a global perspective, it is critical that the best solar resources are used for solar scale-up and MENA region offers this opportunity, says Jonathan Walters[2]. Egypt is piloting a small scale concentrating power plant with support from the Global Environment Facility and Japan Bank for International Cooperation. So, Egyptian government will use the renewable Energy, the renewable energy can be use at Egyptian schools.

Sun in Egypt:

The sun radiation in Egypt is about 2300-4000 hour /year. The renewable energy in Egypt will be 20% of electricity will be from new recourses and renewable. The direct sun radiation in Egypt is 1970 kilo-watt/hour for each 1 m2 at north direction and

[1] Clean technology fund.
[2] Transport and energy manager for the World Bank's Middle East and North Africa region

2600 kilo-watt for each 1 m2 at South direction. The sun radiation at Egypt is between 9-11 hour /Day all the year. The Money value to product 1 kilo-watt from photo voltaic ceils is same value from the traditional ways.

Wind Energy:

Since the 1980s, a series of large-scale grid connected wind energy projects have been planned and implemented in Egypt. In 2009, 65 MW of wind power was added, bringing the total installed wind capacity to 430 MW at the end of 2009. The atlas indicates that large regions of the eastern and western deserts of the Nile River and parts of Sinai have average annual wind speeds of 7-8 m/s. [1]

An Excellent Wind Resource in Egypt

Egypt enjoys an excellent wind system, particularly in the Gulf of Suez, where average wind speeds reach 10 m/sec.

Egypt cooperated with Denmark to develop a wind atlas, published in 1996, for the Gulf of Suez west coast. In 2003, a detailed wind atlas for the same area was issued, concluding that the region can host several large-scale wind farms; the atlas was expanded to cover the entire country in 2005, to establish the meteorological basis for the assessment of wind energy resources all over Egypt.

Egypt has large deserts and abundant land mass, the majority of which is only scarcely populated. These areas are well suited to host renewable energy projects, both to increase the country's share of renewable energy as well as to export excess energy to Europe. Large areas with high wind potential are already earmarked on the west of the Gulf of Suez, as well as the eastern and western deserts of the Nile River banks. Wind Atlas for Egypt is considered the basis for all decisions related to the wind energy projects planning, and feasibility studies in the future.[2] Wind chart in Egypt.[3]

[1]http://www.gwec.net/index.php?id=122(Accessed:2010).
[2] http://www.ewindea.org/index.php/egypt-wind-facts(Accessed:2010).
[3] http://www.windfinder.com/windreports/windreports_online_eg.htm(Accessed:2010).

Location	Short-ID	Wind SMS	Time	Wind direction	Medium Wind speed (Knots)	Sky	Air (°C)	Pressure (hPa)
El Kosseir	KOSSEIR	Yes	08:00		6		**23**	**1008**
El Tor	ELTOR	Yes	08:00		3		**20**	**1008**
Hurghada	HURGADA	Yes	10:00		7		**28**	**1013**
Ras Sudr	RASSUDR	Yes	08:00		2		**20**	**1008**
Safaga	SAFAGA	Yes	09:16		2		**25**	**1011**
Sharm El Sheikh	SHARM_SH	Yes	10:00		4		**30**	**1012**
Aburdees	ABURDEES	No	08:00		3		**21**	**1008**
Alexandria Airport/Nouzha	ALXNDRIA	No	10:00		5		**22**	**1012**
Baltim	BALTIM	No	05:00		5		**17**	**1008**
Cairo Airport	CAIRO	No	11:00		3		**29**	**1012**
Dabaa	DABAA	No	08:00		n/a		**18**	**1008**
Dahab	DAHAB	No	10:00		11		**28**	**30**
El Arish	ARISH	No	08:00		3		**15**	**1008**
El Gouna	ELGOUNA	No	09:21		4		**24**	**1011**
Ismailia	ISMAILIA	No	08:00		n/a		**18**	**1008**
Magawish	MAGAWISH	No	22:00 (30.07.2026)		0		**-18**	--
Marsa Alam Airport/	MARSAALM	No	10:00		6		**30**	**1013**
Mersa Matruh	MARSA	No	10:00		16		**19**	**1014**
Nabq/Sinai	NABQ	No	22:50		0		--	**1020**
Port Said	PORTSAID	No	10:00		8		**21**	**1013**
Sallum	SALUM	No	08:00		15		**14**	**1008**
Soma Bay / Interconti	KREAZY_B	No	10:20		2		**26**	**1011**
Taba Airport	TABA	No	08:00		n/a		**17**	**1017**
Marsa Alam	MARSALAM	No	09:18		8		**30**	**645**

Table 2. 1 Windfinder - Real time wind & weather charts Egypt- Wind chart: Egypt 01.04.2011[1]

[1] http://www.windfinder.com/windreports/windreports_online_eg.htm(Accessed:2010).

2.3.1.2 Solar Energy

Solar radiation is along with secondary solar-powered resources such as wind and wave power, hydroelectricity and biomass, account for most of the available renewable energy on earth. Solar powered electrical generation relies on heat engines and photovoltaic. Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. There are three concepts of solar architecture:

1. Passive System Architecture

Natural systems are not requiring any mechanical equipment to collect or to deliver the sun's heat to be building space. Windows (to collect the sun's heat directly) and masonry construction (to store the heat for a delayed heating effect) are examples of passive solar design. The "school" plan can be made compact and with separate zones, to reduce the volume of space that must be fully heated at one time.

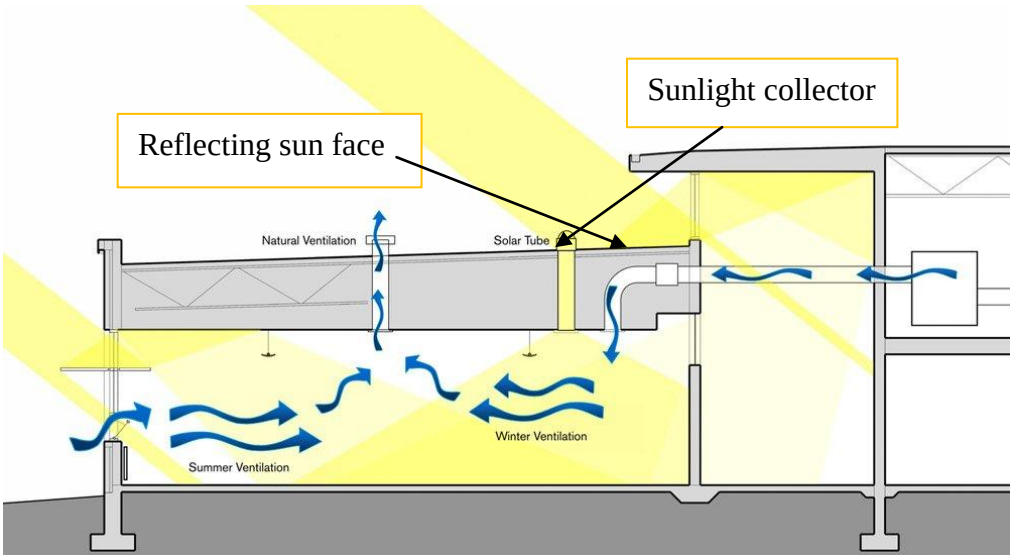


Figure 2. 29 passive solar energy system is easy to design and allow heating, cooling and lighting to all be addressed in the initial stages of planning.Clackamas school. "Sustainable school book". [1]

2. Active System :A system which requires mechanical equipment to collect or to deliver the sun's heat to the building space, that utilizes the sun's thermal energy to

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

supply low-temperature heat are the most common types of solar heating used for schools.

3. Hybrid System

Various designs that use fan power are called “hybrids,” that is, a mixture of passive and actives systems. The passive system concepts the notion that although heating energy can be transferred passively, that is to say it is possible to move heat without anything but its own driving force, this is not always the most practical or economical choice. Fan power is often needed to move air from hot collector space to other areas of schools or to a separate storage bin (usually a rock or pebble bed or concrete blocks placed so that air flows evenly through them).

A “hybrid” system could also be one, which uses pumps to circulate water such as from a “drum wall” or a “roof pond" to other rooms of a house. The few such systems that have been devised have not proven other than of experimental interest.

2.3.1.2a Solar Electricity Panels

One of the most promising renewable energy technologies is photovoltaic’s. Photovoltaic’s (PV) is a truly elegant means of producing electricity on site, directly from the sun, without concern for energy supply or environmental harm. These solid-state devices simply make electricity out of sunlight, silently with no maintenance, no pollution, and no depletion of materials.

Interest in the schools integration of photovoltaic, where the PV elements actually become an integral part of the building, often serving as the exterior weather skin, is growing worldwide. A whole new vernacular of Solar Electric Architecture is beginning to emerge.

There are many advantages of using a solar cell array with various panels fitted along a mounting system.

A single solar panel can only produce a limited amount of power, many installations contain several panels. This is known as a photovoltaic array. A photovoltaic

installation typically includes an array of solar panels, an inverter, batteries and interconnection wiring.

Solar PV power stations today have capacities ranging from 10–60 MW although proposed solar PV power stations will have a capacity of 150 MW or more.[1]

It is possible for a school to receive its full amount of electricity from solar energy using solar panels, yet this is unlikely in most cases. The costs involved with supplying a whole school with electricity from photovoltaic panels would be quite high for the average school owner.

The Solar Light Transformation: Solar cells are often electrically connected and encapsulated as a module. Photovoltaic modules often have a sheet of glass on the front (sun up) side, allowing light to pass while protecting the semiconductor wafers from the elements (rain, hail, etc.). Solar cells are also usually connected in series in modules, creating an additive voltage. Connecting cells in parallel will yield a higher current. Modules are then interconnected, in series or parallel, or both, to create an **array** with the desired peak DC voltage and current.

Figure 2. 30 Photovoltaic's cells. "Available: http://images.google.com/imghp(Accessed :2006)"

Figure 2. 31 Polycrystalline photovoltaic cells- laminated to backing material in a module. "Available: http://images.google.com/imghp (Accessed :2006)"

Figure 2. 32 Using solar panels in the roof and at curtain walls. "Available:http://images.google.com/imghp(Accessed :2006)"

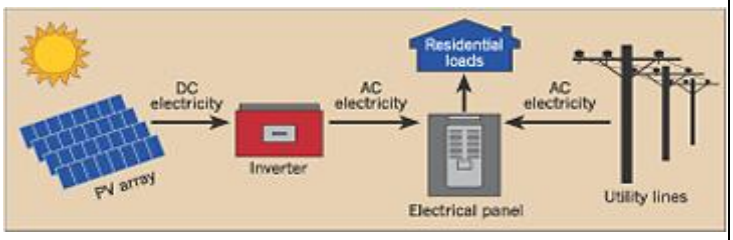


Figure 2. 33 The process of transformation from solar energy to electrical energy. "http://images.google.com/imghp"

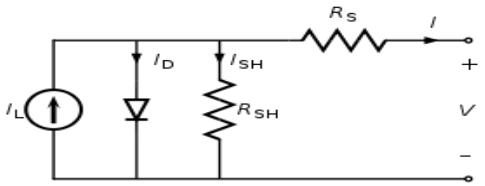


Figure 2. 34 The equivalent circuit of a solar cell. "Available: http://images.google.com/imghp"

[1] Mark Z. Jacobson (2009). Review of Solutions to Global Warming, Air Pollution, and Energy Security p. 4.

A. Photovoltaic's (PV) Technologies Types

There are two basic PV module technologies available today:

1. Thick crystals products include solar cells made from crystalline silicon either as single or poly-crystalline wafers and deliver about 10-12 watts per ft² of PV array (under full sun).

2. Thin-film products typically incorporate very thin layers of photovoltaic active material placed on a glass supersaturate or a metal substrate using vacuum-deposition manufacturing techniques similar to those employed in the coating of architectural glass. Presently, commercial thin-film materials deliver about 4-5 watts per ft² of PV array area (under full sun). Thin-film technologies hold out the promise of lower costs due to much lower requirements for active materials and energy in their production when compared to thick-crystal products.[1]

B. Building Integrated Photovoltaic's (BIPV) System

Building Integrated Photovoltaic's (BIPV) is the integration of photovoltaic's (PV) into the building envelope. The PV modules serve the dual function of building skin—replacing conventional building envelope materials—and power generator. By avoiding the cost of conventional materials, the incremental cost of photovoltaic is reduced and its life-cycle cost is improved. That is, BIPV systems often have lower overall costs than PV systems requiring separate, dedicated, mounting systems.

Roofs are often angled toward the sun to allow photovoltaic panels to collect at maximum efficiency. For any solar panel, a true-south facing orientation maximizes yield. If true south is not possible, solar panels can produce adequate energy if aligned within 30° of south. However, at higher latitudes, winter energy yield will be significantly reduced for non-south orientation. To maximize efficiency in winter, the collector should be angled above horizontal Latitude + 15°. To maximize efficiency in summer, the angle should be Latitude - 15°. However, for an annual maximum production, the angle of the panel above horizontal should be equal to its latitude[2].

[1] Available: http://www.wbdg.org/resources/bipv.php (Accessed:2010).
[2] G.Z. Brown, Mark DeKay. Sun, Wind & Light. 2001

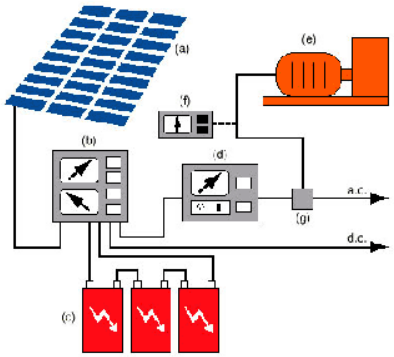


Figure 2. 35 BIPV system diagram.
"http://images.google.com/imghp"

A complete BIPV system includes:

A. the PV modules (which might be thin-film or crystalline, transparent, semi-transparent, or opaque).

b. A charge controller, to regulate the power into and out of the battery storage bank (in stand-alone systems);

C. A power storage system, generally comprised of the utility grid in utility-interactive systems or, a number of batteries in stand-alone systems;

D. Power conversion equipment including an inverter to convert the PV modules' DC output to AC compatible with the utility grid;

E. Backup power supplies such as diesel generators (optional-typically employed in stand-alone systems); and Appropriate support and mounting hardware, wiring, and safety disconnects.

C. Solar Glazing

Solar "See Thru" glass is a revolutionary new type of photovoltaic glazing that is going to revolutionize the way buildings are designed. This material is a Solar module with a unique semitransparent finish, much like tinted glass that can be used in skylights, curtain walls, canopies, atriums, and other vertical or sloped glazed surfaces.

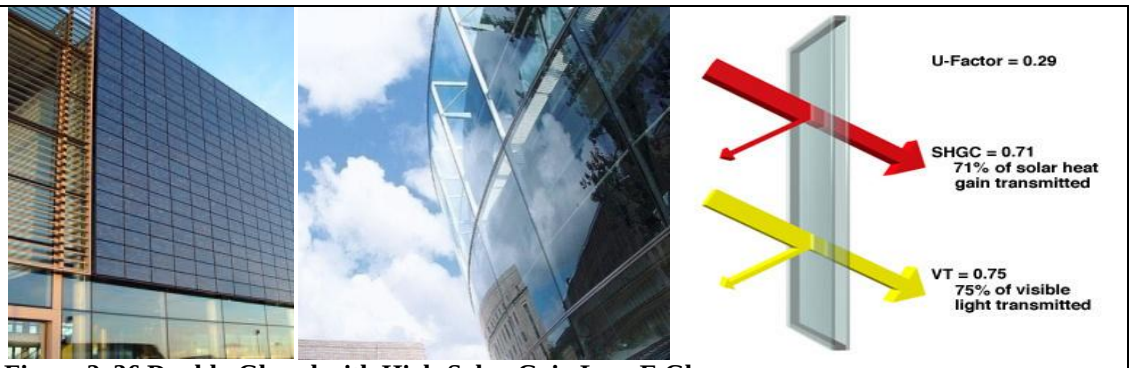


Figure 2. 36 Double-Glazed with High-Solar-Gain Low-E Glass

This figure illustrates the characteristics of a typical double-glazed window with a high-transmission, Low-E glass and argon gas fill. These Low-E glasses are often referred to as pyrolitic or hard coat Low-E glass, due to the glass coating process. It's designed to reduce heat loss but admit solar gain.

Energy Savings: The laser-etched PV cells simultaneously generate electricity and help block the sun's harmful rays. This reduces the building's air-conditioning and lighting loads considerably.

Case Study: Lick-Wilmerding High School

The new Technology and Design Center is equipped with solar panels, natural day lighting, on-demand hot water and other design features that minimize energy use while improving the learning environment. Through increased waste diversion, building efficiency and solar electricity generation, this high school saves thousands of dollars in energy and waste disposal bills annually and avoids about 150 tons of GHG[1] emissions. Energy Bill is Savings $7,000 per year.

Lick Wilmerding High School

Figure 2. 37 Roof solar panels at Lick Wilmerding High School. "Sustainable school book". [2]

Figure 2. 38 Lick Wilmerding High School –Side view at photovoltaic Panels. "Reference sustainable schools book".

The electricity and gas consumption savings at 33 % that equates to just at four years to recover the premium solely on energy costs. "Sustainable school book". [3]

Energy management methods can reduce the school's electricity use by more than 3,500 kWh a month, equivalent to $5,500 per year in energy bill savings.

Going Solar – A 7.5-kW photovoltaic system produces more than 13,000 kWh of electricity each year, which is enough to operate 85 computers and save more than

[1] A green house gas (sometimes abbreviated GHG) is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect.
[2] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.
[3] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

$1,500 annually in power bills. The project paid for itself in about five years and is now a free source of electricity that avoids five tons of greenhouse gases annually.[1]

2.3.1.2b Solar Water Heating

Solar water Heating (SWH) systems are a mature renewable energy technology. Hot water heated by the sun is using in many ways. While perhaps best known in a buildings to provide hot domestic water, solar hot water also has industrial applications, e.g. to generate electricity[2].

Types of Solar Water Heating (SWH) systems

The type and complexity of a solar water heating system is mostly determined by:

- The changes in ambient temperature during the day-night cycle.
- Changes in ambient temperature and solar radiation between summer and winter.
- The temperature of the water required from the system.

The maximum efficiency of the system is determined by the need to prevent the water in the system from becoming too hot (to boil, in an extreme case). There are two main categories of solar water heating systems. Passive systems rely on convection or heat pipes to circulate water or heating fluid in the system, while active systems use a pump.

Figure 2. 39 Close-coupled system the storage tank is horizontally mounted immediately above the solar collectors on the roof. "Available: http://images.google.com/imghp (Accessed:2007)".

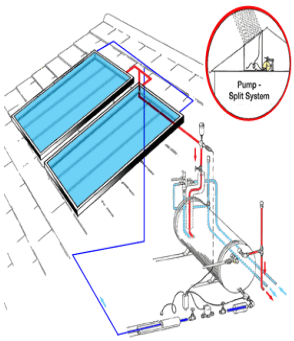


Figure 2. 40 pump circulation-split system . "http://images.google.com/imghp".

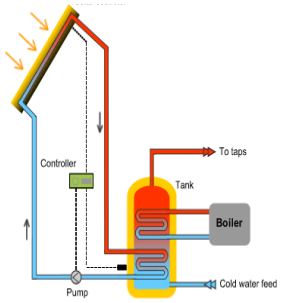


Figure 2. 41 Solar collector. "Available: http://images.google.com/imghp".

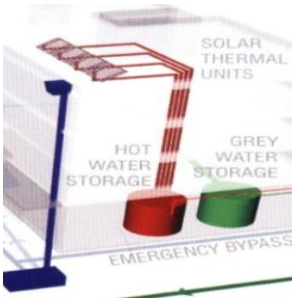


Figure 2. 42 Sidwell friends school -Solar thermal units & hot water domestic storage. "Sustainable school book".[3]

[1] School report
[2] Marken C. (2009) solar collectors - behind the glass. Home power magazine 133,70-76
[3] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

Pump circulated system the storage tank is ground or floor mounted and is below the level of the collectors; a circulating pump moves water or heat transfer fluid between the tank and the collectors. SWH systems are designing to deliver the optimum amount of hot water for most of the year. However, in winter there sometimes may not be sufficient solar heat gain to deliver sufficient hot water. In this case, a gas or electric booster is normally used to heat the water.

2.3.1.2c Solar Chimney and Sustainable Architecture

Air conditioning and mechanical ventilation have been for decades the standard method of environmental control in many building types like schools, in developed countries. Pollution and reallocating energy supplies have led to a new environmental approach in School design. Innovative technologies along with bioclimatic principles and traditional design strategies are often combined to create new and potentially successful design solutions. The solar chimney is one of these concepts currently explored by scientists as well as designers, mostly through research and experimentation.

A Solar chimney can serve many purposes. Direct gain warms air inside the chimney causing it to rise out the top and drawing air in from the bottom. This drawing of air can be used to ventilate school spaces, to draw air through a geothermal heat exchange, or to ventilate only a specific area such as a composting toilet.

The use of a solar chimney may benefit natural ventilation and passive cooling strategies of School thus help reduce energy use, CO_2 emissions and pollution in general. Potential benefits regarding natural ventilation and use of solar chimneys are:

- Improved ventilation rates on still, hot days.
- Reduced reliance on wind and wind driven ventilation.
- Improved control of air flow though the school.
- Greater choice of air intake (i.e. leeward side of building).

- Improved air quality and reduced noise levels in urban areas.
- Increased night time ventilation rates.
- Allow ventilation of narrow, small spaces with minimal exposure to external elements.

Example: St Leonard's School

Potential benefits regarding passive cooling may include:

- Improved passive cooling during warm season (mostly on still, hot days).
- Improved night cooling rates.
- Enhanced performance of thermal mass (cooling, cool storage).
- Improved thermal comfort (improved air flow control, reduced draughts).[1]

The building concepts, developed with FMSA Architects, include:

- Solar wall which acts as a solar heater in winter and thermal exhaust chimney in summer.
- Water walls to evaporative cool incoming air. The water for the walls is gravity fed from a rainwater tank.
- Hydronic heating system with geothermal heat pump (to supplement the solar wall).
- Selection of environmentally friendly materials such as low VOC paints and Ortech ceiling (made from compressed straw).
- The solar walls and water walls are manually operated by the staff and students – this hands-on experience is a core part of the education process.
- Extensive metering and monitoring is provided for energy, water, temperature and humidity so that data recording the performance of the building can be used in student projects.[2]

[1] Afonso, Clito; Oliveira, Armando (June 2000). "Solar chimneys: Simulation and experiment". Energy and Buildings (IOP Publishing Limited) .
[2] Available: http://www.cundall.com/Default.asp?Page=295 (Accessed: 2009).

Figure 2. 43 Front façade at St Leonard's school, Sustainability centre. Solar chimneys provide heated air in winter and induce cross ventilation in summer. "Sustainable school book". [1]

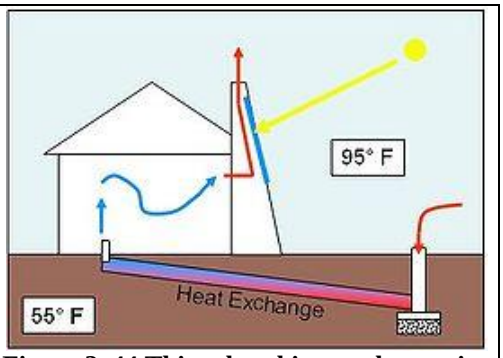


Figure 2. 44 This solar chimney draws air through a geothermal heat exchange to provide passive home cooling. "http://images.google.com/imghp".

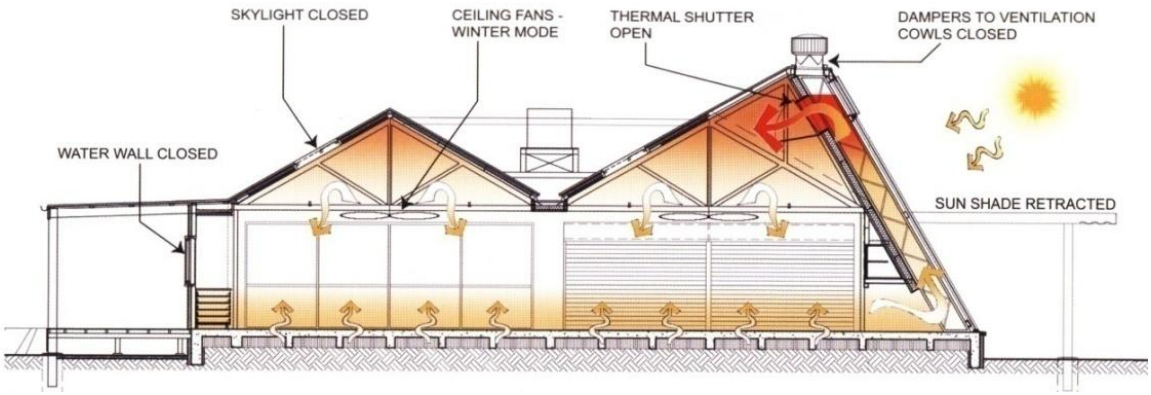


Figure 2. 45 Section at St Leonard's School, the conceptual diagram of passive heating during winter. "Sustainable school book Pg.200". [2]

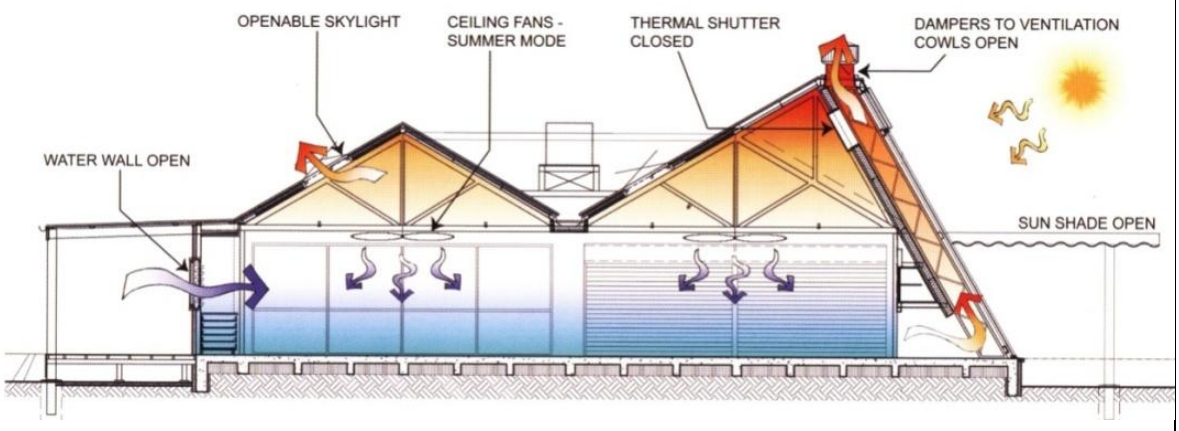


Figure 2. 46 Section at St Leonard's school, the conceptual diagram of passive cooling during summer. "Sustainable school book pg.200". [3]

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.
[2] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.
[3] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

The properties of space		Solar architecture
morphology	Shape pattern	Shape follows the solar protractor according to the location latitude
	Space type	Geometrical with inclined boundary surfaces
	Space relations	Oriented to the sun path according to solar exposure needs.South direction
Environmental control	Natural	Use the passive, active and hybrid methods
	Mechanical	
	Totally	Partially controlled environment
	Partially	
	Intelligent	
Health impact	Physiological& psychological impact	Low harmful impact on health
	Electromagnetic impact	Low impacts from electromagnetic fields
	Pollution	Almost healthy clean indoor environment, but there are some effects when using active methods
Energy configuration	Consumption	Highly energy efficiency
	Resource	Using "the sun" as sources of energy

Table 2. 2 The space properties of solar architecture[1]

2.3.1.3 Wind Energy: Wind Turbines

Figure 2. 47 Wind turbines unites. "http://images.google.com/imghp".

A wind turbine is a rotary device that extracts energy from the wind. If the mechanical energy is used directly by machinery, such as for pumping water, cutting lumber or grinding stones, the machine is called a windmill. If the mechanical energy is instead converted to electricity, the machine is called a wind generator, wind turbine, wind turbine generator (WTG), wind power unit (WPU), wind energy converter (WEC), or aero generator. Speeds bring best return on investment. With a wind resource assessment it is possible to estimate the amount of energy the wind turbine will produce.

Wind Turbines Operating: Small wind systems are generally more expensive than larger wind turbines relative to the amount of energy they produce. For small

[1] Master thesis -Cairo university- contemporary environmental architecture-chapter 2-page75

wind turbines, maintenance costs can be a deciding factor at sites with marginal wind-harnessing capabilities. At low-wind sites, maintenance can consume much of a small wind turbine's revenue.[1] Wind turbines begin operating when winds reach 8 mph, achieve energy production capacity at speeds of 32-37 mph, and shut off to avoid damage at speeds exceeding 55 mph.[2]

The energy potential of a wind turbine is proportional to the square of the length of its blades and to the cube of the speed at which its blades spin. Though wind turbines are available that can supplement power for a single building, because of these factors, the efficiency of the wind turbine depends much upon the wind conditions at the building site. For these reasons, for wind turbines to be at all efficient, they must be installed at locations that are known to receive a constant amount of wind (with average wind speeds of more than 15 mph), rather than locations that receive wind sporadically.[3]

A small wind turbine can be installed on a roof. Installation issues then include the strength of the roof, vibration, and the turbulence caused by the roof ledge. Small-scale rooftop wind turbines have been known to be able to generate power from 10% to up to 25% of the electricity required of a regular domestic household dwelling.[4] Turbines for small school scale use are available. They are usually approximately 7 feet (2 m) to 25 feet (8 m) in diameter and produce electricity at a rate of 900 watts to 10,000 watts at their tested wind speed.

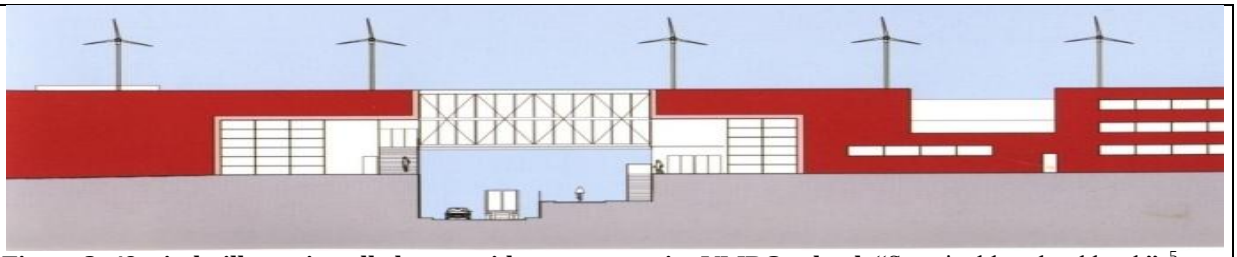


Figure 2. 48 windmills are installed to provide energy at tries VMBO school. "Sustainable school book".[5]

[1] Brower, Michael; Cool Energy, The Renewable Solution to Global Warming; Union of Concerned Scientists, 1990
[2] Brower, Michael; Cool Energy, The Renewable Solution to Global Warming; Union of Concerned Scientists, 1990
[3] Gape, Paul; Wind Power: Renewable Energy for Farm and Business; Chelsea Green Publishing, 2004
[4] The Sunday Times, April 16, 2006, "Home wind turbines dealt killer blow
[5] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

2.3.1.4 Heat Pumps

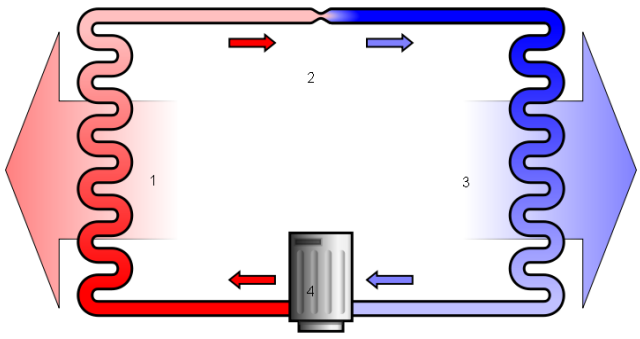


Figure 2. 49 A simple stylized diagram of a heat pump's vapor-compression refrigeration cycle: 1) condenser, 2) expansion valve, 3) evaporator, 4) compressor. "Available: http://en.wikipedia.org/wiki/Heat_pump Accessed (2010".

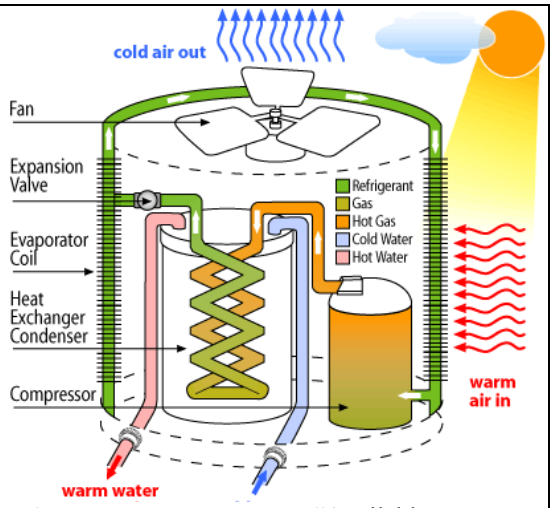


Figure 2. 50 Heat Pumps. "Available: www.heat-pumps-systems.com Accessed (2010".

"Air-source heat pumps (ASHP) can be thought of as reversible air conditioners. Like an air conditioner, an ASHP can take heat from a relatively cool space (e.g. a house at 70°F) and dump it into a hot place (e.g. outside at 85°F). However, unlike an air conditioner, the condenser and evaporator of an ASHP can switch roles and absorb heat from the cool outside air and dump it into a warm house.

Air-source heat pumps are inexpensive relative to other heat pump systems. However, the efficiency of air-source heat pumps decline when the outdoor temperature is very cold or very hot; therefore, they are only really applicable in temperate climates.

For areas not located in temperate climates, ground-source (or geothermal) heat pumps provide an efficient alternative. The difference between the two heat pumps is that the ground-source has one of its heat exchangers placed underground—usually in a horizontal or vertical arrangement. Ground-source takes advantage of the relatively constant, mild temperatures underground, which means their efficiencies can be much greater than that of an air-source heat pump.

The in-ground heat exchanger generally needs a considerable amount of area. Designers have placed them in an open area next to
the building or underneath a parking lot.

Energy Star ground-source heat pumps can be 40% to 60% more efficient than their air-source counterparts can. They are also quieter and can also be applied to other functions like domestic hot water heating.

In terms of initial cost, the ground-source heat pump system costs about twice as much as a standard air-source heat pump to be installed. However, the up-front costs can be more than offset by the decrease in energy costs. The reduction in energy costs is especially apparent in areas with typically hot summers and cold winters.

Other types of heat pumps are water-source and air-earth. If the building is located near a body of water, the pond or lake could be used as a heat source or sink. Air-earth heat pumps circulate the building's air through underground ducts. With higher fan power requirements and inefficient heat transfer, Air-earth heat pumps are generally not practical for major construction". [1]

2.3.2 Heating, Ventilation &Cooling Systems Efficiency

1- The most important and cost effective element of an efficient heating, ventilating, and air conditioning (HVAC) system is a well insulated school building. For more efficient school requires less heat generating or dissipating power, but may require more ventilation capacity to expel polluted indoor air.

2- Significant amounts of energy are flushed out of schools in the water and air. The site energy recycling technologies can effectively recapture energy from waste hot water and stale air and transfer that energy into incoming fresh cold water or fresh air. Site and building orientation have some major effects on a building's HVAC efficiency.

[1] John Randolph and Gilbert M. Masters, 2008. "Energy for Sustainability: Technology, Planning, Policy," Island Press, Washington, DC

3- Passive solar building design allows buildings to harness the energy of the sun efficiently without the use of any active solar mechanisms such as photovoltaic cells or solar hot water panels.

4- Low energy designs also requires the use of solar shading, by means of awnings, blinds or shutters, to relieve the solar heat gain in summer and to reduce the need for artificial cooling.

5- In addition, low energy school buildings typically have a very low surface area to volume ratio to minimize heat loss. This means that sprawling multi-winged building designs (often thought to look more "organic") are often avoided in favor of more centralized structures. [1]

Windows are placed to maximize the input of heat-creating light while minimizing the loss of heat through glass, a poor insulator. In the northern hemisphere this usually involves installing a large number of south-facing windows to collect direct sun and severely restricting the number of north-facing windows.

Certain window types, such as double or triple glazed insulated windows with gas filled spaces and low emissivity (low-E) coatings; provide much better insulation than single-pane glass windows.

Preventing excess solar gain by means of solar shading devices in the summer months is important to reduce cooling needs. Deciduous trees are often planted in front of windows to block excessive sun in summer with their leaves but allow light through in winter when their leaves fall off.

Louvers or light shelves are installed to allow the sunlight in during the winter (when the sun is lower in the sky) and keep it out in the summer (when the sun is high in the sky). Coniferous or evergreen plants are often planted to the north of buildings to shield against cold north winds.

[1]Available:http://en.wikipedia.org/wiki/Sustainable_architecture#Heating.2C_ventilation_and_cooling_system_efficiency(Accessed:2010).

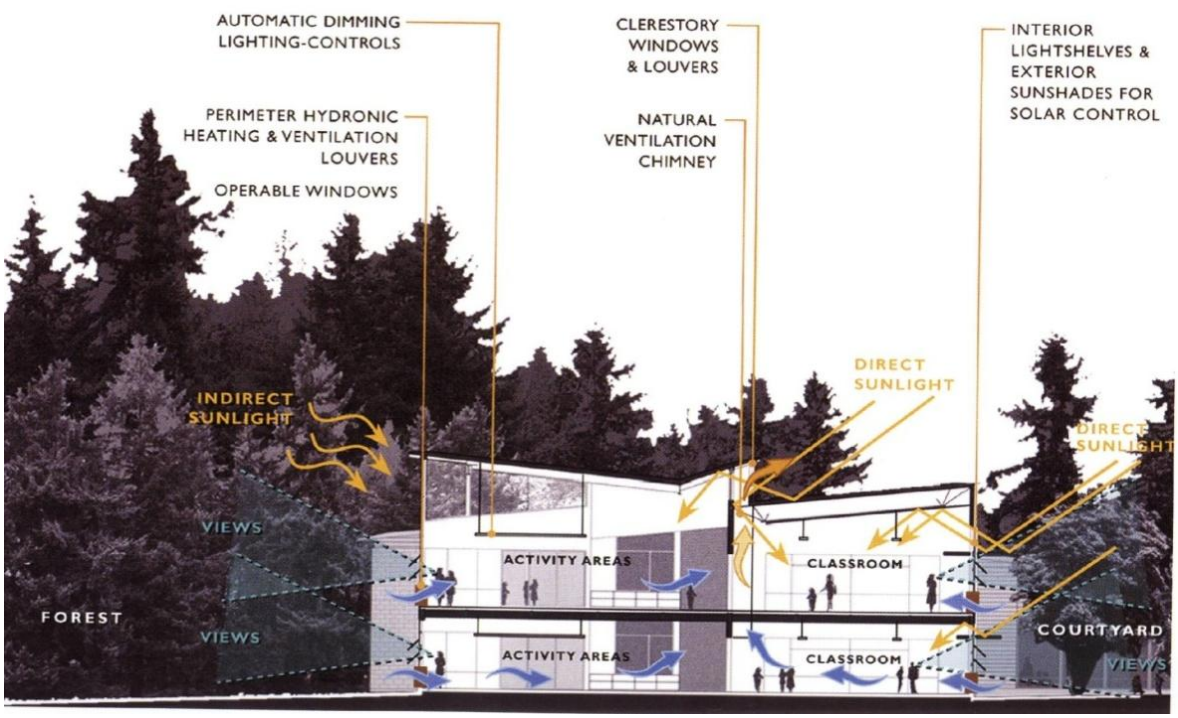


Figure 2. 51Banjamin Franklin school-"Sustainable school book".

The sustainability at the design in :

1. **Controlling the sun light sometimes direct sunlight and sometimes indirect sunlight.**
2. **The vision from the spaces to open view or court yard.**
3. **Making chimney for natural ventilation.**
4. **Making perimeter Hydraulic louvers with operable windows.**
5. **Clearstory window& louvers.**

In colder climates, heating systems are a primary focus for sustainable architecture because they are typically one of the largest single energy drains in buildings.

In warmer climates where cooling is a primary concern, passive solar designs can also be very effective.

Masonry building materials with high thermal mass are very valuable for retaining the cool temperatures of night throughout the day. In addition builders often opt for sprawling single story structures in order to maximize surface area and heat loss. Buildings are often designed to capture and channel existing winds, particularly the

especially cool winds coming from nearby bodies of water. Many of these valuable strategies are employed in some way by the traditional architecture of warm regions, such as south-western mission buildings.

In climates with four seasons, an integrated energy system will increase in efficiency: when the building is well insulated, when it is sited to work with the forces of nature, when heat is recaptured (to be used immediately or stored), when the heat plant relying on fossil fuels or electricity is greater than 100% efficient, and when renewable energy is utilized.[1]

Cooling Tower

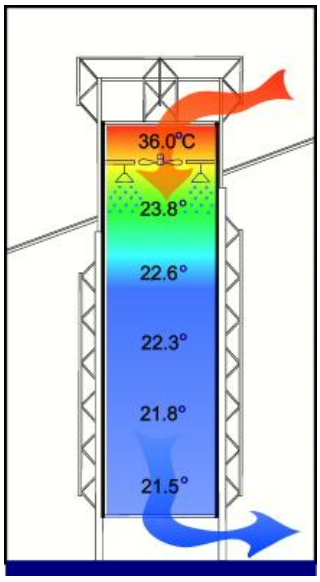
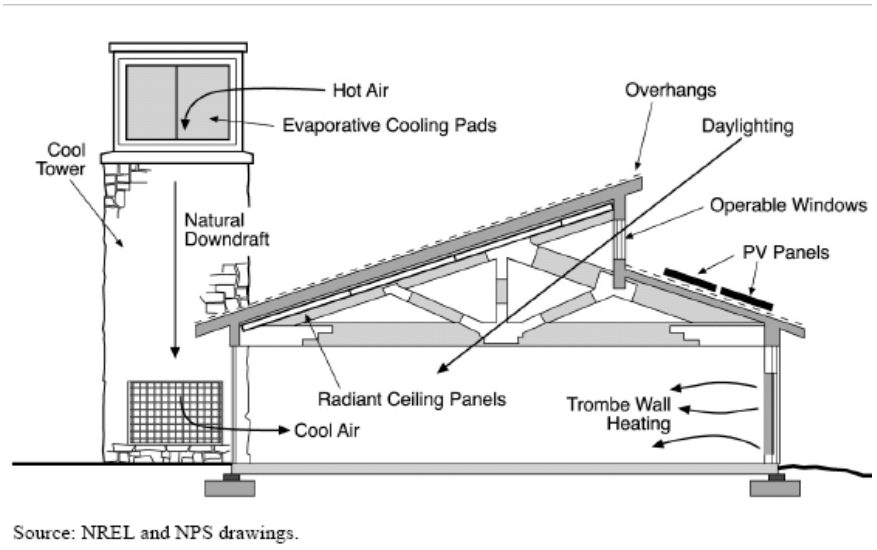


Figure 2. 52 The Cool tower system.
"www.wikipedia.org".



Source: NREL and NPS drawings.

Figure 2. 53 Cool tower at Zion National Park's Visitor Center provides cool air. "www.wikipedia.org".Prominent innovation system is the potential for passive generation of downward air flow by free convection, due to the thermal processes of evaporation through the 10 meter height of the tower.

Grammer School: Westbourne Grammer School | Truganina, Victoria

Thermal chimneys and an underground rainwater tank revolutionize this 1981 laboratory building. Fresh air is cooled by manifolds in the underground tank and induced through the building´s louvered glazed partitions by thermal chimneys. The

[1]Available at: http://en.wikipedia.org/wiki/Sustainable_architecture#Heating.2C_ventilation_and_cooling_system_efficiency (Accessed:2010).

original concrete structure was stripped back to expose thermal mass for improved cooling and heating performance. Rainwater recycling, natural day lighting, photo-voltaic, low energy lights, and ceiling-mounted hydraulic heating panels coordinate for frugal energy usage with high levels of comfort.

Figure 2. 54 Solar Panels in the elevation. . "www.worldarchitecturenews.com".

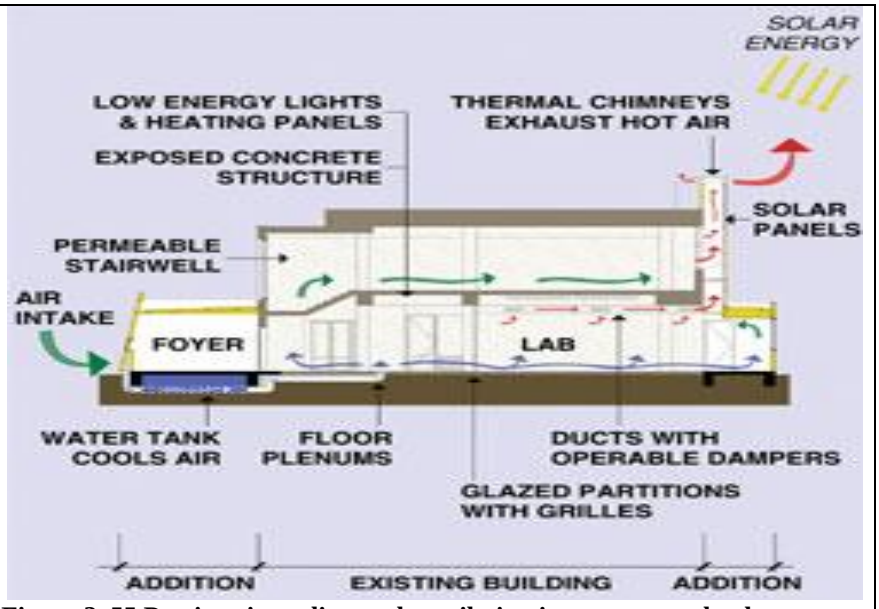


Figure 2. 55 Passive air cooling and ventilation in grammer school. . "www.worldarchitecturenews.com".

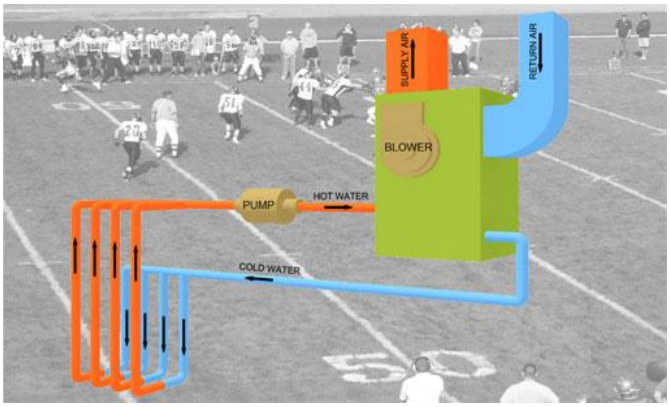


Figure 2. 56 HVAC system. "www.worldarchitecturenews.com"

Figure 2. 57 pipes for HVAC system. "www.worldarchitecturenews.com".

Woodbury High School | Woodbury, NJ: A geothermal ground source HVAC system, one of the first of its kind in an educational building in California, provides heating and air conditioning for the building. This system collects the Earth's natural heat in winter through a series of pipes, called closed loops, which are installed below the surface of the ground. Fluid circulating in the loops carries heat to the building in winter and to the ground in the summer.

2.3.3 A Zero Energy Building (ZEB)

A zero energy building (ZEB) or net zero energy building is a general term applied to a school building's use with zero net energy consumption and zero carbon emissions annually. Zero energy buildings can be used autonomously from the energy grid supply – energy can be harvested on-site. The net zero design principle is overlaid on the requested comfort of the school building occupant. Generally, the more extreme the exposure to the elements the more energy is needed to achieve a comfortable environment of human and student use.[1]

The zero fossil energy consumption principle is gaining considerable interest as renewable energy harvesting is a means to cut greenhouse gas emissions. [2]

In developing countries many people have to live in zero-energy buildings out of necessity. Many people live in huts, yurts, tents and caves exposed to temperature extremes and without access to electricity. These conditions and the limited size of living quarters would be considered uncomfortable in the developed countries.

2.3.3.1 First Zero Energy School: Richardsville School

The School design for this net zero energy was even awarded the Green Design Concept Winner 2008 Green Education Design Showcase.

Sherman Carter Barnhart has designed the nation's first total energy Net Zero public school, the school located in Warren County (Bowling Green), KY). To achieve Net Zero, Sherman Carter Barnhart aggressively examined all possible avenues and identified 6 major areas to reduce energy usage. These include:

1. High Performance Building Envelop
2. Active Day lighting
3. Geothermal HVAC
4. Alternate Renewable Energy Source - Photovoltaic Array Supplying over 300kw of power
5. Efficient Kitchen Cooking Strategies
6. Operations and Maintenance Plan

[1]Available:http://en.wikipedia.org/wiki/Sustainable_architecture#Heating.2C_ventilation_and_cooling_system_efficiency. (Accessed:2010).

Realizing not all schools have the resources available for alternative renewal energy sources, Sherman Carter Barnhart has also created a net zero achievable/solar ready design for schools.[1]

About to be in session

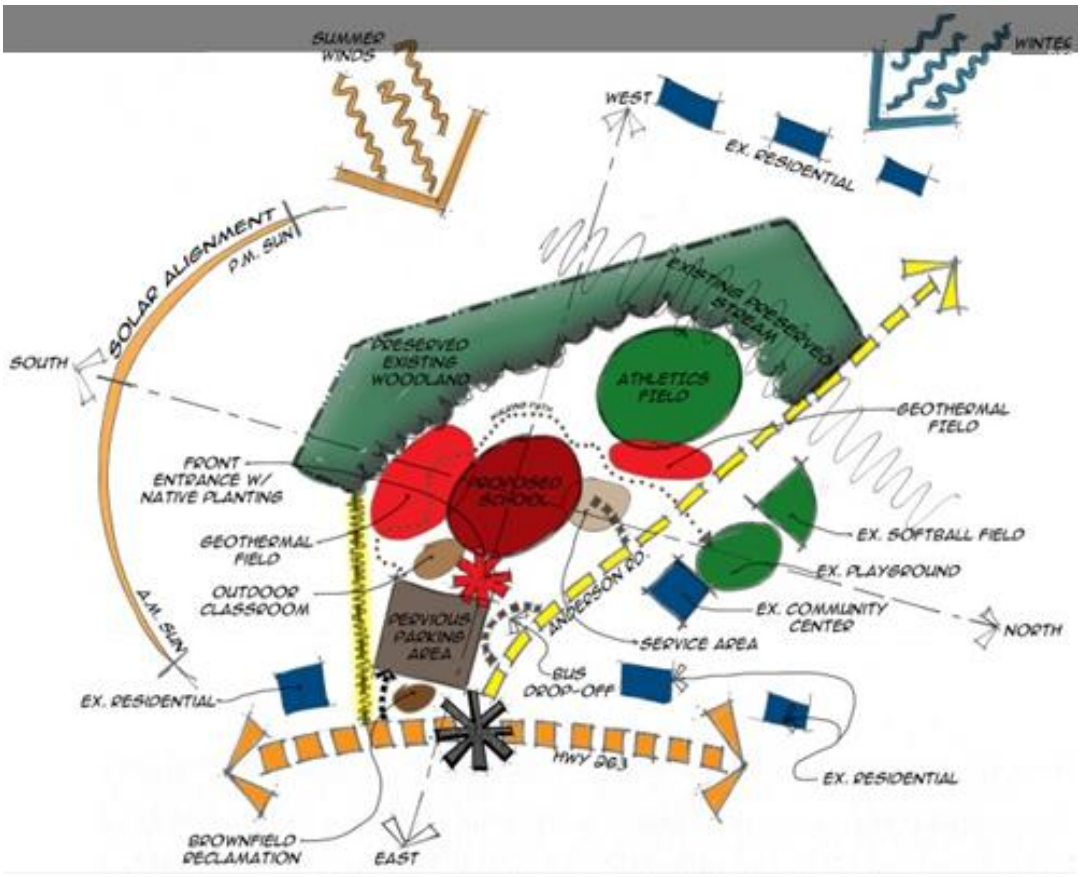


Figure 2. 58 School Design Concept. " http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session/ "**.**

High Performance Elements include:

- Insulated concrete form wall construction and high performance building envelope.
- Geothermal HVAC with CO2 monitoring and de-centralized pumping.
- Active day lighting with light shelves and.
- Compact two story design with reduced building volume.

[1] Available:http://biofriendly.com/blog/energy/first-net-zero-energy-public-school-set-to-open-this-year/(Accessed:2010).

- Roof adhered thin film photovoltaic system.
- Bioswales

Bioswales are landscape elements designed to remove silt and pollution from surface runoff water. They consist of a swaled drainage course with gently sloped sides (less than six percent) and filled with vegetation, compost and/or riprap.[1]

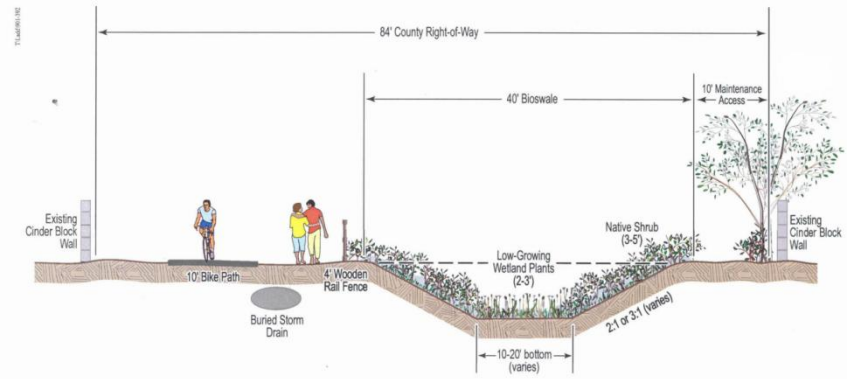


Figure 2. 59 Bioswales typical cross section. Available: http://www.sbprojectcleanwater.org/images/South_Turnpike_BMP_Xsection.jpg. /(Accessed:2010).

Figure 2. 60 It includes a array of solar panels on the main building in addation to the covered drop-off/pick-up area in the parking lot. Renewable materials were used during construction whenever possible and ICFs (Insulated Concrete Forms) were used as a green construction measure to provide smart insulation.
The building was laid out in a north-south site orientation in order to increase solar output and naturally conserve energy. "http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session".

[1] Loechl, Paul M., et al (2003). Design Schematics for a Sustainable Parking Lot. Champaign, IL: US Army Corps of Engineers, Research and Development Center. http://www.cecer.army.mil/techreports/Stumpf_SustainableParkingLot/Stumpf_SustainableParkingLot-TR.pdf. Construction Engineering Research Laboratory. Document no. ERDC/CERL TR-03-12.

Figure 2. 61 solar panels. " http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session/ ".

Figure 2. 62 The front entrance, the building has a clerestory spine running down the middle of the was designed to allow for maximum building. This natural daylight and minimal lighting costs.
The windows themselves are made from sandwich panel glass to provide a nice aesthetic for the building without lowering energy efficiency. " http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session/ ".

Figure 2. 63 This photo shows the rear of the school building, with the media center on the second floor and a covered outdoor classroom below it. The stair towers to the left and right are encased by windows and decorated by sunshades at each level to minimize heat/glare. " http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session/ ".

Figure 2. 64 The south facing facade (classrooms) clearly shows the use of day lighting as well as the incorporation of sunshade devices in the design and practicality of the building. " http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session/ ".

Figure 2. 65 The new gymnasium floor was made mostly from bamboo with the dark hardwood sections salvaged from the old gymnasium. Acoustical wall panels were added to give the room optimum acoustics. You can also see a bit of the clerestory day lighting in place here as well. " http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session/ ".

Figure 2. 66 With regard to the kitchen area, Energy Star rated equipment was used and comb-ovens were chosen as a healthier option to traditional fryers and skillets. So not only will the cafeteria be energy-efficient, it will be able to provide healthier food choices to the students as well. " http://biofriendly.com/blog/energy/first-zero-energy-school-about-to-be-in-session/ ".

As principal architect on this project, Kenny Stanfield described it:

"For our team, the goal of achieving a net zero school was simply the next step – to go from a proven, design operating facility that requires only 28 Kbytes of energy per square foot annually to a facility that needs 18 Kbytes to operate.**"**

It was designed and built as a tool to educate students on the value of energy conservation, solar, water conservation, recycling and more.

In terms of overall construction costs, the building and site itself ran about $12,160,000 with the solar/Photovoltaic costs adding an additional $2,753,124. Bringing the total construction costs to a little under $15 million. As the building is 77,466 sq ft, that breaks down to approximately $193 per sq ft. One note though, as this is a net zero building.

2.4 Social Sustainability in Architecture

Relation to Community

The School model of development is placing an increasing burden on the planet. In order to secure the future of youth all over the world, we need to make a decisive move towards sustainable development.

Schools have a special role to play in preparing young people to build a brighter future.

The places of learning, they can help pupils understand the impact on the planet and encourage them to weigh up the evidence themselves. As models of good practice, they can offer young people the chance to contribute to sustainable living, and demonstrate good practices to others.

Empowering young people to take responsibility for their own future is not only desirable: it is a crucial feature of their education.

2.4.1 Case Study for School with Community

Sickla Kunskapsgalleria, Nacka, Sweden

This shool is a new concept for education, mixing private and municipal teaching at upper secondary and post-upper secondary level, and coupling this with other activities. To this end, the centre offers a restaurant, café, municipal services and so on.

The school building has capacity for over 1200 students and other users, and constitutes a targeted development of the area as a meeting place. Education can now

be added to the existing elements in the form of shops, services, work and culture. Externally, the school has a different look from different directions. Balconies run along the full length of the building on this side. These have several functions: to reduce the scale of the building, provide sun screens, create outdoor spaces for tenants and provide evacuation routes.

Figure 2. 67 Computer room can use after the school time.

"www.worldarchitecturenews .com"

Figure 2. 68 Cultural center. The interior creates the impression of an active studio with flexible, light spaces that can easily cope with the changes and lively activities of such an environment.
"www.worldarchitecturenews.com"

Figure 2. 69 Along the entrance facade is a large split-level room with space for information services and so on, plus the outward-facing restaurant.
"www.worldarchitecturenews. com"

2.4.2 Case Study for Social Spaces in the School

Orestad College- København, Danmark

Orestad School focuses on student interaction, Social spaces and opportunities to learn from each other

"On each floor of the school building a large cylinder contains an AV room and, above it, a terrace for relaxation and individual work, supplied with colored cushions. At the center of the school a helicoidal staircase clad in light oak connects all four floors: it is the fulcrum of circulation for the students, but also a place of socializing, to see and be seen. Three maxi-columns support the whole structure, along with an irregular grid of smaller columns. On each level, then, the fixed architectural elements are few in number, while all the furnishings, to different extents, can be repositioned to meet the needs of different groups. The space reflects the most advanced international trends in education, which call for dynamic spaces in close contact with

everyday life, facilitating communication and interaction. The main goal, fully achieved by the project by design office 3XN, is to reinforce the capacities of individual students to supervise their own work, both independently and in teams. Elevation of the school designed by, with chromatic modulations in the system of semitransparent glass shutters; the interior spaces with, in the foreground, the study and relaxation area at the top of a circular room"[1].

Figure 2. 70 The secondary school reform with its added emphasis on strengthening and improving students' academic proficiency, giving students an active responsibility for their own learning, creating a better springboard for them to move on to university." Available: http://images.google.com/imghp".

Figure 2. 71 The rotation opens a part of each floor to the vertical tall central atrium and forms a zone that provides community and expresses the college's ambition for interdisciplinary education.

"http://www.e-architect.co.uk/copenhagen/orestad_gymnasium.htm".

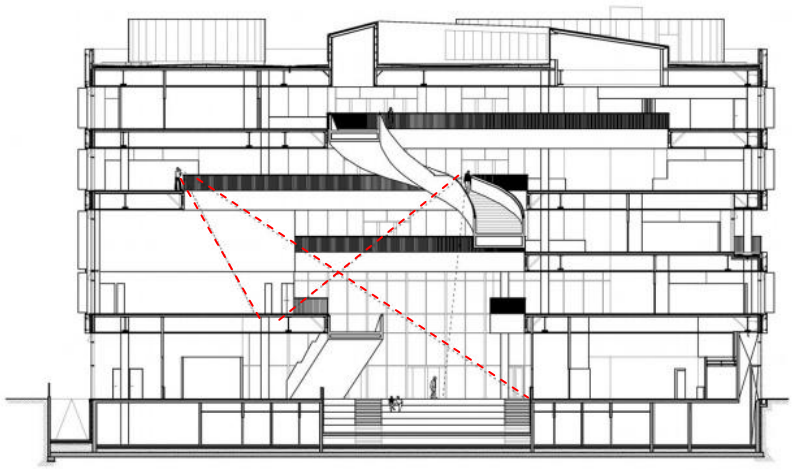


Figure 2. 72 Section in orested school. The school is interconnected vertically and horizontally. "Available: http://www.e-architect.co.uk/copenhagen/orestad_gymnasium.htm".

The building consists of four boomerang shaped decks which overlap in incremental rotation. The four study zones are accommodated on each their level with a spatial layout that caters for varying learning environment needs. The central staircase is the heart of the college is social and work / study life; the primary 'highway' up and down through the building and the place to linger – for seeing and

[1]Available: http://www.e-architect.co.uk/copenhagen/orestad_gymnasium.htm- 2 Dec 2008

being seen. The open spaces are supplemented by sections of innovative 'space division furniture', making it possible to create flexible, temporary spaces and learning environments for any size of group.[1]

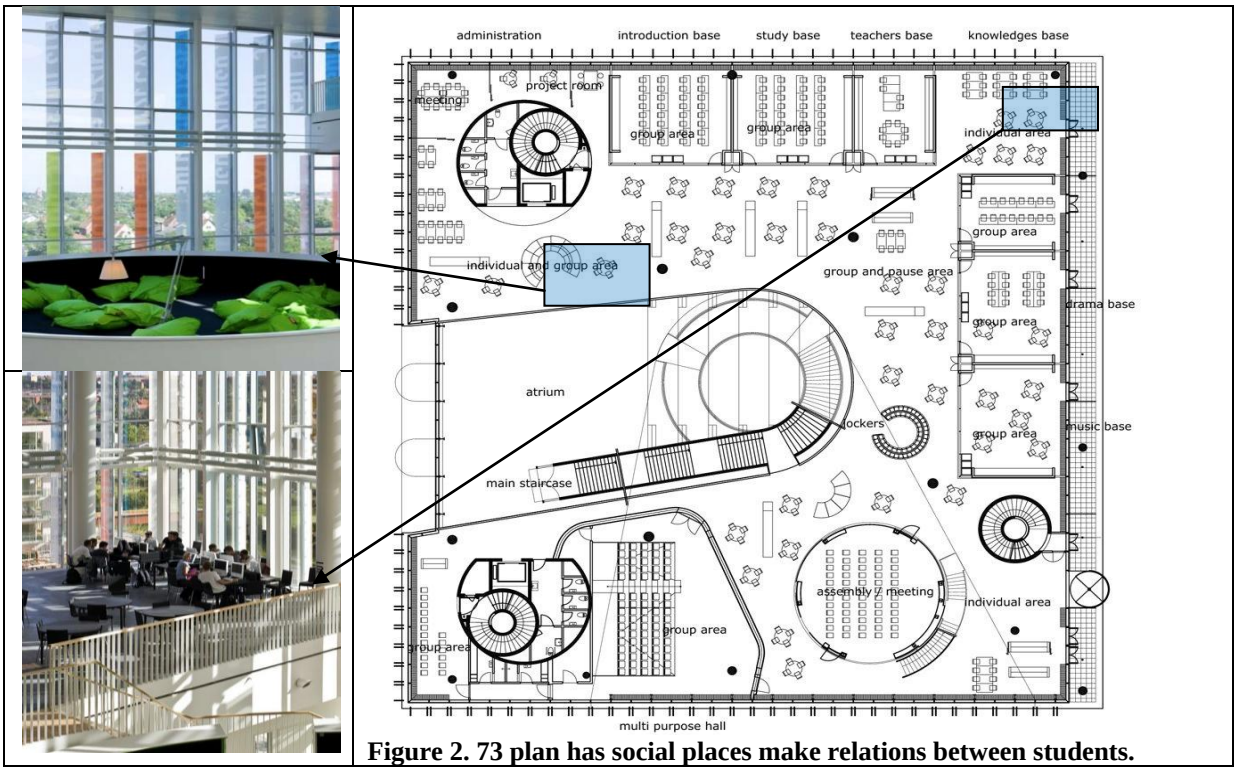


Figure 2. 73 plan has social places make relations between students.

The school open, flexible spaces permit a high degree of interaction that generates a better ambience for working and learning, encouraging students to take active responsibility for their own learning process and their collective working environment.

The design brief was worded to avoid reference to the traditional spatial layout. The school is the result of a research based design process – a journey towards a physical structure to support the visions of knowledge sharing, interdisciplinary co-operation and competencies. The overall vision was to combine large, open spaces with a high degree of familiarity and belonging on a smaller scale. It is a functional working environment – yet there are plenty of nooks and crannies for relaxation and contemplation.

[1]Available: http://www.e-architect.co.uk/copenhagen/orestad_gymnasium.htm- 2 Dec 2008

2.4.3 Case Study: Langley Academy, Slough, United Kingdom:
School is a museum and an Educational building

"The Langley Academy is an exemplar of sustainable design, a theme which is showcased by the building itself. The school's curriculum highlights science and is the first academy to specialize in museum learning. As well as running its own museum, ancient artifacts and objects are brought into the classroom to spark questions, debate, and analysis and provide connections across the curriculum. The scheme also provides unparalleled access to significant cultural institutions across the country, involving hundreds of students.

With an enclosed full-height atrium at the heart of the three-storey building, the social life of the school revolves around this assembly space for 1,100 students. The school atrium is defined by a sense of transparency and openness – like a gallery of learning which in this case also resonates with the museum theme. Inside the atrium there are three yellow drums raised above the floor on circular columns.

The environmental features save 20% in water consumption and approximately 150 tones of CO2 / year compared to a traditional academy and are used in the teaching of science and environmental issues.

Students can see the solar collectors on the roof and the workings of the exposed plant room, as well as the network of pipes that illustrate how energy is generated and carried through the building.

Rain water is collected and stored and grey water filtered for reuse in sanitation and irrigation; a system of horizontal louvers provides shade; and the building has been configured to allow out-of-hours use by the wider community, ensuring its sustainability over time"[1].

[1] Available: http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/

Figure 2. 74 Classroom from corridor. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 75 interior for the school. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 76 from inside the classroom. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 77 Lobby Entrance. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 78 The atrium is defined by a sense of transparency and openness – like a gallery of learning – which in this case also resonates with the museum theme. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 79 Dinosaurs: Langley academy puts exhibits at the heart of everything. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 80 horizontal louvers provide shade. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 81 Computer lab. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Figure 2. 82 Solar panels. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

"Environmental performance and appearance are indivisible at The Langley Academy. The school pioneers a revolutionary new educational concept which draws on the theme of museums and galleries, so that the school itself is like an exhibit, with

its physical manifestation a showcase and educational tool for environmental design" [1]Nigel Dancey[2] said.

Built largely from sustainable materials such as wood, the Academy has been designed with a view to improving its energy performance as it matures and it has the infrastructure in place to add further energy saving measures. Currently, active measures include a biomass boiler that uses locally sourced woodchip – this is the lead boiler producing both heating and hot water. There are also solar collectors and thermal tubes for hot water and a ground source heat pump lying 90m below the surface. This will extract heat from deep under the school and use it for under floor heating in the restaurant and the atrium spaces.

The two teaching wings have different water saving devices for comparison purposes. There is a separate pipe system that collects water from the wash hand basins for recycling, which is filtered and used for irrigating the plants and watering lawns. Rain water is used to flush the toilets. Infrastructure has also been put in place for a reed bed, allowing the Academy to grow more environmentally friendly over time". [3]

Finally ,the school is the first academy to specialize in museum learning. As well as running its own museum, ancient artifacts and objects are brought into the classroom to spark questions, debate, and analysis and provide connections across the curriculum.

2.5 Sustainable Materials

Sustainable school designs should give preference to materials that reduce environmental impact over their cycle. School management must have experience of evaluating materials performance, advising on the best solutions for thermal efficiency and occupant comfort.

[1] http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/.(Accessed:2010).
[2]senior partner and design director at Foster + Partners (Accessed:2010).
[3] http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/.(Accessed:2010).

Typically, passive solar building designs incorporate materials with high thermal mass that retain heat effectively and strong insulation that works to prevent heat escape.[1]

2.5.1 Reduce, Reuse, Recycle

Three strategies to reduce waste as defined:

Source reduction is the practice of designing, manufacturing, purchasing, or using materials (such as products and packaging) in ways that reduce the amount or toxicity of trash created.

Reuse stops waste at its source because it delays or avoids that item's entry into the waste collection and disposal system.

Recycling converts materials that would otherwise become waste into valuable resources.

On every project it considers the overall efficiency of the structure and the type of materials involved, ensuring that it limits the amount of waste that is sent to landfill. This enables us to deliver buildings with embodied energy and future carbon footprint in mind.[2]

Figure 2. 83 Langley Academy, Slough, United Kingdom Sustainable material (wood) at elevations. "http://www.topboxdesign.com/langley-academy-in-slough-united-kingdom/".

Case Study 1- The Wales Institute for Sustainable Education

The Wales Institute for Sustainable Education (WISE) demonstrates sustainable building in such a way that the structure itself is exposed as part of the education process. A rammed earth lecture theatre, made with a highly sustainable mix of clay,

[1] John Ringel., University of Michigan, Sustainable Architecture, Waste Prevention
[2] Green Building Education services, (2009).

sand, water and aggregate, built up in thin layers before being tamped down to form the walls, forming a natural alternative to a concrete or steel building. The other buildings are all timber frame, built with sustainably sourced timber. The designer provides a natural, low carbon means of insulation.

Figure 2. 84 The Wales Institute for Sustainable Education combines renewable technology with natural building materials.

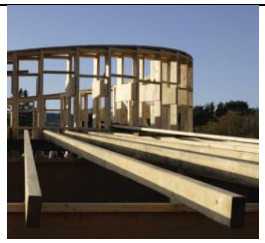


Figure 2. 85 A rammed earth lecture theatre made with a highly sustainable mix of clay, sand, water and aggregate.

Figure 2. 86the buildings built with sustainably sourced timber. The designer provides a natural, low carbon means of insulation.

2.6 Waste Management

"Waste takes the form of spent or useless materials generated from households and businesses, construction and demolition processes, and manufacturing and agricultural industries. These materials are loosely categorized as municipal solid waste, construction and demolition (C&D) debris, and industrial or agricultural by-products. Sustainable architecture schools focuses on the on-site use of waste management, incorporating things such as grey water systems for use on garden beds, and composting toilets to reduce sewage. These methods, when combined with on-site food waste composting and off-site recycling, can reduce a school's waste to a small amount of packaging waste".[1]

Waste Management has been recycling many materials, including

1. Paper .
2. Organics.
3. Glass.
4. Metals.
5. Plastics.
6. E-Waste.
7. Construction and Demolition Waste.
8. Coal Combustion Residuals.[2]

[1] John Ringel., University of Michigan, Sustainable Architecture, Waste Prevention
[2]Available: http://www.wm.com/sustainability/pdfs/2010_Sustainability_Report.pdf (Accessed:2009)

2.7 Water Management

2.7.1 Rainwater Management: Water management is an interdisciplinary field concerned with the management of water resources. Schools are concerned with ensuring that a supply of clean, potable water will be available to students who need it, while balancing the needs of industry and the environment. A number of different topics fall under the umbrella of water management, from sewage treatment to wetlands restoration. Many national governments have departments, which are in charge of water management, and regional governments often have smaller offices of their own to focus on this issue.[1] Rainwater harvesting and grey water reuse is some of the possibilities for reducing water demand.

2.7.1.1 Case Study- Sidwell Friend's School[2]

Not merely an eco-ornament, it's a machine that "manages all the wastewater generated by the building, as well as all the rain water that falls on the site.

Just as with wastewater, managing urban storm water typically involves massive infrastructure to dispose runoffs as efficiently and as quickly as possible. In addition to being a drain on municipal coffers, such a method is known to increase the probability and the intensity of a flood event during major storms, endangering human life and property.

[1] www.wisegeek.com/what-is-water-management.htm

[2] Andropogon Associates, architects Kieran Timberlake Associates and Natural Systems International, (2010),

, The wetland "machine" of Sidwell Friends Middle School, , Andropogon Associates, Avilable : "http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html". (Accessed :2010).

Figure 2. 87 Water management at sidewall friend's school is treated school wastewater on site and recycles it for gray water use in the building. "Available: http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html(Accessed :2009)**".**

Moreover, since storm water isn't allowed to remain where it falls, (1) water doesn't have enough time to infiltrate the soil and seep into waiting, possibly depleted groundwater aquifers, and (2) what may have been clean at first contact with the surface undoubtedly will not remain so as it moves through sidewalks, roads, parking lots and sewers before going on to pollute rivers, lakes and other sources of our drinking water. [1]

[1] Andropogon Associates, architects Kieran Timberlake Associates and Natural Systems International, (2010),

, The wetland "machine" of Sidwell Friends Middle School, , Andropogon Associates, Available : "http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html". (Accessed :2010).

Figure 2. 88 View from top of the wetland terrace towards the new building extension. "Available : http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html(Accessed :2009)".

Figure 2. 89 Two students on the border between the rain garden and the pond. "Available : http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html(Accessed :2009)".

Figure 2. 90 Site plan. "http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html".Site plan:[1]
1. Existing Middle School.
2. Middle School addition with green roof.
3. Trickle filter with interpretive display.
4. Wetlands for wastewater treatment.
5. Rain garden.
6. Pond.
7. Outdoor classroom.
8. Butterfly meadow.
9. Woodland screen at neighborhood edge.
10. Playground. "
Available : http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html(Accessed :2009)".

[1]Available : http://pruned.blogspot.com/2009/06/wetland-machine-of-sidwell.html (Accessed :2009)

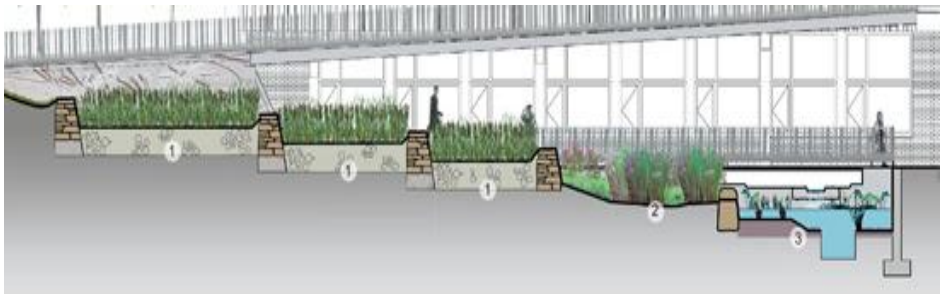


Figure 2. 91 Section cut through the :

1. Tiered wetlands used for wastewater treatment.

2. Rain garden. 3. Pond.
"http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html".

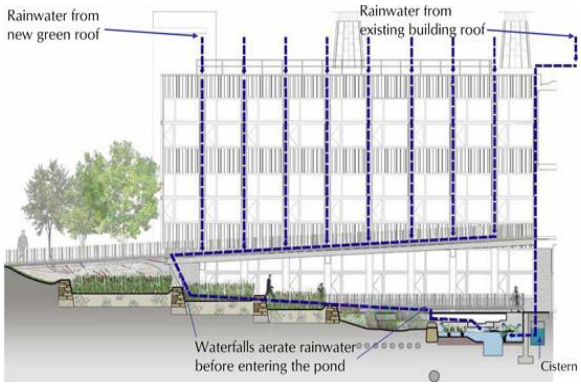


Figure 2. 92 Flow diagram of storm water runoff. Image by Andropogon Associates, Some of the runoff gets in an underground cistern. During dry weather, this storage tank provides water to the pond. During heavy rains, excess water flows from the pond into the rain garden, simulating the hydrological dynamics of a floodplain environment. Water seeps through the soil and gets naturally filtered.
"http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html".

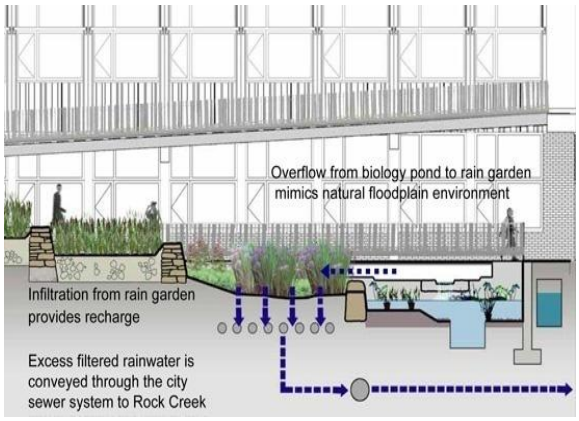


Figure 2. 93 (Flow diagram of storm water runoff from pond to rain garden.
"http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html".

Wastewater, storm water and domestic hot water management schematic at sidwell friend's school : This project describes as a "working landscape" but it might prefer calling it an "event landscape," wherein natural processes are co-opted into a cybernetic amalgam of landscape, architecture, geology, biology and institutional pedagogy. Rather than in the inaccessible subterranean voids and in scientific abstractions, this eco-machine is made to perform out in the open for the edification of the elite who, in their dirty, smelly, real-world engagement with the landscape, will hopefully turn into great stewards of the earth. [1]

[1] Andropogon Associates, architects Kieran Timberlake Associates and Natural Systems International, (2010),

2.7.2 Cold Seawater Air Conditioning

Seawater Air Conditioning (SWAC) takes advantage of available deep cold seawater instead of energy-intensive refrigeration systems to cool the chilled water in one or more buildings.

SWAC Basics

A seawater air conditioning system is illustrated below. The buildings to the far right are identical internally to buildings cooled with conventional A/C. Chilled fresh water moves through these buildings with the same temperatures and flows of conventional systems. A conventional chiller, however, does not cool the chilled water loop in this system. The low temperatures in the chilled water loop are maintained by passing this fresh water through a counter-flow heat exchanger with the primary fluid being deep cold seawater. The two fluids are on either side of a titanium plate that transfers the heat from one fluid to the other or do not mix.

The seawater intake brings in water at a temperature lower than the temperature maintained in the chilled water loop. Once the seawater passes through the heat exchanger(s), it is returned to the ocean through another pipeline. [1]

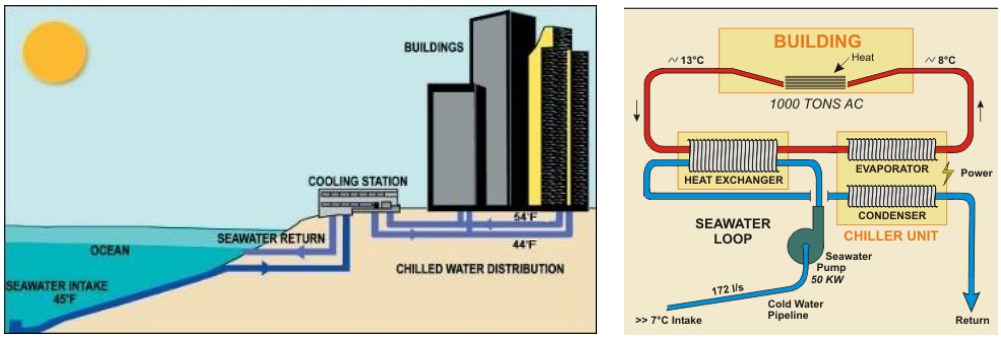


Figure 2. 94 Centralized sea water air conditioning. "available: www. inpipeline.com, accessed 2009"

Seawater Air Conditioning (SWAC) can apply in Egypt schools which beside Mediterranean sea & Red sea.

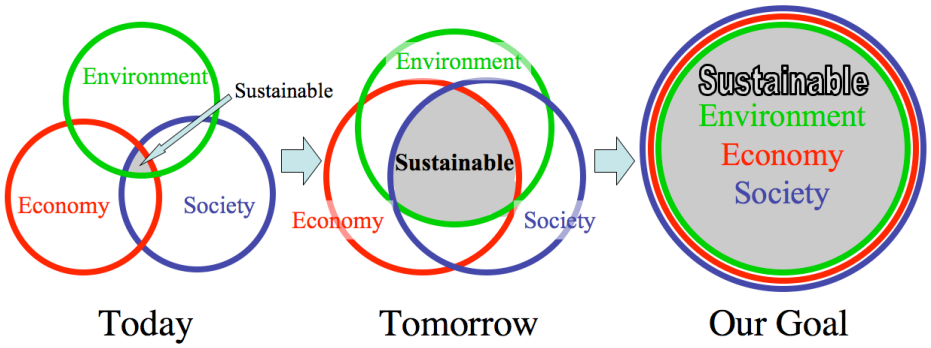
The wetland "machine" of Sidwell Friends Middle School, , Andropogon Associates, Avilable : "http://www.solaripedia.com/13/304/3452/sidwell_friends_wetlands_diagram.html". (Accessed :2010).

[1] www.makai.com

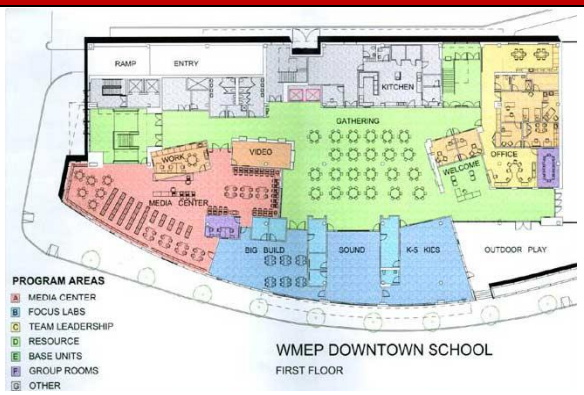
Conclusion:

Sustainable Architecture

Sustainability Definitions:



	Sustainable Architecture	
Sustainable Design	1-Good Clear Organization 2-Spaces 3-Circulation 4-Good environ-mental conditions 5-Attractive-ness in design 6-Good use of the site 7-Attractive external spaces 8-layout 9-materials 10-Flexible design	Sustainable school design is applied good sense, an aspiration to build to the highest quality and functional standard now and in the future. The maximum environmental and social benefit and with cost assessments that reflect the completely building life cycle such that investment can be properly maintained. **Sustainable school has shared spaces with the community.**
Sustainable in Energy	1-Renewable Energy Solar Energy Wind Energy Heat pumps 2-Heating,Ventilation&Cooling Systems Efficiency 3-A zero energy building (ZEB)	Renewable energy is energy which comes from natural resources such as sunlight, wind, rain, ocean, hydropower, tides, and geothermal heat, which are renewable (naturally replenished). Egyptian government need to start applying the renewable energy at the future buildings especially at schools buildings, that's to face the Climate change concerns, coupled with high oil prices, peak oil.



Social Sustainability

Sustainability for school community is a dynamic process that enables all the students and the community to realise their potential and improve their quality of life in ways.

1-The School's curriculum highlights science, is the school to specialize in museum learning.

2- Schools now focuses on student interaction, Social spaces and opportunities to learn from each other. The space reflects the most advanced international trends in education, which call for dynamic spaces in close contact with everyday life, facilitating communication and interaction.

3- This is a new concept for education, mixing private and municipal teaching at upper secondary and post-upper secondary level, and coupling this with other activities. To this end, the centre offers a restaurant, café, municipal services and so on.

Sustainable Materials

Reduce, Reuse, Recycle

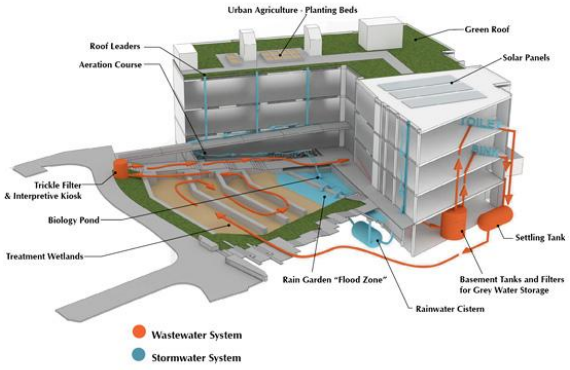
Sustainable designs should give perfence to materials that reduce environmental impact over their cycle.School management must have experience of evaluating materials performance, advising on the best solutions for thermal efficiency and occupant comfort.

Building Placement

Most building should avoid suburban sprawl in favor of the kind of light urban development articulated by the New Urbanism movement. Careful mixed use zoning can make commercial, residential, schools, and light industrial areas more accessible for those traveling by foot, bicycle, or public transit, as proposed in the Principles of Intelligent Urbanism.

Water Management

Water management is the management of water resources. Schools are concerned with ensuring that a supply of clean, potable water will be available to students who need it, while balancing the needs of industry and the environment. under the umbrella of water management, from sewage treatment to wetlands restoration. National governments have departments, which are in charge of water management, and regional governments often have smaller offices of their own to focus on this issue.Rainwater harvesting and grey water reuse is some of the possibilities for reducing water demand.



Chapter Three

Design Criteria of Sustainable School

Chapter Three: Design Criteria of Sustainable School

3.1 Definition of Sustainable School

3.1.1 High Performance School

3.2 CABE

3.2.1 The Importance of Good Design

3.2.2 Main Goals of Sustainability in School Design

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3.3.1 What's LEED

3.3.1.1 LEED for Schools

3.3.2 LEED for Existing Buildings: O&M Rating System Credit Categories

3.3.3 West Brazos Junior High School

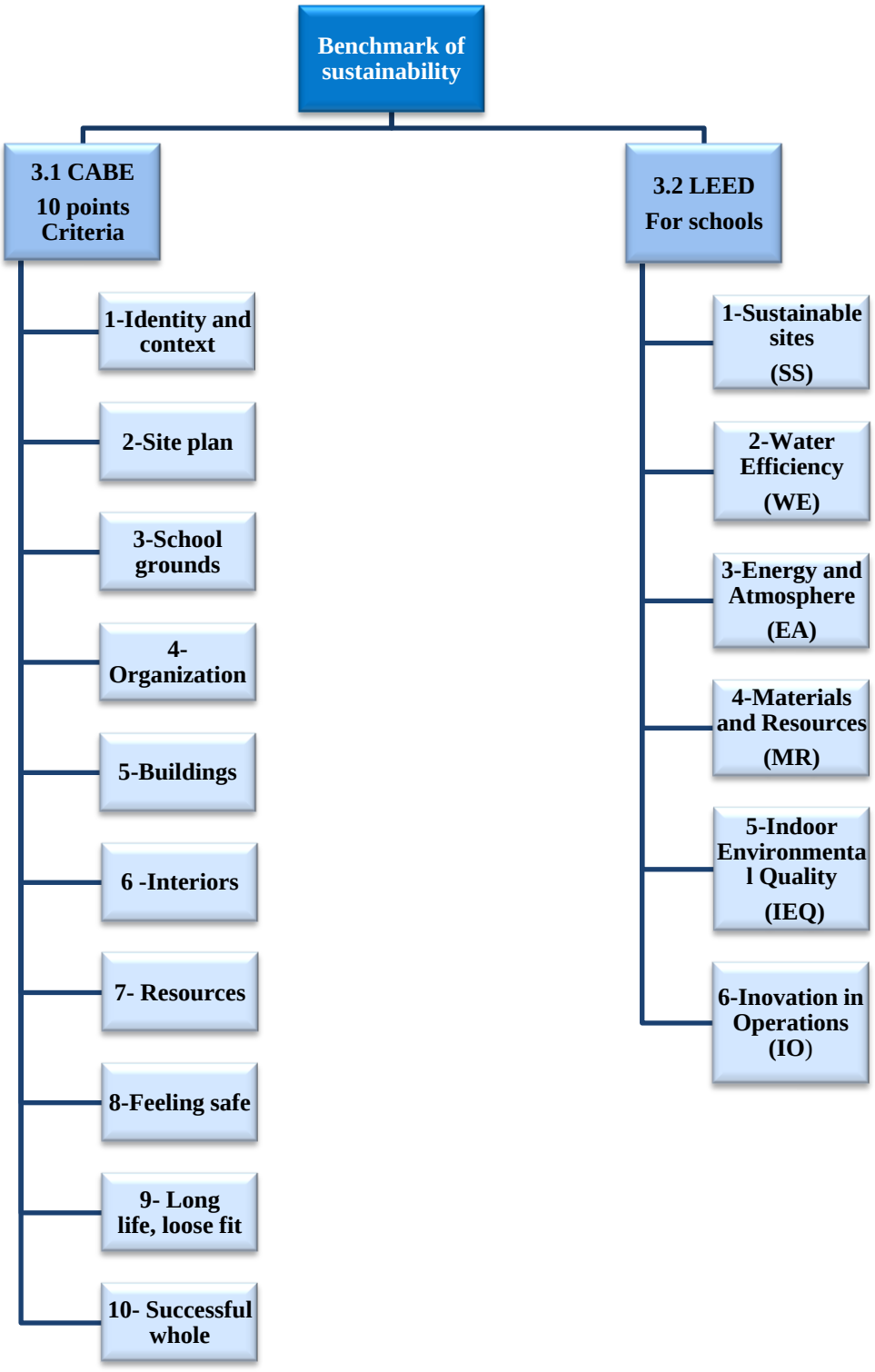

Diagram 3. 1 Benchmark of sustainability. "Researcher"**.**

3.1 Definition of Sustainable School

“Whether it is termed "Sustainable", "High Performance", "Green", or "Environmentally-friendly", is the design will be sustainable in the future, people have varied notions about what sustainable building and schools means. Some think the sustainable schools means saving energy. Others think it means protecting the environment. While these are important aspects of sustainability at school buildings, but they are not sufficient to describe it, because sustainability has a human dimension as well, for the students and teachers at the school buildings.

Sustainable school building can provide improvements in lifestyle, comfort, satisfaction, and health along with protecting ecosystems and saving energy and resources. It integrates the project designing, planning, and engineering, in order to work with, not against nature. Sustainable school building practices incorporate nature's "free" services (wind, sun, thermal properties, greenhouse principles, light, etc.) to create a high quality indoor environment while circumventing as much damage to the ambient environment as possible". [1]

3.1.1 High Performance School

"High Performance School" refers to the physical facility. Good teachers and motivated students can overcome inadequate facilities and perform at a high level almost anywhere, but a well-designed facility can truly enhance performance and make education a more enjoyable and rewarding experience. A high performance school is healthy; thermally, visually, and acoustically comfortable; energy, material, and water efficient; safe and secure; easy to maintain and operate; commissioned; has an environmentally responsive site; is a building that teaches; a community resource; is stimulating architecture; and is adaptable to changing needs”. [2]

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[1] State of California (2008), Sustainable Schools-Introduction to Sustainability,Available : www.sustainableschools.dgs.ca.gov/SustainableSchools/introduction.html -(Accessed: Wednesday, March 30, 2010).

[2]John Sorrell CBE Chair, (2007), cabe, Creating excellent secondary schools, a guide for clients.

High performance school is the sustainable school; the research will use CABE guidelines for the study of sustainable schools.

3.2 CABE "Commission for Architecture and the Built Environment"

"CABE is a national body in UK, almost everything they do is local. They work on behalf of the public and they want to inspire public demand for good design, helping people (student & Teachers) to shape the look and feel of places where they live and learn. They have built a large, strong network of local design advisers, all leaders in their professions – architects, planners, engineers, landscape architects, urban designers and surveyors. They give advice that is specific to each place."[1]

"At UK, there is project BSF "Building Schools for the Future" CABE is supporting those involved in the BSF program by:

- Advising local authorities on the procurement process.
- Assessing school designs.
- Training school leaders and client design advisors.
- Offering guidance and research.
- Reviewing designs put forward by bidders during the Competitive stage of BSF.

Through all of this work, they have acquired a wealth of knowledge about the processes involved in school building projects. To bolster their schools design advice, they have recently established a schools design assessment panel – a group of specialist experts offering detailed advice on school building designed through BSF. The research is trying to understand the criteria of design from CABE"[2].

[1] John Sorrell CBE Chair, (2007), cabe, Creating excellent secondary schools, A guide for clients.
[2]John Sorrell CBE Chair, (2007), cabe, design champion, Available : http:/www.cabe.org.uk/files/building-schools-for-the-future-role-of-a-design-champion.pdf (Accessed : 2008).
Building Schools
for the Future

Egypt needs national bodies to develop the Egyptian Schools. The research will discuss the Criteria of CABE and the possibility to apply these criteria in Egyptian schools to become High performance schools and sustainable Educational Building.

3.2.1 The Importance of Good Design

Good design is about providing schools and spaces that are fit for purpose and built to last, but also lift the spirits of everyone who uses them.

The design of schools can promote the performance of pupils and a more creative approach to teaching and learning. [1]

Figure 3. 1 Designer from CABE with the students; it is the best way for best design for the school. "Available: www. Cabe.org.uk (Accessed 2006)".

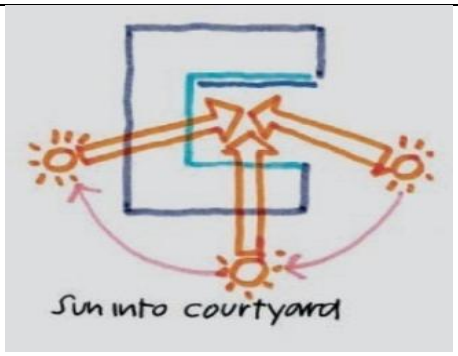


Figure 3. 2 starting with Design concept and orientation are considered the way to sustainable school. "Available: www. Cabe.org.uk (Accessed 2006)".

A UK study of pupil performance found that capital investment in school buildings had a strong influence on staff morale, pupil motivation and effective learning time.[2]

Studies on the relationship between pupil performance, achievement and behavior and the built environment have found that test scores in well-designed buildings were up to 11% higher than in poorly designed buildings.[1]

[1] John Sorrell CBE Chair, (2007), cabe, design champion, Avilable : http:/www.cabe.org.uk/files/building-schools-for-the-future-role-of-a-design-champion.pdf (Accessed : 2008).

[2]Price water house Coopers, Research Report No 242, Building performance: an empirical assessment of the relationship between schools capital investment and pupil performance, Department for Education and Skills (DfES),London, 2000

Good design can help recruit and retain staff, cutting the costs of staff turnover. And, in another education sector, around 60 % of students and staff have indicated that the quality of building design affected their choice of university.[2]Good design makes public services easier to deliver and so improves productivity. At one school, the redesign of the playgrounds and school hall allowed supervisors to see the students easily in communal areas.

Although well-designed environments can undoubtedly support successful teaching and learning, no one would suggest that design alone can raise educational achievement. However, poor design can be an obstacle to raising educational standards above a certain level.

3.2.2 Main Goals of Sustainability in School Design:

- "Result from a well understood, and organization-wide, proactive commitment to engage in sustainable development as a positive social and economic driver.
- Meets the functional needs of the school and integrates with the wider community through consideration of shared and communal facilities and mixed-use development.
- Recognizes people as the most important assets of a school
- Enhances the teaching and learning environments through healthy and vibrant internal environments including excellent levels of natural light and ventilation and quality external environments that facilitate outdoor activities
- Does not endanger the health of the occupants, or any other parties, through exposure to pollutants, the use of toxic materials or providing host environments to harmful organisms
- Is responsive to local community needs, requirements and aspirations,

[1]The value of good design, CABE, London, 2002
[2]John Sorrell CBE Chair, (2005), cabe, Design with distinction: the value of good design in higher education, CABE, London.

- Enhances biodiversity locally by landscaping based on best practice guidance and globally by not using materials from threatened species or environments.
- Does not cause unnecessary waste of energy, water or materials due to short life, poor design, inefficiency or poor construction and manufacturing procedures
- Uses materials that are environmentally benign in manufacture, use and disposal
- Is affordable to run and simple to manage and maintain in a benign manner.
- Does not consume a disproportionate amount of resources, including land during construction, use or disposal
- Uses renewable and recycled and recyclable resources wherever possible
- Has a green travel plan at inception to create minimum dependence on polluting forms of transport and encourage access to, and the development of, safe, non-polluting and sustainable forms of transport.
- Is flexible to facilitate changes in demographics and technology and allows expansion or contraction in the future, where appropriate".[1]

3.2.3 The Design Quality Indicators

Design quality should be discussed, specified, evaluated and checked at various stages throughout the design and procurement process.

This will relate to things that can be scientifically measured, such as the level of daylight in a classroom, or to more subjective aspects such as the attractiveness of the building or how it makes you feel.

At the outset of the project, there are many factors to be considered and many individual views to be taken into account – not least the views and aspirations of the school community.

The design quality indicators are the things we look for in a well-designed building.

[1] John Sorrell CBE Chair, (2007), cabe, design champion, Available : http:/www.cabe.org.uk/files/building-schools-for-the-future-role-of-a-design-champion.pdf (Accessed : 2008).

They come under three main headings:

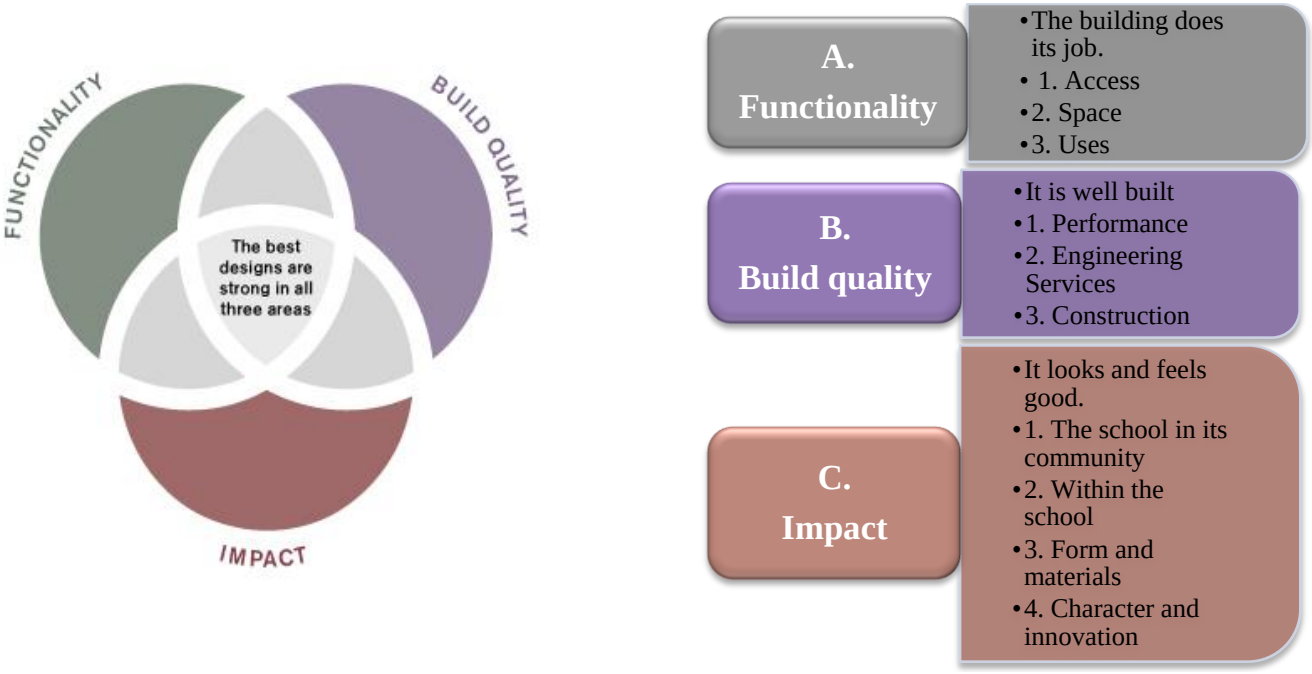


Diagram 3. 2 Venn diagram [1]

The best designs will be right at the centre, strong in all three areas, although not all for each of the main design qualities (functionality, built quality and impact) there are several things that are indicators of good design. [2]

The research will take the following criteria as framework points to make a new sustainable school and develop the current school buildings to be sustainable schools.

[1] Venn diagrams or set diagrams are diagrams that show all hypothetically possible logical relations between a finite collection of sets (aggregation of things). Venn diagrams were conceived around 1880 by John Venn.
[2] Ben Spencer,Head of Education, (February 2006), buildings and spaces: learning from every angle, issue 9, page.7,8

3.2.4 Criteria for Successful Sustainable School Design

The following CABE 10 points are the criteria against which each design is assessed in the research. The sub points are indicators of the success of a design and are the primary issues considered when scoring a scheme in relation to each of the criteria.Because design issues vary widely between sites and projects, this is not a conclusive list. [1]

The following criteria provide a framework for reviewing design proposals for school renewal projects.

1. Identity and Context:

Making a school the students and community can be proud of:

The design of a place can create a sense of belonging, and reinforce local culture and identity so that people feel a sense of ownership and pride. Buildings and public spaces help to make places distinctive and inspiring.

Site Investigation

This sequence of drawings shows the factors affecting the site (relationship with the neighborhood). [2]

[1] John Sorrell CBE Chair, (2007), cabe, design champion, Avilable : http:/www.cabe.org.uk/files/building-schools-for-the-future-role-of-a-design-champion.pdf (Accessed : 2008).

[٢] http://www.cabe.org.uk/design-review/schools/identity-and-context-b

Figure 3. 3 Environment and access and views. "www.cabe.org.uk/design-review".

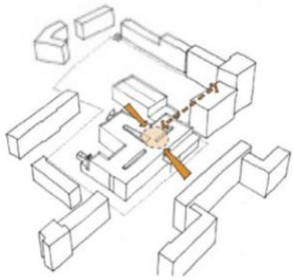


Figure 3. 4 Access-separate entrances. "www.cabe.org.uk/design-review".

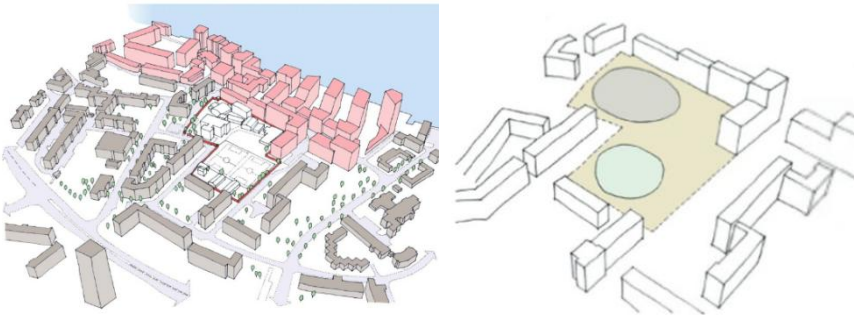


Figure 3. 5 Site as mediator-two polarized communities. Landscape spaces-different activities in the landscape. "www.cabe.org.uk/design-review".

Figure 3. 6 Density ,Shadows and Green spaces. "www.cabe.org.uk/design-review".

(Table 3.1) Identity and Context[1]		
School ethos and identity	**Relationship with neighborhoods**	**Civic character**
• Is the educational vision successfully manifested in the design? • Is the school design inviting to the local community? • Does the design respond and contribute positively to its locality? • If the school has a specialism, how has this influenced the design priorities? • Does the design help foster pride and ownership in the school? • Has the school ethos been defined? If so, how has this been expressed in the design? • How does the scheme promote inclusion? • How does the design of entrance express regard for the school community? • Is there a welcoming view of the school from the street? • Is there an element from an existing building that provides continuity of identity? • If the school is co-located do the individual schools require their own identity? • How do the school's community facilities respond to different patterns of access? • Is learning visible on arrival to give a good first impression?	• Does the design respond and contribute positively to its locality? • Does the design enhance the character of the neighborhood? • How does the massing of the design contribute to the adjacent streetscape or landscape? • How does the design improve local movement routes? • How does the design address planning issues? • How does the school relate to local buildings and landmarks? • How does the design impact on local views? • How does the proposal respond to the grain of the context? • How does the design relate to a holistic vision for the area?	• Does the scheme establish an appropriate civic presence for the school in the neighborhood? • Will the design strengthen the image of education locally? • How does the design communicate that this is a public building? • What will the first impressions of the building be? • How does the school relate to the street? • How does the school improve social cohesion in the community?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/identity-and-context-questions , Accessed (2008).

2. Site Plan

Site plan is making best use of the site-Criteria for good school design-Enhancing the character of the site.

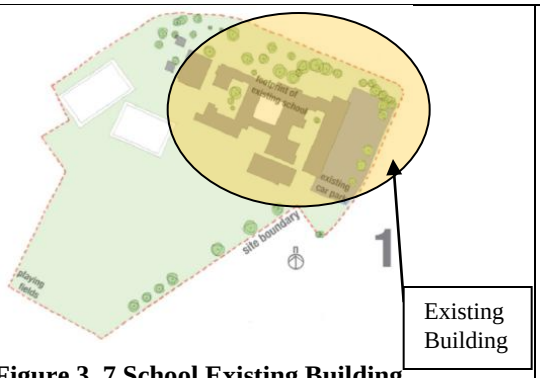


Figure 3. 7 School Existing Building. "Available: http://www.cabe.org.uk/design-review/schools/identity-and-context (Accessed 2009)".

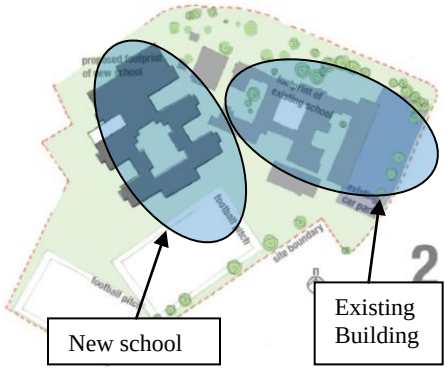


Figure 3. 8 The Existing Building and the new school. "Available:http://www.cabe.org.uk/design-review/schools/identity-and-context (Accessed 2009)".

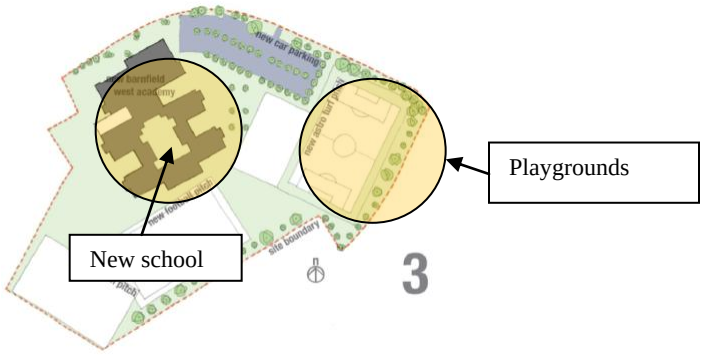


Figure 3. 9 Phasing diagrams – New school building is replacing the old building. "Available: http://www.cabe.org.uk/design-review/schools/identity-and-context (Accessed 2009)".

Working with existing site constraints and opportunities. This sequence of drawings shows how the project will be phased to retain the existing buildings during construction of the new school. In schemes that are more complex it can be useful to explain how the contractor's access will work during construction and show how the phasing avoids compromising the final design (working with existing site constraints and opportunities).[1]

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/identity-and-context". Accessed (2008).

(Table 3.2) Site Plan[1]		
Enhancing the character of the site	**Working with existing site constraints and opportunities**	**Strategic site organization**
• Does the design foster a sense of place? • How does the scheme enhance the topography and existing landscape features? • How does the scheme enhance the micro-climate and ecology of the site? • Does the scheme make the most of its position and views? • Does the scheme relate well to buildings outside the site? • Does the scheme provide shelter from the prevailing wind, rain and sun?	• How well does the design deal with site specific constraints and opportunities? • If the scheme is a refurbishment, what is the rationale for the retention of any existing buildings? • How has the design responded to the acoustic constraints of the site? • Does the proposed phasing work sensibly without compromising the final design? • Does the phasing allow the school to function during the construction period? • Does the scheme approach existing services and utilities sensibly? • Are there specific site issues that infringe on the site of the school buildings?	• Are the buildings, grounds and facilities arranged well on the site? • Does the configuration of buildings create positive internal and external spaces? • Are the external circulation routes clear and do they balance the needs of different users? • Does the design provide safe on-site pedestrian routes? • Is there a clear external circulation diagram? • What are the entrance sequences for users arriving by different modes of transport? • Are there discrete arrangements for deliveries and refuse collection? • Are routes to sports facilities safe throughout the year? • Is any car parking on the site unobtrusive? • How does the scheme create identifiable boundaries and security zones? • Have sensible routes to key areas of the grounds been planned to avoid disruption to learning spaces? • Do the entrance routes to the school link to local movement routes? • Are the buildings placed to achieve optimum orientation? Does the strategic vision for the site allow for future development?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/site-plan-questions ,Accessed (2008) .

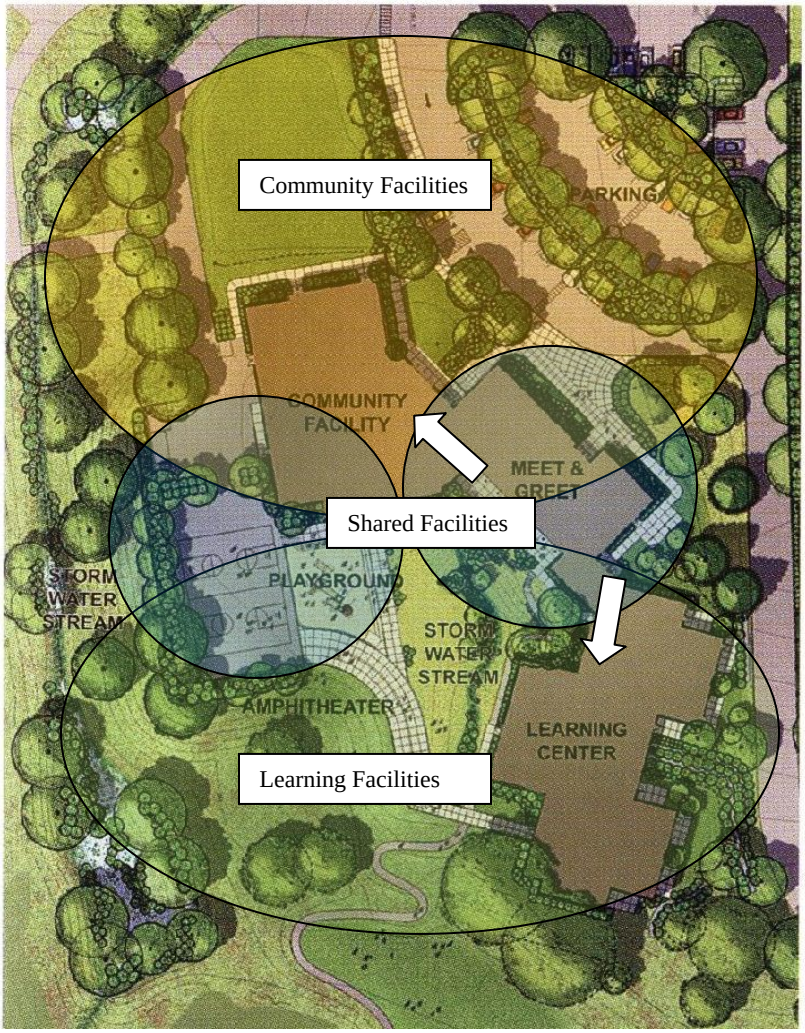


Figure 3.10 Site plan – Community facility and learning center at Eagle Rock school. "Sustainable school book". [1]

3. School Grounds

Making assets of the outdoor spaces

"The amount of recommended space for outdoor activity/play can vary significantly. It is best to provide at least the minimum required space, rather than no outside space at all. Compensation for lack of outdoor space with additional indoor activity space, in equal proportion to the outdoor requirement, is acceptable.

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

Given the constraints of building sites, particularly in urban or inner-city locations, outdoor space may not be possible. In such situations, designers must find inventive solutions for access to fresh air and sunlight. Any outdoor space, however small, can be important, providing release to the students, and offering a broad range of educational opportunities, even if not satisfying requirements for an outdoor area."[1]

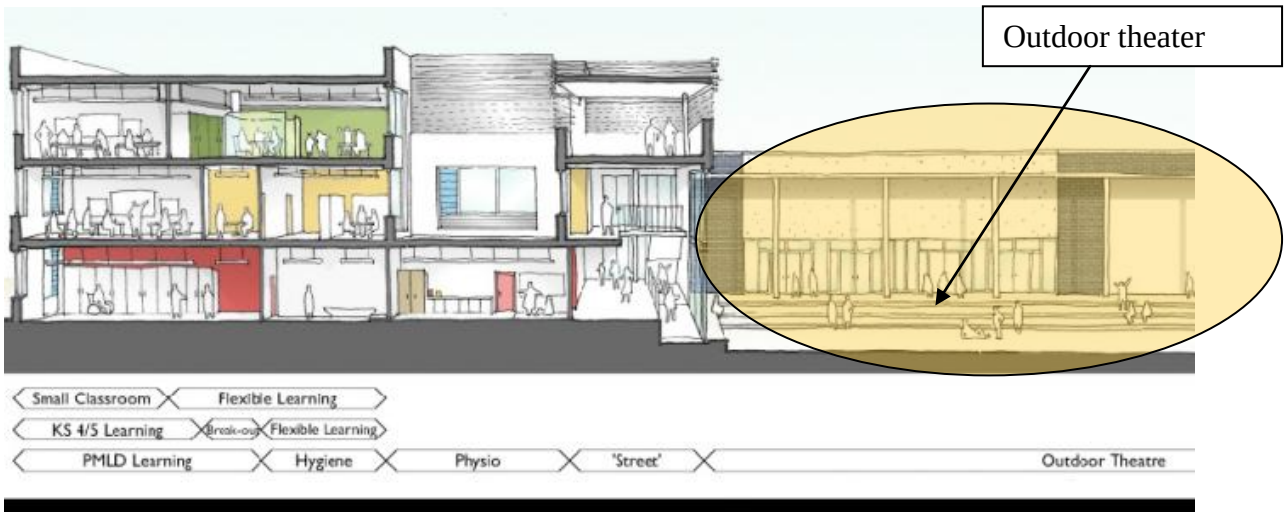


Figure 3. 11 Section-The drawing demonstrates the important role the grounds have in the design (relationship between the grounds and building). "http://www.cabe.org.uk/design-review/schools/site-plan".

The outdoor theatre space, which is adjacent to drama, also provides an informal social space for students (outdoor learning and social spaces and play).

Learning is about creating connections between students directly with the environment in which they live. The central courtyards expose students to art.

The school expands beyond the classroom by connecting the district's educational pedagogy with environmental sustainability.

The clear organization of the different functions suggests that the grounds would be memorable and change with the seasons.

[1] Building Type book for elementary and secondary schools Stephen A. Kliment, Series Founder and Editor BRADFORD PERKINS Perkins Eastman Architects PC JOHN WILEY & SONS, INC.New York,

(Table 3.3) School Grounds [1]			
Relationship between the grounds and the buildings	**Social spaces and play**	**Outdoor learning**	**Physical activity**
• Relationship between the grounds and the buildings • Do the grounds and planting contribute to creating a sense of place? • Does the design respond to the existing topography, climate and ecology of the site? • Have the outside spaces been designed in conjunction with the building form? • Is there strong structural planting with a coherent hierarchy? • Do the grounds support a sustainability strategy? • Does the scheme provide a rich sensory environment? • Will the school grounds change with the seasons? • Does the planting enhance the micro-climate to create habitable spaces? • Have the maintenance and management implications of the design been considered? • Are there views out over the surrounding landscape? • Are external shelters well-incorporated with the design to provide robust and practical transitions?	• Are outdoor spaces provided for a variety of different student social activities, interest ranges and group sizes? • Are there spaces which allow imaginative and creative play? • Are some social spaces sheltered from wind, rain and sun? • Are social spaces safe? • Does the design provide outdoor dining both formally and informally? • Is external seating and storage provided?	• Are there provisions for outdoor learning? • How do the outdoor learning spaces support the curriculum? • How do the learning spaces support the school's pedagogy? • Are there clear links between the indoor and outdoor learning environments? • Can food be grown in the grounds?	• Are there opportunities for a wide range of physical activities? • Are there opportunities for challenge and risk taking in the grounds? • Are sports facilities integrated into the overall landscape strategy? • Does the design maximize the area for sports pitches? • Has access to other local facilities been considered? • Do the grounds facilitate community use? • Can the areas for physical activity be easily used during the winter months?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/school-grounds-questions, Accessed (2008).

Figure 3. 12 Secondary School in Hong Kong has an excellent reputation in sports facilities. "www.wan.com"

Figure 3. 13 Choueifat secondary It's considered a physical space for sports."Researcher".

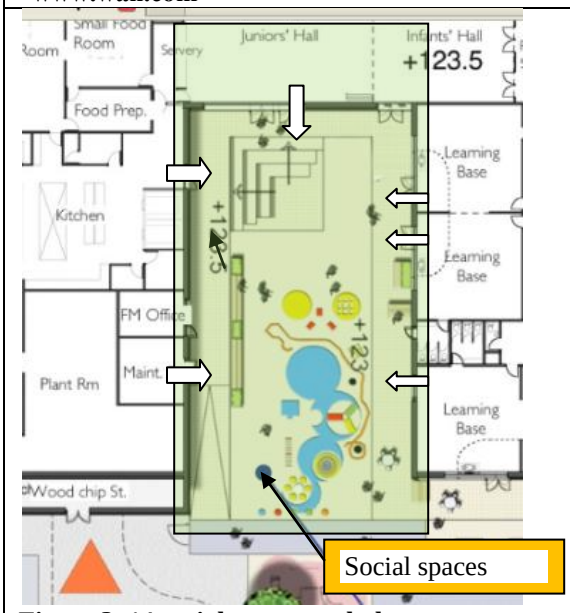


Figure 3. 14 social spaces and play spaces are between the school spaces. "http://www.cabe.org.uk/design-review/schools/site-plan".

Figure 3. 15 Benjamin franklin school has outdoor learning spaces in courtyards. "Sustainable school book". [1]

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

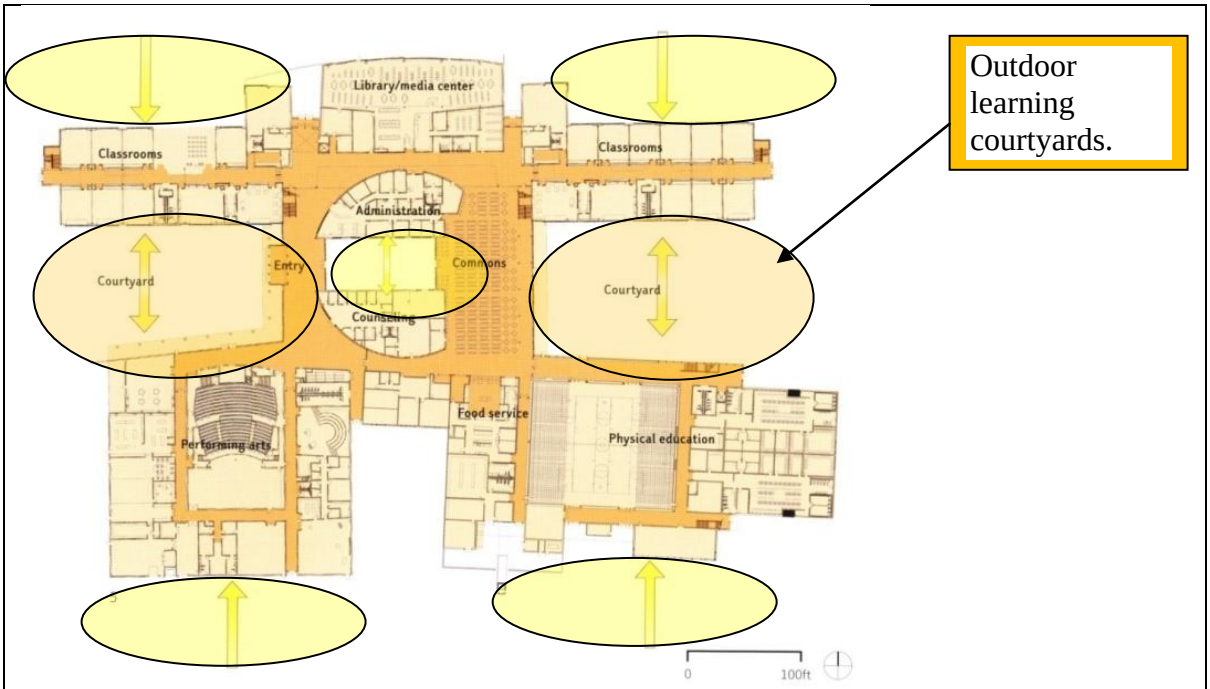


Figure 3. 16 Clackamas high school-first floor plan showing Social spaces and play outdoor paces along east –west oriented building masses. [1] "Sustainable school book". [2]

4. Organization:

Creating a clear diagram for the buildings

Criteria for good school design accommodating the educational agenda is this successfully accommodated in the internal arrangement of spaces.

Adjacencies between school program elements are determined by the following major factors:

A. Entry sequence: How do students enter school each day, and where do they go? Do they immediately report to a homeroom, or do they first gather in a larger area such as the gym or the cafeteria? How do staff and faculty enter the building? How does the public enter the building during the school day? Is central administration the security check point? How does the public enter the building for community events?

B. Internal circulation: During the school day, where do students have to go, and how often? Do they travel the corridors as a class, such as in secondary school, while

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.
[2] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

other classes are in session? Do they travel individually at each class period, such as in the upper grades? How much time is allotted between periods, and how far are the distances? How are student lockers used and distributed in the school?

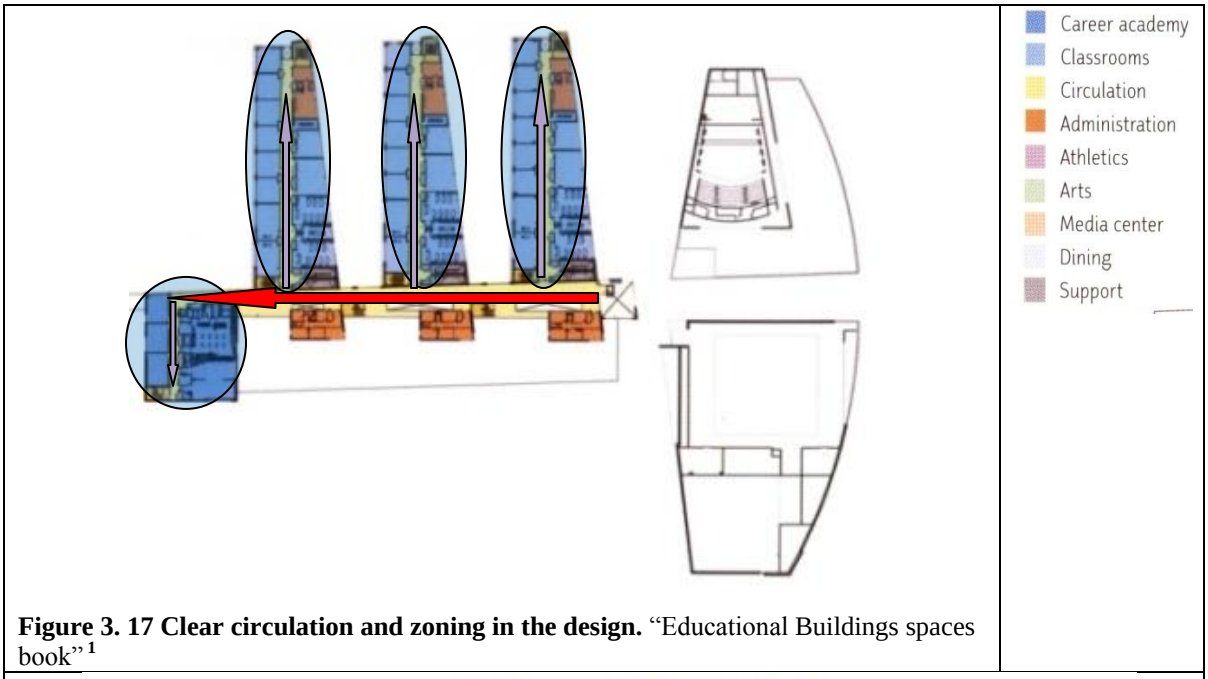


Figure 3. 17 Clear circulation and zoning in the design. "Educational Buildings spaces book" [1]

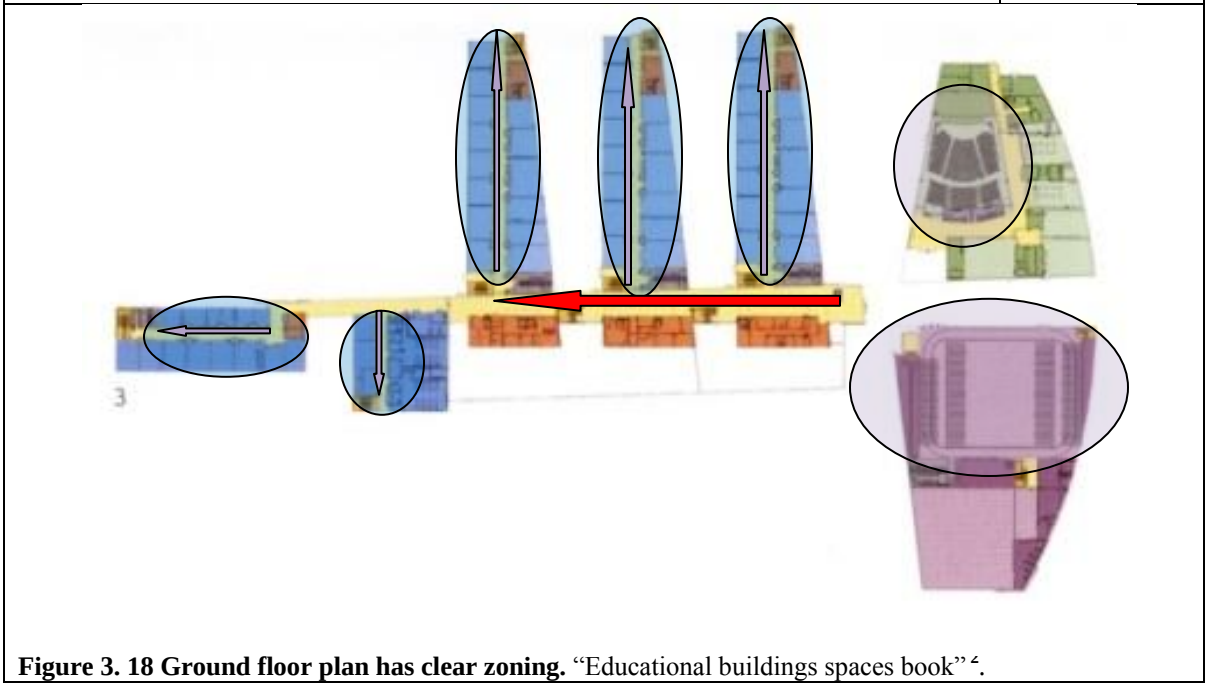


Figure 3. 18 Ground floor plan has clear zoning. "Educational buildings spaces book" [2].

[1] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com
[2] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com

(Table 3.4) Organization[1]		
Accommodating the educational agenda	**Spatial organization**	**Movement routes**
• Is this successfully accommodated in the internal arrangement of spaces? • Is there a clear understanding of the school's educational agenda and its organizational implications? • Will the design allow the delivery of the curriculum when the school opens? • What are the aspirations of the pastoral system? • Does the design identify the main social spaces? • What is the role of ICT in the educational agenda? • How does the design encourage a healthy food agenda?	• Is there a clear spatial diagram for the building? • Are the learning spaces arranged well across the school? • Does the design provide opportunities for cross-curricular learning? • Is there a diagram showing which of the spaces will be timetabled? • Does the spatial arrangement allow for natural ventilation and day lighting to the majority of spaces? • Does the location on specialist facilities allow the design to accommodate different pedagogies? • Is the plan legible for users? • Are the positions of key roof lights shown on the plan? • Does the design provide opportunities for social interaction?	• Is there a clear hierarchy of circulation routes? • Are links between indoor and outdoor spaces optimized? • Is there a clear movement and connection diagram? • Is there a variety of circulation spaces which respond intelligently to any changes in level? • Has the vertical circulation been designed to avoid congestion and encourage positive behavior? • Do movement routes into the school depend on signage? • Can vertical and horizontal links be made between clusters? • Does the internal circulation fit with the school's proposed timetabling? • Does the circulation allow for short travel times between key spaces? • Are circulation routes accessible for all users?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/organisation-questions, Accessed (2008).

5. Building and Form

Making form, massing and appearance work together

Case study: The sketch felt this is a highly competent scheme. The building's rational diagram generates clear entrances, a legible internal environment and an inherent flexibility and adaptability for the future.

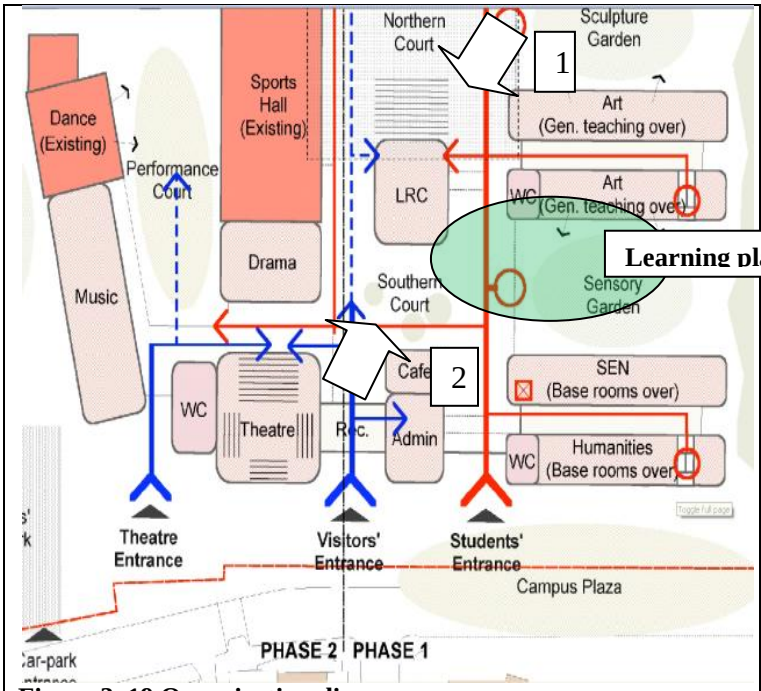


Figure 3. 19 Organization diagram "http://www.cabe.org.uk/design-review/schools/organisation-questions".

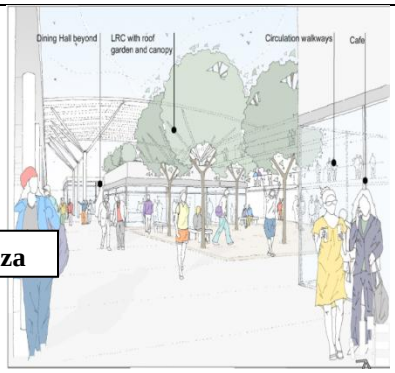


Figure 3. 20 1- Sketch view of north courtyard. "www.cabe.org.uk".

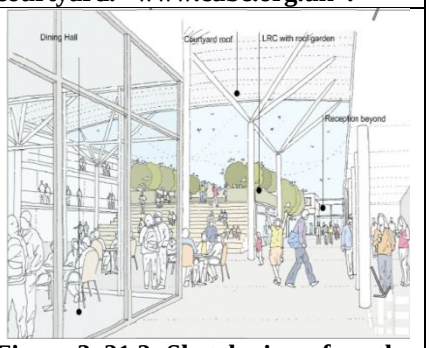


Figure 3. 21 2- Sketch view of south courtyard. "http**://www.cabe.org.uk/design-review/schools/organisation-questions".**

Diagrams explain how the 'schools within schools' pedagogy is translated into the design (concept).The scheme creates a relationship with the existing primary school opposite by establishing a 'learning plaza' between the two (form and massing).

(Table 3.5) Buildings[1]			
Concept	**Form and massing**	**Appearance**	**Construction and materials**
• Is there a coherent design idea that relates plans, sections and elevations? • Has the organization diagram been convincingly translated into a coherent building? • In refurbishment schemes, do the new elements relate well to existing buildings and make the school into a coherent whole?	• Are the building's form and massing appropriate to the site? • Does the building create well proportioned internal and external spaces? • How does the massing support the day lighting strategy? • Has the height of the building been considered from educational and massing perspectives? • How do the buildings on the site relate to one another?	• Do the elevations reflect the design concept to create an inspiring building? • Is the building good architecture in its own right? • How is the spatial organization of the school expressed in the elevations? • How any is exposed structure detailed? • How is the fenestration designed and detailed? • How have the entrances been defined through the building design? • Does the roof plan support the resources strategy? • Is there elevation co-ordination of services and lighting? • How do the elevations respond to orientation and site constraints? • How do the elevation help deliver a low-energy internal environment? • How are color, pattern, graphics and texture integrated?	• Do the materials contribute positively to the quality of the scheme? • Will the fabric of the buildings be durable and easy to maintain? • Which details give the design value? • Are any modern methods of construction used? • Has the maintenance strategy been addressed? • How do the materials contribute to the character of the scheme? • How do the materials used support the sustainability strategy?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/buildings-questions, Accessed (2008).

6. Interiors

Will the building work well in full use?

Have the acoustic requirements of different spaces been achieved?

Figure 3. 22 Section "http://www.cabe.org.uk/design-review/schools/interiors-questions".

Orestad College:

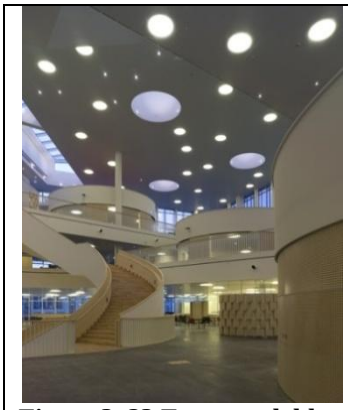


Figure 3. 23 Entrance lobby. www.conceptrends.com.

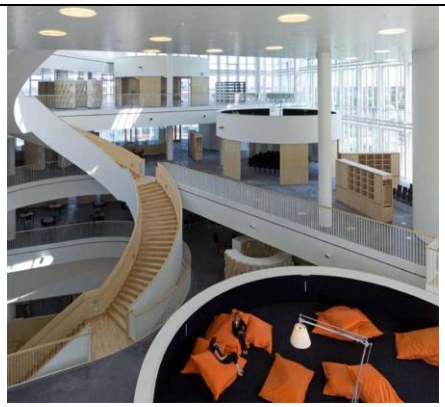


Figure 3. 24 Mezzanine floor. www.conceptrends.com.

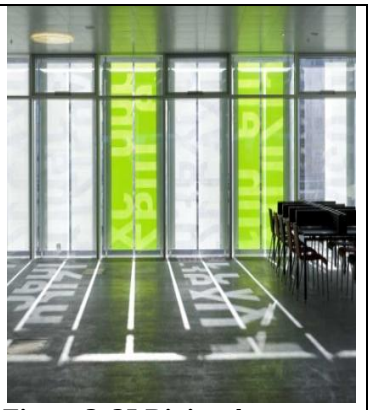


Figure 3. 25 Dining Area. www.conceptrends.com.

The main stair case is the heart of college educational and social life; the primary connection up and down, but also a place to stay, watch and be seen. Three 'mega columns' form the primary load bearing system, supplemented by a number of smaller columns positioned according to structural requirement, not as part of a regular grid.[1]

[1] Available: http://www.archinnovations.com/featured-projects/academic/orestad-college/(Accessed 2009)

(Table 3.6) Interiors[1]		
Variety and delight	**High quality**	**The building in use**
• Will occupants experience variety and delight as they move around the school? • Are circulation and social areas inviting to students? • How will the school stamp its identity on the building? • Is there a well considered strategy for the use of color, pattern, graphics and texture? • Is dining seen as a social activity? • Do circulation and social spaces benefit from daylight and views?	• Will the internal environment help students and staff feels valued and motivated? • Are learning spaces well proportioned and pleasant? • Does the quality of the space encourage good behavior? • Are internal materials demonstrably robust? • Will the users be aware of the external environment throughout the day? • Is the furniture of high quality and robust? • Is the incorporation of storage well-considered?	• Will the building work well in full use? • Have the acoustic requirements of different spaces been dealt with? • Is the ability to display students work incorporated into the design? • Are the acoustics appropriate in all spaces not just the classrooms? • Does the building enable staff to respond to the differing needs of the range of age groups? • Will there be glimpses of the range of learning activities happening in the school to inspire pupils? • Will the use of outdoor courtyards cause disturbance to adjacent class spaces? • Is staff offered a good working environment?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/interiors-questions, Accessed (2008).

7. Resources:

Deploying convincing environmental strategies

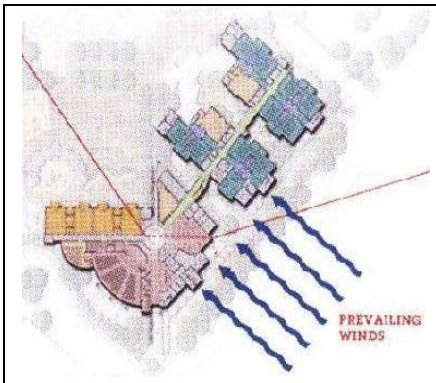


Figure 3. 26

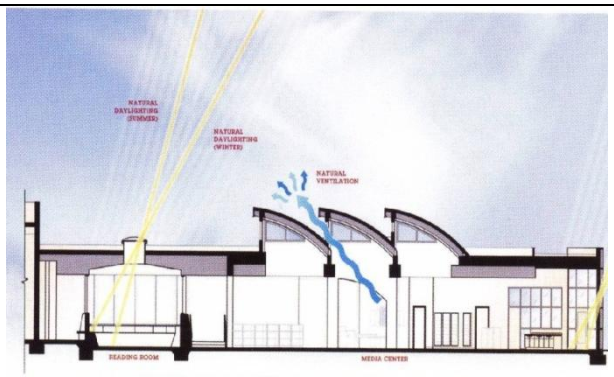


Figure 3. 27

Prevailing winds at Salana pacific school, the school is oriented to Prevailing wind and solar access, taking advantage of prevailing breezes for natural cooling, solar gain for heating and proper protection through shading. " Educational facilities book" [1].

Figure 3. 28 Salana pacific school. " Educational facilities book" [2].

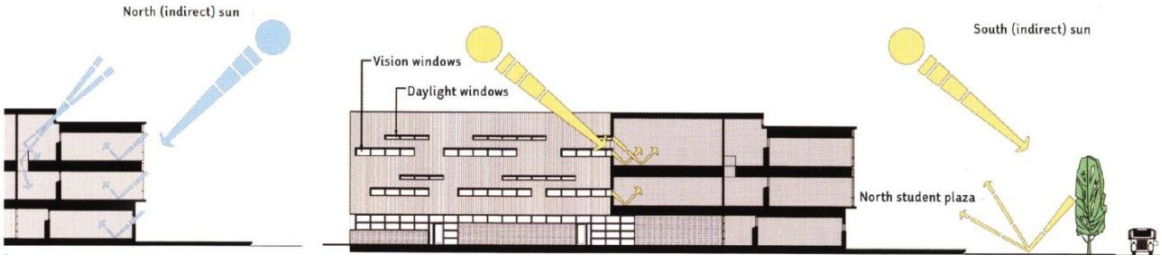


Figure 3. 29 Hector Garcia school-The direct and indirect sun at north and south elevation.

" Educational facilities book" [3].

[1] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com
[2] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com
[3] Kwang young jeong, (2006), Educational Facilities Book, Archiworld co.ltd. http://www.archiworld-pa.com

(Table 3.7) Resources[1]			
Orientation	**Ventilation**	**Day lighting**	**Energy and services strategies**
• Has the optimum orientation for different types of spaces been considered? • Does the design of the elevations respond to different orientations? • Does the building form allow daylight into all spaces? • Do the room proportions allow good daylight and ventilation? • Has the orientation informed the choice of materials or detailing of elevations?	• Does the ventilation strategy provide a comfortable environment in which to learn in all seasons? • Where possible, are spaces naturally ventilated? • Are mixed mode systems proposed? If so, where and why? • Is ventilation maintained when blinds are in use? • How, if applicable, is night time ventilation achieved securely? • How is summer time overheating avoided? • Is the environmental strategy resilient to increased heat gain or the effects of climate change? • How are the effects of external noise dealt with? • How is the ventilation controlled, especially in the design of window openings? • How will the ventilation strategy function if different plan layouts or pedagogies are adopted?	• Is key spaces daylight for most of the year? • Are solar glare and solar gain well controlled? • Are opportunities for roof-lights utilized? • Are halls and circulation areas well day-lit? • Are rooms located to maximize appropriate use of available daylight? (eg. art rooms on top floor or making use of roof lights) • How will the day-lighting and solar control strategy be affected if different layouts are adopted?	• Does the whole design help to minimize energy use and carbon emissions? • Is any on-site energy generation appropriate and meaningful? • Will the design provide an environment with a comfortable temperature for learning throughout the year? • How can CO2 emissions and water saving be used in the curriculum and community engagement? • How, if applicable, will biomass be delivered and handled? • How is waste reduction approached on a whole life basis? • Is there a clear strategy for reduction of energy use and CO2 emissions? • How are energy, water and waste minimized, particularly from out of hours and equipment use? • How does the heating and ventilation strategy allow for the expected use of the building? And what are the implications on flexibility? • How does the services strategy support flexible ICT and specialist spaces? • How are plant areas and main services routes accessed for maintenance?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/resources-questions, Accessed (2008).

8. Feeling Safe

Creating a secure and welcoming place safe: creating a secure and welcoming place.

(Table 3.8) Feeling Safe[1]	
External environment	**Internal environment**
• Are external routes and boundaries clear and well defined? • Is the security strategy balanced with openness? • Can all users access the site safely? • Is it clear which areas are open to the community and which are not? • How does the boundary treatment facilitate the school's approach to security? • Are entrances welcoming for all users of the building, well located and capable of passive surveillance? • Can boundaries between zones change to suit activities? • Are pedestrian routes overlooked and safe throughout the day and evenings?	• Are there opportunities for passive surveillance throughout the school? • Does the design of toilets, staircases and circulation areas allow for visibility so users feel safe? • Are teachers' work rooms and administration staff's offices in key positions for overlooking? • Have dead-end corridors been avoided in the design? • Do stairwells benefit from some passive supervision? • Does the design of lockers areas limit opportunities for bullying? • Is the reception desk well located and obvious on arrival? • Are the toilets easily supervised and in easy reach of learning spaces? • Are any proposed access control systems appropriate and integrated into the design?

Feeling safe by looking at the plans and drawings presented to the schools design panel.

"The design creates a secure and welcoming environment both internally and externally on a tight inner city site. It creates clear boundaries and uses passive supervision successfully throughout the buildings".[2]

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/feeling-safe-questions, Accessed (2008) .

[2] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/feeling-safe-questions, Accessed (2008) .

Floor plans

"Boundaries are clearly defined on the plan. The visitor and student entrances are welcoming and well-located, with a prominent reception desk. The service yard is discretely positioned and is tightly controlled, providing limited access to the site (external environment).The staff admin offices are positioned at the entrances to the teaching wings and the main staff room overlooks the social space in the south courtyard with the Learning Resource Centre overlooking the Northern courtyard.

The corridors have clear views out and in.The design also allows easy community use of the theatre and sports hall, so that only the west building areas remain open out of hours". [1]

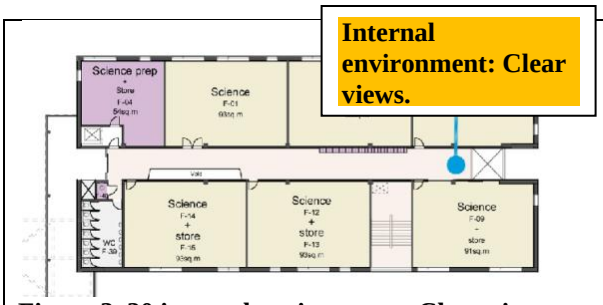


Figure 3. 30 internal environment: Clear views. Available: http://www.cabe.org.uk/design-review/schools/feeling-safe-questions, Accessed (2008).

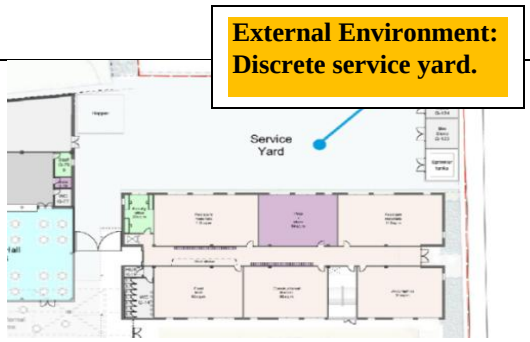


Figure 3. 31 External Environment: Discrete service yard. Available:http://www.cabe.org.uk/design-review/schools/feeling-safe-questions, Accessed (2008).

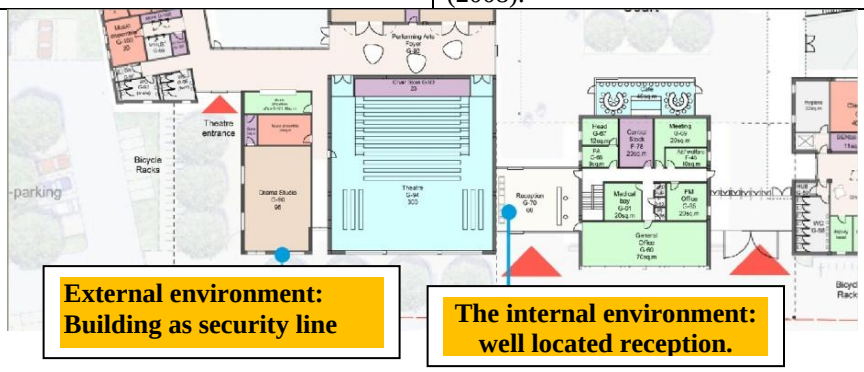


Figure 3. 32 External environment: Building as security line – The visitor entrance is for people who use the theater. The internal environment: well located reception Avilable : http://www.cabe.org.uk/design-review/schools/feeling-safe-questions, Accessed (2008) .

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Avilable : http://www.cabe.org.uk/design-review/schools/feeling-safe-questions, Accessed (2008) .

9. Long Life, Loose Fit: Creating a school that can adapt and evolve in the future

The designer is able to add value by designing schools that are adaptable to future changes of use while being cost-effective to build and maintain. The designer advice on how all areas of the building program can be optimized to ensure the project is completed on time and to budget. To deliver economical and future-proof solutions The designer consider key aspects such as flexibility of space planning and accessible primary services distribution, the standardization of structural elements, use of off-site prefabrication, and the future integration of ICT connectivity. We always aim to ensure that work is completed with as little disruption to the students as possible.

(Table 3.9) Long Life, Loose Fit[1]

Day to day flexibility	Adaptability	Furniture & equipment
• Does the design provide day to day flexibility for different types of learning and teaching? • Is there a range of spaces available for widely different group sizes? • Does the design encourage social learning throughout the school and its grounds? • Can spaces be reconfigured easily? • How does the design support community use and out of hours use? • Are the spaces suitable for a variety of uses?	• Is the building able to accommodate different organizational structures or pedagogies over time? • How well does the design allow for future expansion of the school? • What impact will alternative layouts have on the circulation? • Which pastoral / curriculum groupings can the plan accommodate? • Do the building services allow for adaptation of the plan? • If the layout changes, what will be the impact on the day lighting of the space? On acoustics? On ICT? • Does the design make provision for future change if required? • How will the school respond if pupil numbers increase? • Can circulation routes be extended for future additions?	• Can a good range of layouts be made using the proposed furniture? • Will the proposed furniture and equipment allow changes to be made easily? • Where will furniture be stored when not in use? • How will the furniture and equipment be integrated with ICT? • Is there a variety of furniture provided? • What external furniture will be provided?

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/long-life-loose-fit, Accessed (2008) .

Example plan: The plan is a refurbishment and extension of an existing building which radically changes the school through the new circulation street which connects the general and specialist learning spaces to the social areas. The plan also adds extra classrooms to the existing blocks creating clusters with central open plan spaces. This was commended as an approach which offers flexibility of organization. The plan provides various degrees of enclosure with external learning spaces available. Specialist teaching spaces are on either side of the central generic cluster (day to day flexibility).

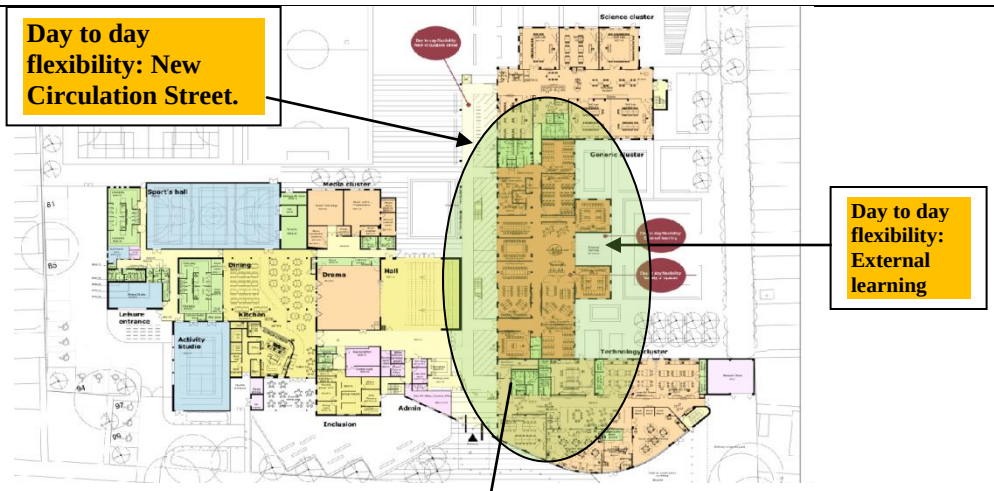


Figure 3. 33 The plan adds extra classrooms to the existing blocks creating clusters with central open plan spaces. "www.cabe.org.uk".

Figure 3. 34 Cluster floor plans The drawing shows the variety of different layouts the plan can support for different curriculum arrangements. The same furniture is used in each of the layouts, presentation and exam scenario. (Adaptability). "www.cabe.org.uk "

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/long-life-loose-fit, Accessed (2008) .

10. Successful Whole:

(Table3.10) Successful Whole - questions to ask[1]	
Appropriateness	**Delight**
Does this design as a whole offer a thoughtful, coherent and convincing response to the key issues of the site and brief? Does the whole design add up to more than a sum of its parts?	Will it be a pleasure to work, eat, learn, play, teach and socialize in this school?
Timelessness	**Fulfilling user intentions**
Is this school set to become a cherished part of its locality?	Does the architectural approach successfully meet the aspirations of the client and community? Will the school's design help to deliver educational transformation?

Example plan : The CABE commented that this plan has great overall potential. It resolves the difficult problem of tying three schools together coherently across the campus without compromising the schools' desire to retain separate identities. The scheme was also commended for its straightforward approach to organization which creates legible circulation routes throughout the building.

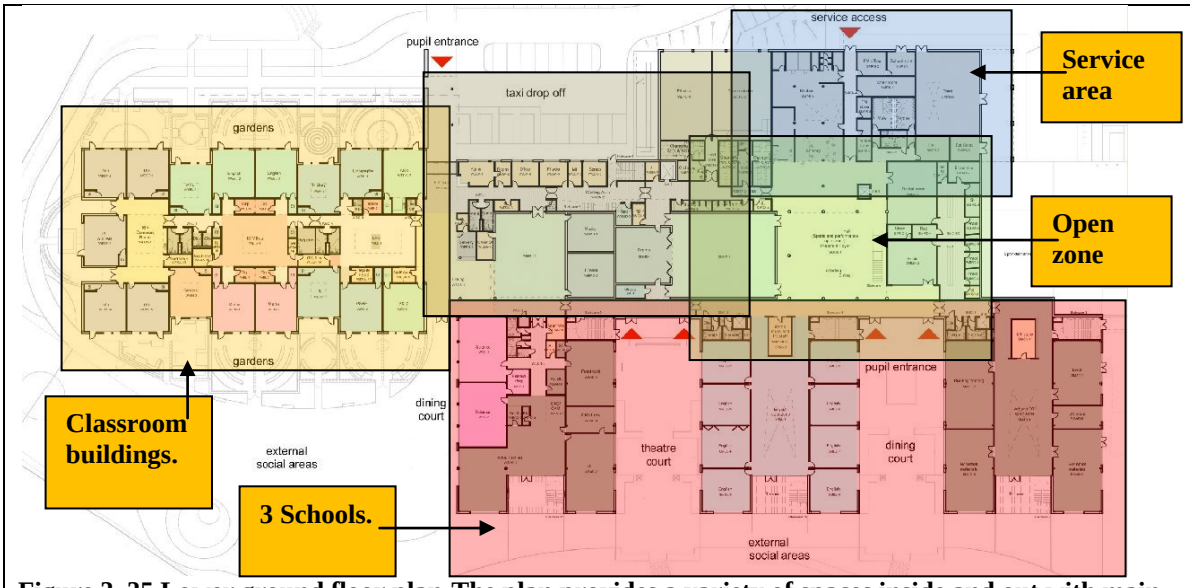


Figure 3. 35 Lower ground floor plan-The plan provides a variety of spaces inside and out with main social spaces in the heart of the school. "http://www.cabe.org.uk/design-review/schools/successful-whole**".**

[1] John Sorrell CBE Chair, (2007), Commission for Architecture and the Built Environment This final version of our website was archived on, Available : http://www.cabe.org.uk/design-review/schools/successful-whole, Accessed (2008) .

Figure 3. 36 plan is for the 3 schools. "www.cabe.org.uk".

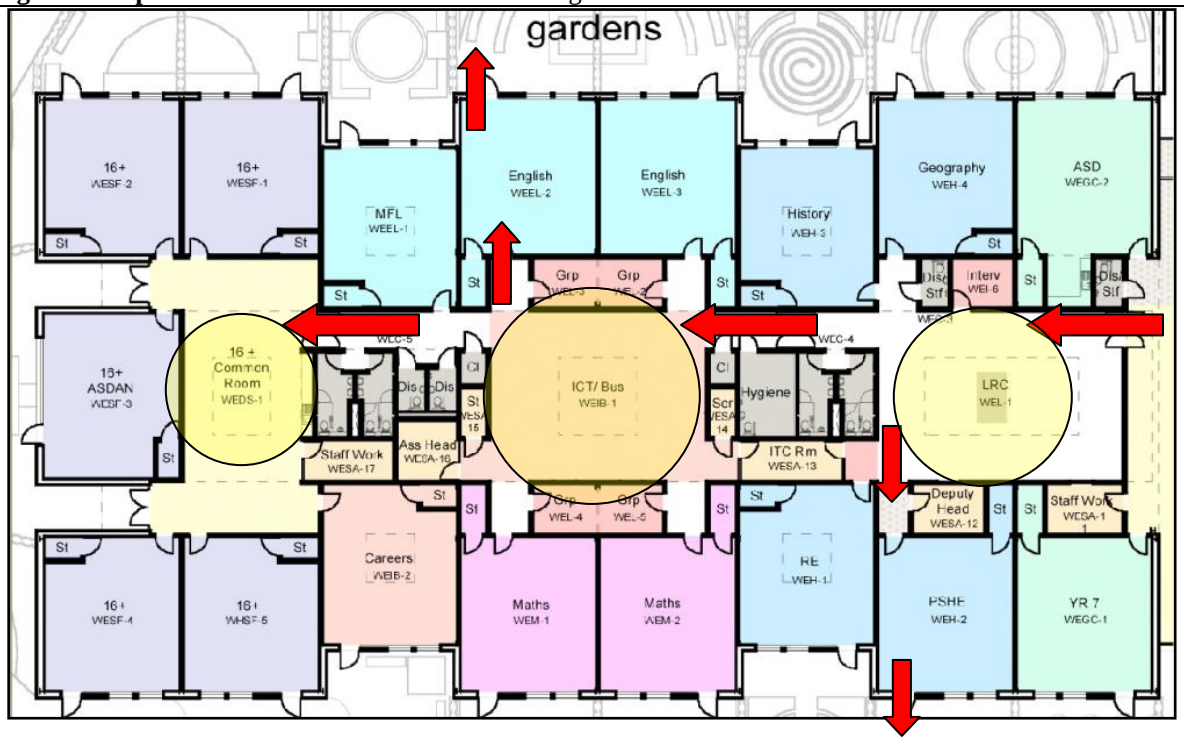


Figure 3. 37 plan for classrooms. "http://www.cabe.org.uk/design-review/schools/successful-whole".

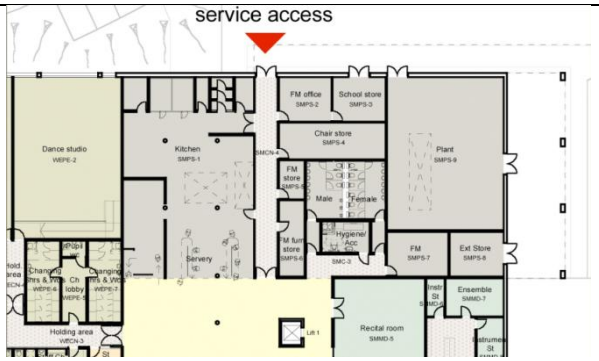


Figure 3. 38 back of house area"http://www.cabe.org.uk/design-review/schools/successful-whole".

Figure 3. 39 Administration "http://www.cabe.org.uk/design-review/schools/successful-whole".

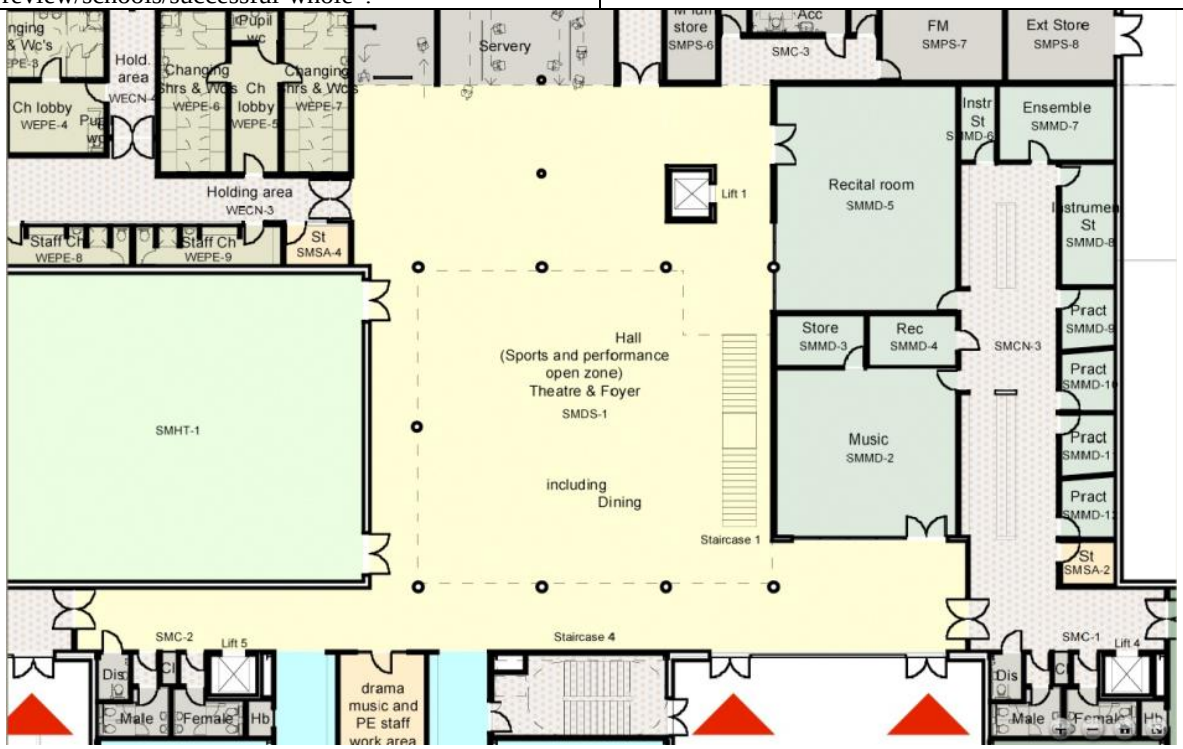


Figure 3. 40 plan is for sports and performance open zone theater & Foyer"http://www.cabe.org.uk/design-review/schools/successful-whole".

Figure 3. 41 Perspective from grounds-The scheme makes good use of its position giving views out across the landscape from the learning spaces (appropriateness).The three schools which make up the brief arecarefully integrated yet retain their identities. "http://www.cabe.org.uk/design-review/schools/successful-whole (Accessed2008)".

Figure 3. 42 south west elevation . "http://www.cabe.org.uk/design-review/schools/successful-whole(Accessed2008)".

Figure 3. 43 south east elevation. "http://www.cabe.org.uk/design-review/schools/successful-whole".

Figure 3. 44 north west elevation. "http://www.cabe.org.uk/design-review/schools/successful-whole".

Figure 3. 45 north east elevation. "http://www.cabe.org.uk/design-review/schools/successful-whole".

The topography of the site is well considered with the scheme dealing successfully with changes in level when locating the playing fields and entrances to the site (appropriateness).

Figure 3. 46 Perspective of entrance approach
The perspective shows the clear entrance route to the building and access points for inclusion and the community. "http://www.cabe.org.uk/design-review/schools/successful-whole".

3.3 LEED for Schools

"Green schools create healthy environments conducive to learning while saving energy, resources, and money. The U.S. Green Building Council (USGBC) [1]developed The Green Existing Schools Project Management Guide to help schools and school districts green their existing facilities and achieve LEED (Leadership in Energy and Environmental Design) certification. The guide outlines the process for navigating LEED certification for existing schools and provides details on how to conduct organizational assessments, educate and train staff, initiate the certification process, and manage a campus- or district-wide plan.

USGBC works toward its mission of market transformation through its LEED green building certification program, robust educational offerings, a nationwide network of chapters and affiliates, the annual Green build International Conference & Expo, and advocacy in support of public policy that encourages and enables green buildings and communities." [2]

[1] The U.S. Green Building Council is a Washington, D.C.-based 501(c) (3) nonprofit organization committed to a prosperous and sustainable future for our nation through cost-efficient and energy-saving green buildings.
[2] LEED for Schools Rating System 1st Edition, Updated (November 2007).

3.3.1What is LEED?

In 2000, USGBC established the LEED rating system as a way to define and measure "green & Sustainable buildings." LEED is an internationally recognized green building certification system, providing third-party verification that measures how well a building or community performs across all the metrics that matter most: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. The suite of LEED rating systems are designed to address the complete lifecycle of buildings.

Each rating system provides a concise framework for identifying and implementing practical and measurable green building solutions. LEED points are awarded on a 100-point scale, and credits are weighted to reflect their potential environmental impacts. A project must satisfy specific prerequisites and earn a minimum number of points to be certified. Certification levels, based on the number of points, include: Certified, Silver, Gold, and Platinum.

3.3.1.1 LEED for Schools

The LEED for Schools Rating System recognizes the unique nature of the design and construction of K-12 schools. Based on LEED for New Construction, it addresses issues such as classroom acoustics, master planning, mold prevention, and environmental site assessment.

By addressing the uniqueness of school spaces and children's health issues, LEED for Schools provides a unique, comprehensive tool for schools that wish to build green, with measurable results. LEED for Schools is the recognized third-party standard for high performance schools that is healthy for students, comfortable for teachers, and cost-effective.[1]

[1] LEED for Schools Rating System 1st Edition, Updated November 2007

3.3.2 LEED for Existing Buildings: O&M Rating System Credit Categories[1]

O&M rating system is organized into six credit categories are:

1.Sustainable Sites 2.Water Efficiency 3.Energy and Atmosphere 4.Materials and Resources 5. Indoor Environmental Quality 6. Innovation in Operations.

Regional Priority is an additional category that acknowledges the importance of local conditions in determining best practices for ongoing operations and maintenance.

1. Sustainable Sites:

Credits promote responsible, innovative, and practical site maintenance strategies that are sensitive to plants, wildlife, and water and air quality. These credits also mitigate some of the negative effects buildings have on the local and regional environment. Environmentally sensitive site maintenance practices reduce site operations and maintenance costs while creating and maintaining outdoor spaces that are attractive and healthy for both building occupants and local flora and fauna.[2]

(Table 3.11) Sustainable Sites Points: (SS) [3]

• **SSc1** LEED Certified Design and Construction • **SSc2** Building Exterior and Hard scape Management Plan. • **SSc3** Integrated Pest Management, Erosion Control, Landscape Management Plan. • **SSc4** Alternative Commuting Transportation. • **SSc5** Site Development—Protect or Restore Open Habitat • **SSc6** Storm water Quantity Control	• **SSc7.1** Heat Island Reduction—Non roof • **SSc7.2** Heat Island Reduction—Roof	• **SSc8** Light Pollution Reduction

[1] Operations & Maintenance (LEED-EB: O&M) maximizes operational efficiency while minimizing environmental impacts , LEED for Schools Rating System 1st Edition, Updated November 2007.
[2] LEED for Schools Rating System 1st Edition, Updated November 2007
[3] LEED for Schools Rating System 1st Edition, Updated November 2007

2. Water Efficiency:

Prerequisites and credits encourage the use of strategies and technologies that reduce the amount of potable water consumed in facilities. Many water conservation strategies are no-cost; others provide rapid payback. Some, such as biological wastewater treatment systems and gray water plumbing systems, require more substantial investments and are cost-effective only under certain building and site conditions. [1]

(Table 3.12) Water Efficiency Points: (WE) [2]	
• **WEp1** Minimum Indoor Plumbing Fixture and Fitting Efficiency.	• **WEc1** Water Performance Measurement • **WEc2** Additional Indoor Plumbing Fixture and Fitting Efficiency • **WEc3** Water Efficient Landscaping • **WEc4** Cooling Tower Water Management.

3. Energy and Atmosphere: Prerequisites and credits address the reduction of energy consumption through a performance-based approach that allows owners and managers to tailor energy reduction measures to their buildings. Improving the energy performance of facilities lowers operating costs, reduces pollution, and enhances occupant comfort. Many energy efficiency measures have a rapid payback because of the rising cost of energy. [3]

(Table 3.13) Energy and Atmosphere points: (EA) [4]		
• **EAp1** Energy Efficiency Best Management Practices (BMP). • **EAp2** Minimum Energy Efficiency Performance • **EAp3** Fundamental Refrigerant Management	• **EAc1** Optimize Energy Efficiency Performance • **EAc2.1** Existing Building Commissioning—Investigation and Analysis • **EAc2.2** Existing Building Commissioning—Implementation • **EAc2.3** Existing Building Commissioning—Ongoing Commissioning	• **EAc3.1** Performance Measurement— • Building Automation System • **EAc3.2** Performance Measurement—System-Level Metering • **EAc4** On-site and Off-site Renewable Energy • **EAc5** Enhanced Refrigerant Management • **EAc6** Emissions Reduction Reporting

[1] LEED for Schools Rating System 1st Edition, Updated November 2007
[2] LEED for Schools Rating System 1st Edition, Updated November 2007
[3] LEED for Schools Rating System 1st Edition, Updated November 2007
[4] LEED for Schools Rating System 1st Edition, Updated November 2007

4. Materials and Resources:

Prerequisites and credits set the foundation for developing, implementing, and documenting policies and practices that support effective waste management and responsible procurement. The MR credit category focuses on two main issues: the environmental impact of materials brought into the facility and the minimization of landfill and incinerator disposal for materials taken out of the facility. [1]

(Table 3.14) Materials and Resources Points: (MR) [2]

• **MRp1** Sustainable Purchasing Policy. • **MRp2** Solid Waste Management Policy.	• **MRc1** Sustainable Purchasing—Ongoing Consumables. • **MRc2** Sustainable Purchasing—Durable Goods. • **MRc3** Sustainable Purchasing—Facility Alterations and Additions • **MRc4** Sustainable Purchasing—Reduced Mercury in Lamps. • **MRc5** Sustainable Purchasing—Food.	• **MRc6** Solid Waste Management—Waste Stream Audit • **MRc7** Solid Waste Management—Ongoing Consumables • **MRc8** Solid Waste Management—Durable Goods • **MRc9** Solid Waste Management—Facility Alterations and Additions

5. Indoor Environmental Quality:

Prerequisites and credits address concerns relating to indoor air quality; occupant's health, safety, and comfort; air change effectiveness; and air contaminant management. The IEQ credit category encourages improvements to ventilation, indoor CO2 levels, day lighting and lighting quality, and thermal comfort – all of which have the potential to impact occupant health and performance. [3]

[1] LEED for Schools Rating System 1st Edition, Updated November 2007
[2] LEED for Schools Rating System 1st Edition, Updated November 2007
[3] LEED for Schools Rating System 1st Edition, Updated November 2007

(Table 3.15) Indoor Environmental Quality Points: (IEQ) [1]		
• **IEQp1** Minimum Indoor Air Quality (IAQ) Performance. • **IEQp2** Environmental Tobacco Smoke (ETS) Control. • **IEQp3** Green Cleaning Policy. • **IEQc1.1** IAQ BMP—IAQ Management Program □ • **IEQc1.2** IAQ BMP—Outside Air Delivery Monitoring. • **IEQc1.3** IAQ BMP—Increased Ventilation. • **IEQc1.4** IAQ BMP—Reduce Particulates in Air Distribution. • **IEQc1.5** IAQ BMP—IAQ Management for Facility Alterations and Additions.	• **IEQc2.1** Occupant Comfort—Occupant Survey • **IEQc2.2** Controllability of Systems—Lighting. • **IEQc2.3** Occupant Comfort—Thermal Comfort Monitoring. • **IEQc2.4** Daylight and Views.	• **IEQc3.1** Green Cleaning—High-Performance Cleaning Program □ • **IEQc3.2** Green Cleaning—Custodial Effectiveness Assessment • **IEQc3.3** Green Cleaning—Purchase of Sustainable Cleaning Products and Materials • **IEQc3.4** Green Cleaning—Sustainable Cleaning Equipment □ • **IEQc3.5** Green Cleaning—Indoor Chemical and Pollutant Source Control • **IEQc3.6** Green Cleaning—Indoor Integrated Pest Management □

6. Innovation in Operations:

Credits recognize projects for innovative and exemplary technologies, methods, project planning, and project execution.

Regional Priority (RP) credits address environmental concerns that are local priorities for each region of the country, as identified by USGBC's regional councils, chapters, and affiliates. A project that earns a regional priority credit will earn one bonus point in addition to any points already awarded for that credit. Up to four extra points can be earned in this way. [2]

(Table 3.16) Innovation in Operations Points: (IO) [3]	
• **IOc1** Innovation in Operations • **IOc2** LEED Accredited Professional • **IOc3** Documenting Sustainable Building Cost Impacts	• **Regional Priority Point: (RP)** • **RPc1** Regional Priority

[1] LEED for Schools Rating System 1st Edition, Updated November 2007
[2] LEED for Schools Rating System 1st Edition, Updated November 2007
[3] LEED for Schools Rating System 1st Edition, Updated November 2007

The School as a Teaching Tool

Teachers at green schools can use the building as the basis for innovative curricula. The school can serve as a tool for hands-on lessons, such as math students tracking and charting utility cost savings, science students analyzing the environmental impact of traditional cleaning products compared to eco-friendly ones, and students designing their dream sustainable homes using the types of systems and innovations used to green their school. Exercises like these help students connect to their environment and understand the effect that buildings have on land, natural resources, and their communities.

Green Schools at the Intersection of "Big Three": Energy, Education, and Health

Green schools are at the very intersection as healthy environments conducive to learning while saving energy and money.

Education: With reduced operating costs, green schools can put the money saved directly back into the classroom. Innovative design strategies provide students and teachers with a wealth of hands-on learning opportunities that they can take beyond the classroom and into their homes and communities. Young people are at the forefront of the fight against climate change, and they understand what is at stake if significant efforts are not made to rethink the way America produces and uses energy. We must recognize the need to meet the demands of this new generation of sustainability natives, and to prepare them for the emerging green jobs market.

When it comes to educating for sustainability, teachers are seeking interdisciplinary, active models of student engagement that are easily applied to their classrooms. The approach must be both informational and interactive: learned and experienced. Utilizing the built environment as the context for learning promotes student achievement in math, science, and literacy skills through hands-on

explorations. Envision students engaged with a new type of laboratory – their immediate surroundings – exploring concepts and developing new understandings. [1]

3.3.3 West Brazos Junior High School

West Brazos Junior High School Brazoria, Texas LEED for New Construction Certification awarded July 30, 2007 Certified 27*	
Sustainable Sites	7/14
Water Efficiency	4/5
Energy & Atmosphere	1/17
Materials & Resources	4/13
Indoor Environmental Quality	6/15
Innovation & Design	5/5

*Out of a possible 69 points

(Table 3.17)

A Better Learning Environment

Architect: SHW Group, LLP

School on the Texas Gulf Coast Shows a Cost-Effective Approach to Green

Project Size: 91,500 square feet

Total Project Cost: $9,931,000

Cost per square foot: $109

PROJECT BACKGROUND[2]

West Brazos Junior High School, located in Brazoria, Texas, serves 600 students in grades seven and eight. The first public junior high school in Texas to earn LEED certification, West Brazos opened in time for classes in fall 2006. Built for $109 per square foot, the school was built for 18% less than the average junior high school in the region.[3]

LEED Facts

"Our goal was to demonstrate that green schools were achievable without spending extra money during the process. The key was smarter choices, not more money."[4]Martha Buckner, Assistant Superintendent, Columbia Brazoria Independent School District.

[1] LEED for Schools Rating System 1st Edition, Updated November 2007

[2] http://www.dbrinc.com/featured/West_Brazos_Junior_High_School

[3] (2006 Construction Report. School Planning & Management).

[4] http://www.greenschoolbuildings.org/resources.aspx

Figure 3. 47-Aluminum shading outside the building reduces heat load on the windows, minimizing cooling needs inside, and the shades were "low-cost items that get big gains" financially, according to Henry." Available:www.greenrightnow.com (Accessed 2009)".

Figure 3. 48 Library has visual link to the exterior spaces
"Available:www.greenrightnow.com (Accessed 2009)".

1. Sustainable Sites

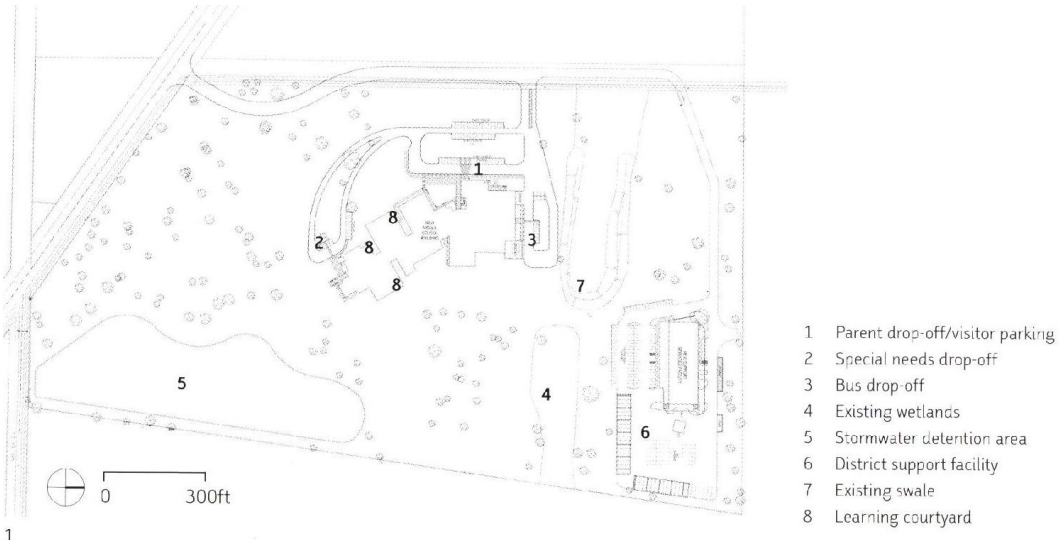


Figure 3. 49 site plan. "Sustainable School Book".

The beautifully wooded site is approximately 57 miles (92 kilometers) south of Houston. This regional focus gave the community a brand-new green school with a similar aesthetic to conventionally designed schools in the area – something the community

Figure 3. 50 Main Entrance. " Available: www.greenrightnow.com (Accessed 2009)".

values.

The building is located on a 53-acre site landscaped with vegetation that is adapted to the region's coastal environment and needs no irrigation.

To encourage alternative transportation, the school provides bike racks and showers, preferred parking spaces for carpool vehicles and a carpool incentive program.[1]

Figure 3. 51 The school building's dominant material is concrete masonry, which was chosen for its natural, durable quality. " Available:www.schooldesigns.com (Accessed 2009)".

2. Water Efficiency

School is succeeded in Storm water management. The site is preserved and consists of rainwater detention and natural filtration areas, and naturally preserved native landscape. All landscape elements added to the site, including spaces adjacent to the building, are filled with native grasses, bushes, and trees that are drought-resistant and thrive in the regional coastal environment.

[1] U.S. Green Building Council, (2008),Printed on 100% post consumer recycled, process chlorine-free paper with non-toxic soy inks

Low-flow toilets and faucets reduce the project's interior water use, bringing total potable water consumption 31.31% below code.

All drains from custodial rooms and science areas are separately plumbed.

3. Energy & Atmosphere

Core spaces (library, dining area and group instructions spaces) are also daylight, reducing artificial lighting loads, providing a visual link to the exterior spaces, reducing costly energy demands, lowering life cycle cost, and ensuring that the students and teachers can learn, work, and play in an open, fun, and liberating environment. [1]

Heat island effects are reduced through the use of a high-reflective Energy Star roofing system and reflective paving, which also reduce heat gains.

4. Materials & Resources

The school is low emitting materials, it's used local materials, and 14.17 recycled materials, recycled 99.95 of construction waste.

The building is primarily concrete masonry and includes stucco and metal panels. The project team selected these materials for their durability and low maintenance needs as well as their cost and aesthetics. The team also selected materials for their recycled content and regional origins. More than 55% of all materials, by cost, were manufactured within 500 miles of the project site, and the construction team diverted 56% of all waste, by weight, from the landfill.[2]

The project team selected adhesives, sealants, paints, and carpeting for their low chemical emissions. Entry grates collect dirt and other pollutants before occupants track them into the building.

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.
[2] U.S. Green Building Council, (2008),Printed on 100% post consumer recycled, process chlorine-free paper with non-toxic soy inks

All roofing materials and site paving are light-colored; reducing the project's contribution to the urban heat-island effect, and all site lighting was selected or modified to reduce light pollution. [1]

Figure 3. 52 Interior spaces at the school have light colored finishes to accent natural lighting. "Available:www.greenrightnow.com (Accessed 2009)".

5. Indoor Environmental Quality

The school has committed to preserving indoor environmental quality by using only green cleaning products.

All custodial rooms, science labs and copy areas feature dedicated ventilation.[2]

Low-emissivity glazing in the classrooms, library, cafeteria, and office areas reduce the building's cooling loads while allowing daylight into working areas.

[1] U.S. Green Building Council, (2008),Printed on 100% post consumer recycled, process chlorine-free paper with non-toxic soy inks

[2] U.S. Green Building Council, (2008),Printed on 100% post consumer recycled, process chlorine-free paper with non-toxic soy inks

Simple exterior shading devices reduce glare and solar heat gain. They also function as light shelves, bouncing daylight deeper into classroom spaces.

Figure 3. 53 ,Figure 3. 54
The library is open plan with study areas along exterior walls to take advantage of large windows. "Sustainable school book". [1]

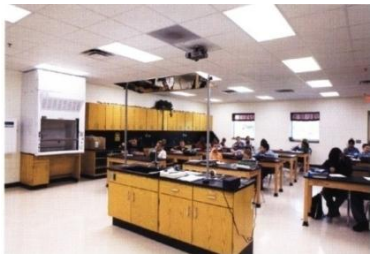


Figure 3. 55 Classroom feature day lighting. "Sustainable school book". [1]

6. Innovation & Design

DESIGNED FOR LEARNING

A 260-foot (79-meter) circulation spine connects multiple learning/activity pod centers. These centers feature clerestory windows, allowing natural light deep into the core spaces.

Encouraged by the links between the indoor environment and student performance, the project team focused on strategies that would enhance day lighting and indoor air quality.

Following the move to the new school, student standardized test scores improved by four, five, and seven percentage points for mathematics, reading, and social studies, respectively.

While privacy and security concerns convinced the project team to leave certain Spaces—including the computer labs, fitness center, and teachers' lounge without direct outdoor views, windows and clerestories bring daylight into other areas. More than 90% of these remaining areas, including classrooms, have views to the outdoors.

[1] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

Figure 3. 56 foot circulation spine connects multiple learning/activity pod centers that feature clerestory windows, allowing natural light to penetrate deep into the core spaces. "Available: www.schooldesigns.com (Accessed 2009)".

Figure 3. 57 the school improvements in standardized test scores for reading, math and social studies ranged from 4-7% better in the first year alone. "Available: www.usgbc.org(Accessed 2009)".

The school Certified under the LEED for New Construction Rating System, the project team achieved Innovation & Design credits by implementing educational signage throughout the building. By working together with the community, the West Brazos Junior High School project team made smart design choices to build a green school in Brazoria, Texas for 18% less than the average cost of school construction for that region. [1]

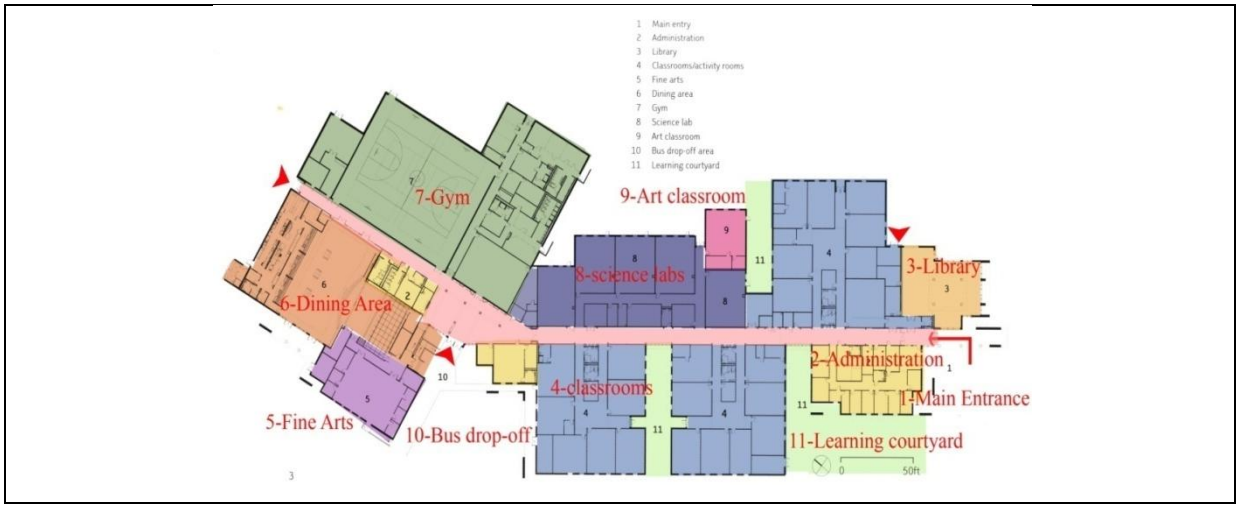


Figure 3. 58 West Brazos Junior High School Ground floor plan."Researcher**".** [2]

[1] U.S. Green Building Council, (2008),Printed on 100% post consumer recycled, process chlorine-free paper with non-toxic soy inks

[2] Alan ford, (2007), Desining the Sustainable School: The Images publishing group.

Conclusion

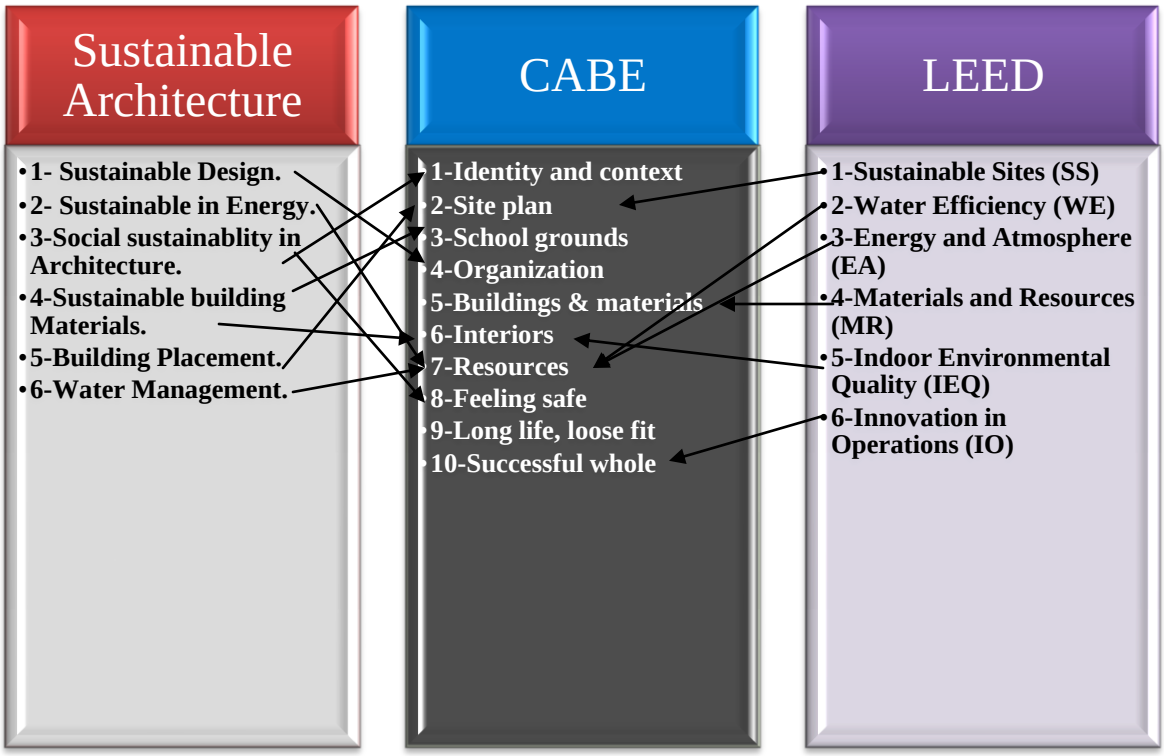
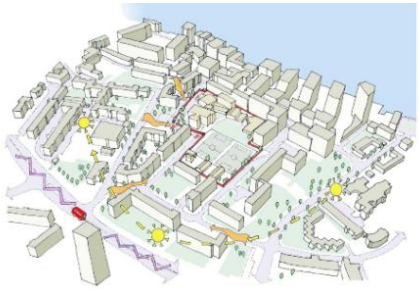


Diagram 3. 3 sustainable school. "Researcher"

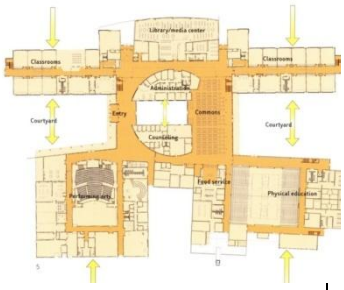
Diagram 3. 4CABE sustainable school. "Researcher"

1. Identity & context

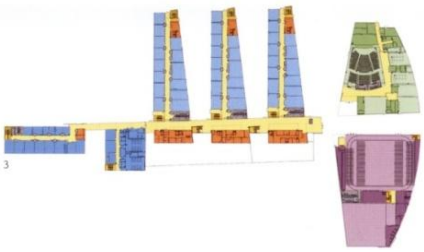


2. Site plan

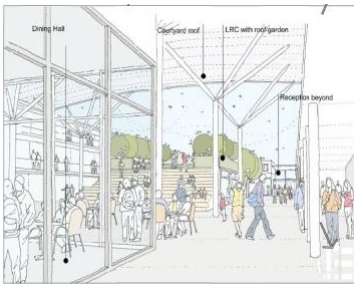
3.School ground



4.Organization

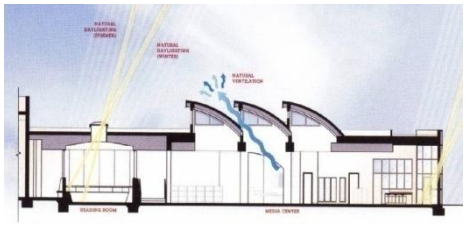


5.Buildings



6.Interiors

7. Resource



8. Feeling safe

9.Long life, loose fit

10.Successful whole

Chapter Four

International Schools

Case Studies

Chapter Four: International Schools Case Studies

4.1 Stanley Park High School

4.1.1 Identity and Context

4.1.2 Site plan

4.1.3 School grounds

4.1.4 Organization

4.1.5 Buildings

4.1.6 Interiors

4.1.7 Resources

4.1.8 Feeling safe

4.1.9 Long life, Loose fit

4.1.10 Successful whole

4.2 Fossail Ridge High School

4.2.1 Identity and Context

4.2.2 Site plan

4.2.3 School grounds

4.2.4 Organization

4.2.5 Buildings

4.2.6 Interiors

4.2.7 Resources

4.2.8 Feeling safe

4.2.9 Long life, Loose fit

4.2.10 Successful whole

4.3 Science Park High School

4.3.1 Identity and Context

4.3.2 Site plan

4.3.3 School grounds

4.3.4 Organization

4.3.5 Buildings

4.3.6 Interiors

4.3.7 Resources

4.3.8 Feeling safe

4.3.9 Long life, Loose fit

4.3.10 Successful whole

International Schools Case Studies

This Chapter will present the analysis done by CABE and LEED to international schools, which acquired the certification for sustainability. These selected schools interact with community, and apply sustainable energy. One of these schools is "Stanley park high school, UK". This school is an old school and developed by to be a sustainable building.

This Chapter will present two new sustainable schools in the USA as references which are "Fossil Ridge High School" and "Science Park High School". These American schools are considered successful sustainable examples and were certificated from LEED; the research will also introduce the 10 criteria points of "CABE".

Applications of The 10 Assessment Criteria of CABE

"The following 10 points are the criteria against which each design is assessed.

1. Identity and Context: making a school the students and community can be proud of.
2. Site Plan: making the best use of the site.
3. School grounds: making assets of the outdoor spaces.
4. Organization: creating a clear diagram for the buildings.
5. Buildings: making form, massing and appearance work together.
6. Interiors: creating excellent spaces for learning and teaching.
7. Resources: deploying convincing environmental strategies.
8. Feeling safe: creating a secure and welcoming place.
9. Long life, Loose fit: creating a school that can adapt and evolve in the future.
10. Successful whole: making a design that works in the round."[1]

[1] CABE, 10 criteria for successful school design, (CABE website archive), Available:www.cabe.org.uk/design-review/schools/criteria (Accessed: 2009, April)

"The sub points are indicators of the success of a design and are the primary issues considered by the panel when scoring a scheme in relation to each of the criteria."[1]

4.1 Stanley Park High School

4.1.1 Identity and Context

New building in a rural conservation site

This new-built school in a rural setting had its own set of challenges. Its location in a strategic view on an important nature conservation site had a fundamental impact on the design. The site itself is an existing Primary care trust campus due for demolition. The mainstream School and autistic spectrum disorder unit are co-located on the site, allowing independent and shared uses of internal and external spaces.

Key objectives were to create adaptable room configurations, respond to the 'schools within a school' vision but with a single school ethos, and provide flexible spaces for team teaching. The surrounding landscape is used as an important learning resource. The local community will be able to use sports facilities out of school hours and the location of the library is designed to encourage use both within and outside the normal school day.[2]

[1] CABE, (2010, July 29),Schools design panel: assessment report, Available:ahttp://webarchive.nationalarchives.gov.uk/20110118095356/http:/www.cabe.org.uk/files/dagenham-park.pdf (Accessed: 2010, September)
[2] Sutton website, Stanley Park design commended, Available: http://www.sutton.gov.uk/index.aspx?articleid=3815 (Accessed: 2009, December)

Figure 4. 1 Aerial photograph of Carshalton with Orchard Hill site indicated in red. "Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)".

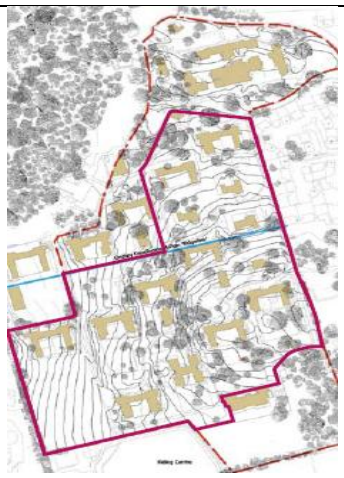


Figure 4. 2 Existing site plan illustrating hospital building locations, existing trees and 'ridgeline'. "Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)".

Figure 4. 3 Sustainable school zoning "Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)".

School elements site planning is analyzed in relation to location, height, site topography and planning constraints. Pedestrian routes for students, staff, parents, and the wider community, as well as vehicular access for public transport and minibuses are shown.

Public rights of way are also indicated on the site plan.

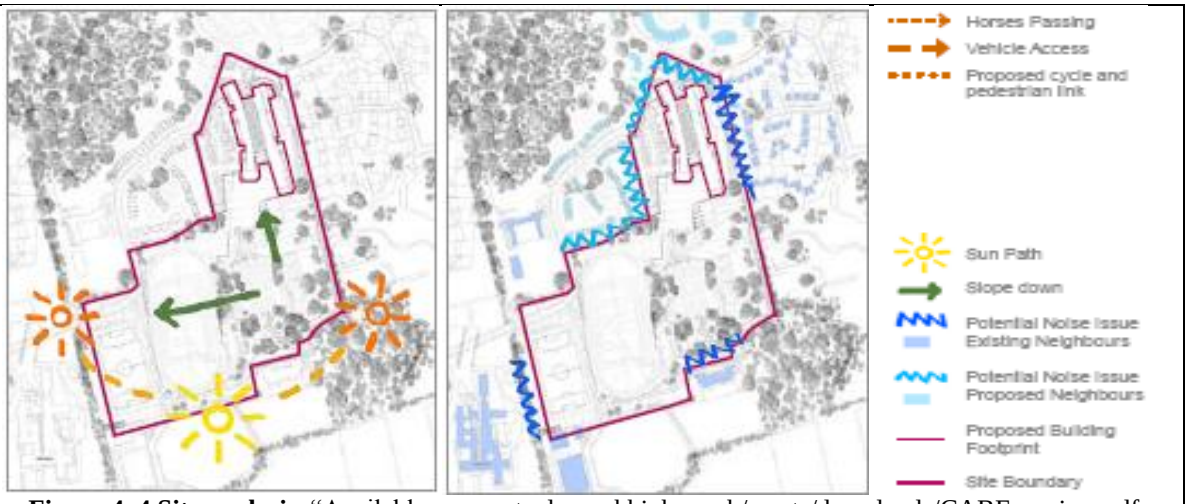


Figure 4. 4 Site analysis. "Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)".

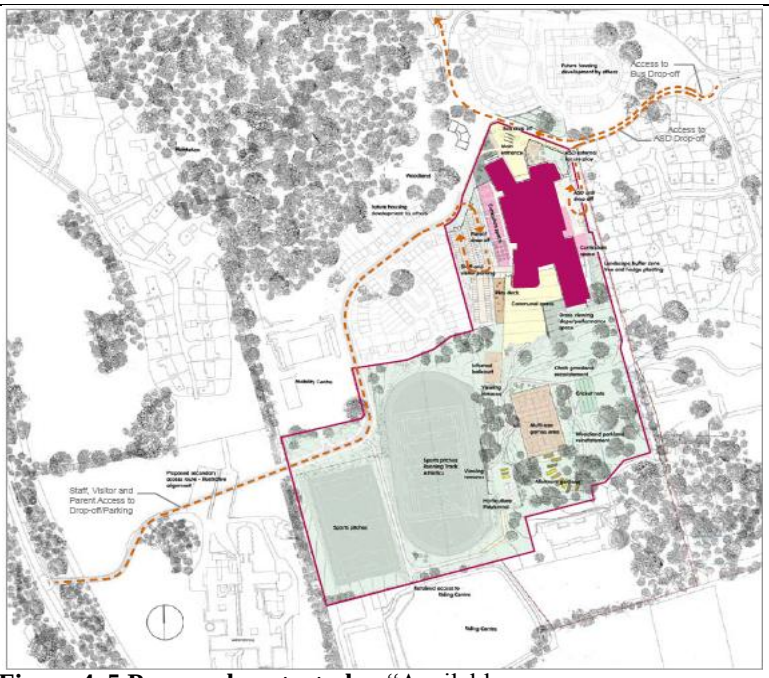


Figure 4. 5 Proposed context plan."Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)".

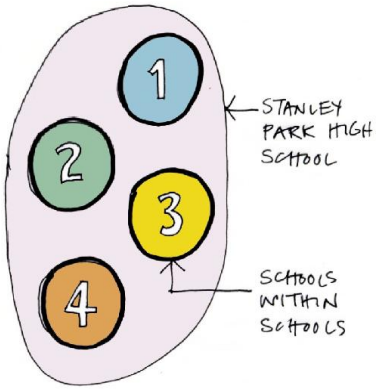


Figure 4. 6 Schools within schools but one school ethos. "Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)".

Understanding The Brief

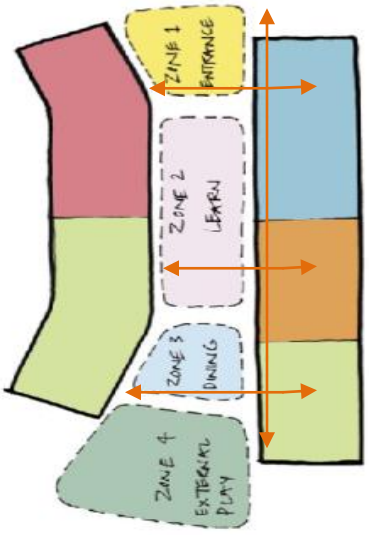


Figure 4. 7 Campus zones and relationships"www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

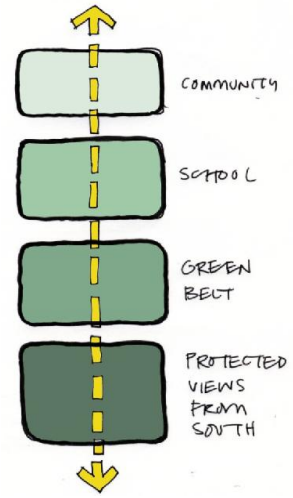


Figure 4. 8 Permeable site north to south. www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf

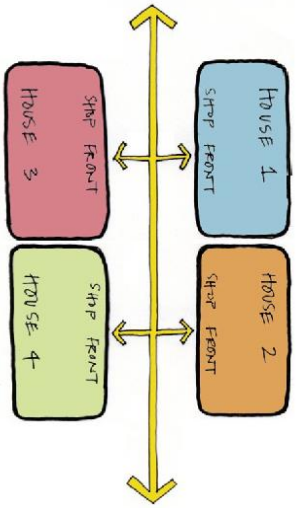


Figure 4. 9 shop fronts. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf".

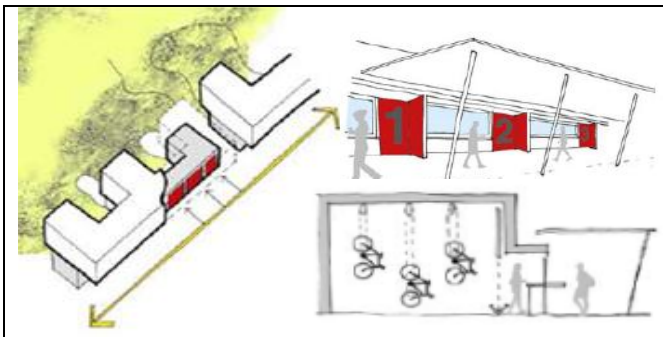


Figure 4. 10 Vocational learning zone.
"www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 11 Studios and team teach.
"www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

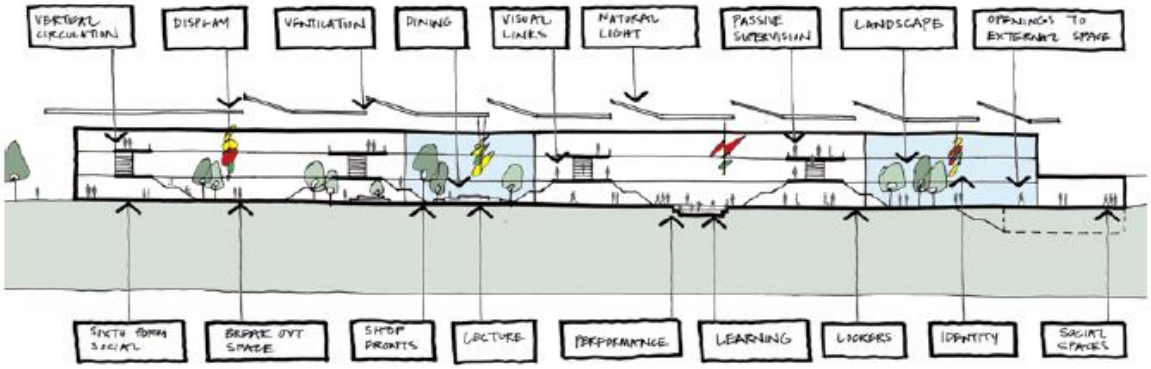


Figure 4. 12 The street as a learning space.
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf "

Figure 4. 13 Landscape as part of the curriculum." www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf "

Figure 4.13 demonstrates how the learning model and school ethos have been translated into an education environment. The vision has been defined in terms of curriculum delivery, the relationship of internal and external spaces, and co-location.

4.1.2 Site Plan

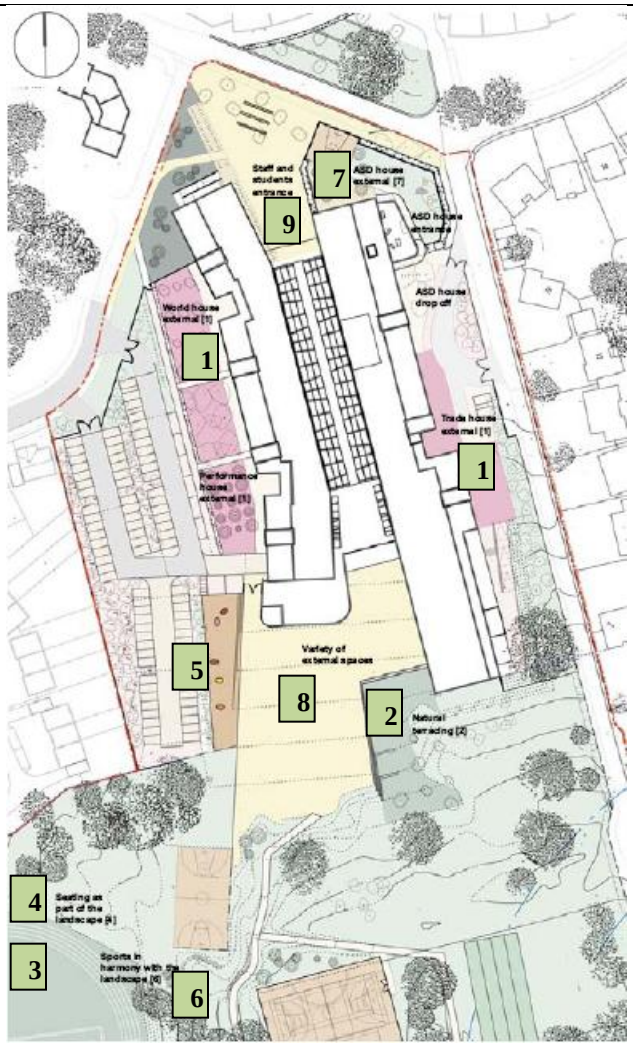


Figure 4. 14 proposed site plan.
"www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

1.House delicate external curriculum space

2.Terracing

3.Harmony

4.Seating in the landscape

5.Curriculum allotments

6.Sports tracks and landscape in harmony

9.Entrance

8.Social

7.Hard court sports and landscape in harmony

The Orchard Hill site provides a unique opportunity to create an exemplar school environment, providing external teaching, social, sports and performance

spaces set within the context of existing mature landscape, whilst ensuring the sustainable management of the site's ecological, heritage and natural assets.[1]

4.1.3 School Grounds

Figure 4. 15 Ground floor. www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf**.**

Figure 4. 16 First floor. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 17 Second floor. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

There is a clear plan for the school, which will be legible for all users of the building (spatial organization).

There are varieties of external spaces and the entrance is clear linking immediately to the circulation of the school. There are views and daylight to core

[1] Sutton website, Stanley Park design commended, Available: http://www.sutton.gov.uk/index.aspx?articleid=3817 (Accessed: 2009, December)

circulation spaces with secondary staircases providing circulation within ‘houses’ (movement routes).

This drawing details the organization of the ‘school within a school’ model and allocation of both internal and external spaces for delivering the curriculum.

4.1.4 Organization

These diagrams explain how the buildings have been organized to respond to pastoral learning, community zoning, circulation, and ICT delivery. Elevations (Figures 4.22-4.27) show how the massing and material treatments respond to internal functions and different orientations.

Figure 4. 18 principles. “www.stanleyparkhigh.co.uk/assets/ downloads/CABE_review.pdf”

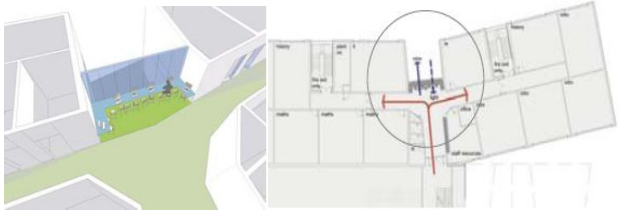


Figure 4. 19 Personalized learning. “www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf”

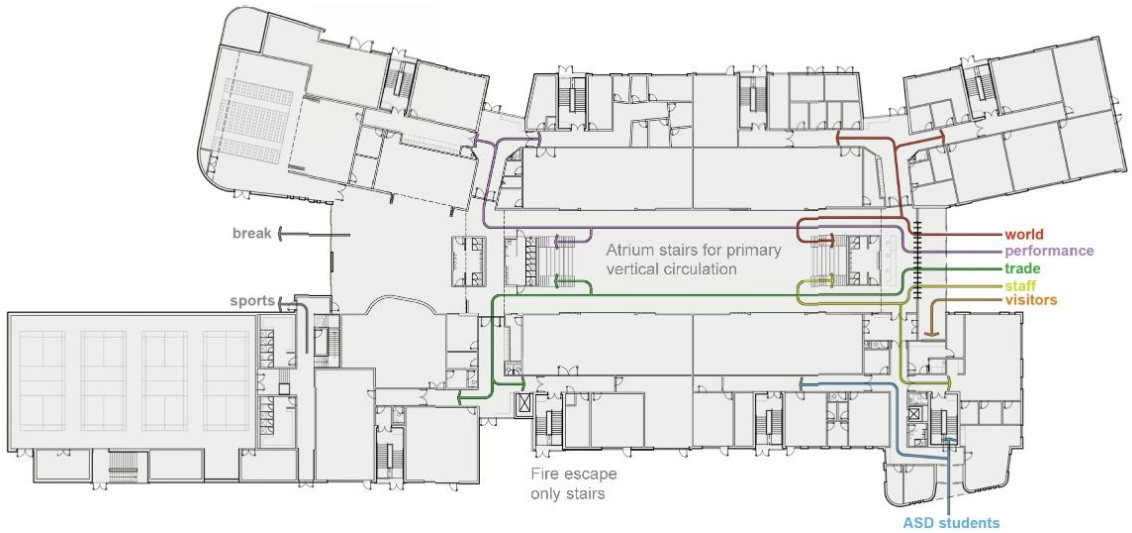


Figure 4. 20 circulation. “Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)”.

This drawing details the organization of the ‘school within a school’ model and allocation of both internal and external spaces for delivering the curriculum.

4.1.5 Buildings

Figure 4. 21 Building massing and shadow study. "Available: www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf (Accessed 2007)".

Figure 4. 22 East elevation. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 23 South elevation. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 24 West elevation. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 25 North elevation. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 26 Section west. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 27 Section south. "www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf".

The buildings have been organized to respond to pastoral learning, community zoning, circulation, and ICT delivery. Elevations show how the massing and material treatments respond to internal functions and different orientations.

4.1.6 Interior

Figure 4. 28 Learning street.
"www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf".

Figure 4. 29 School Hall
"Available: www.arnots.co.uk (Accessed 2010)".

4.1.7 Resources

At site level, the building's orientation, ecological response and access to green transport inform the sustainability strategy.

At building level, it is met through ventilation and heating strategies (illustrated for both summer and winter), which are demonstrated in more detail in the fenestration design.

Day lighting acoustics and ICT strategies are also addressed.

Mixed Mode Strategy
Ventilation and Heating Strategy

Figure 4. 30 Energy efficiency
"www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

- High U values
- Efficient ICT
- Controlled lighting(occupancy sensor, daylight dimming)
- Controlled water flow
- Heat recovery

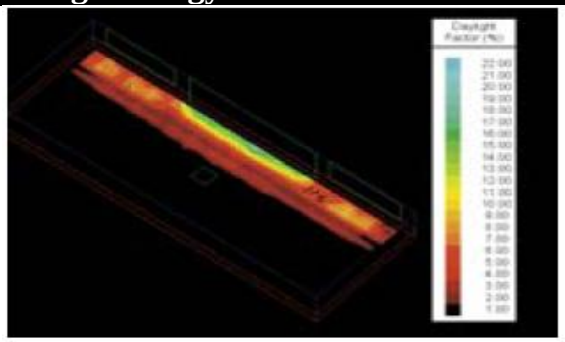


Figure 4. 31 Daylight example
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

- Daylight factors above 2%
- Glare issues minimized with blinds
- Room depth meets day lighting room depth criterion
- Energy saved through sensor control lighting

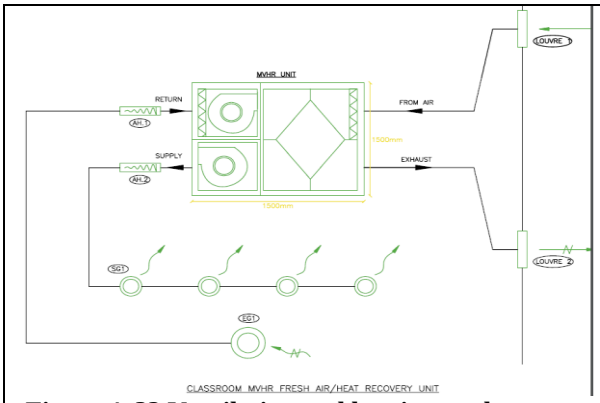


Figure 4. 32 Ventilation and heating to classrooms

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

- High efficiency heat recovery
- Local control through thermostats, CO2 and occupancy sensors
- Guaranteed ventilation rates all year
- No draughts
- Night purge to provide cooling in summer

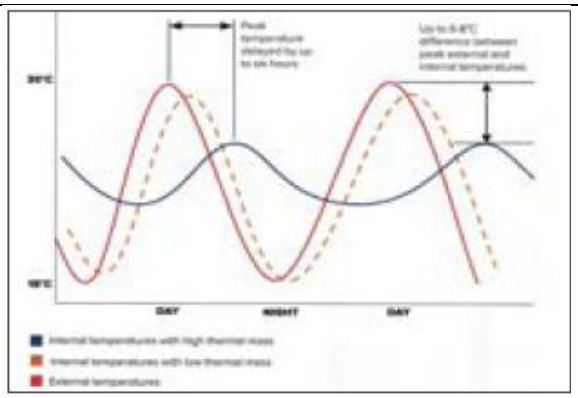


Figure 4. 33 Night-time purging benefits

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 34 Thin client IT strategy

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 35 Photovoltaic energy system

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

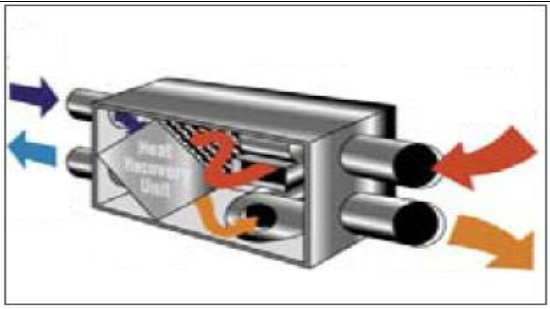


Figure 4. 36 Heat recovery units

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 37 Biomass renewable energy

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Natural Ventilation

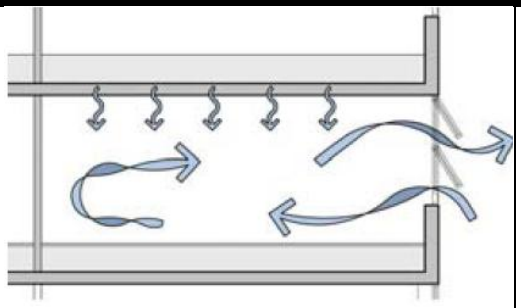


Figure 4. 38 summer day natural ventilation to curriculum spaces

- User control of windows during summer months
- Coolth from exposed concrete slab

“ www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf”

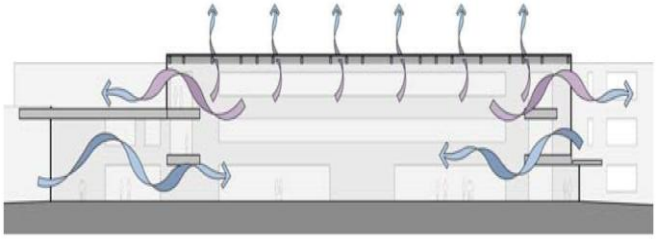


Figure 4. 39 Extensive natural ventilation to atrium, End walls and roof vents

- End walls and roof louvers on BMS automatic actuators

“ www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf”

Atrium Cooling

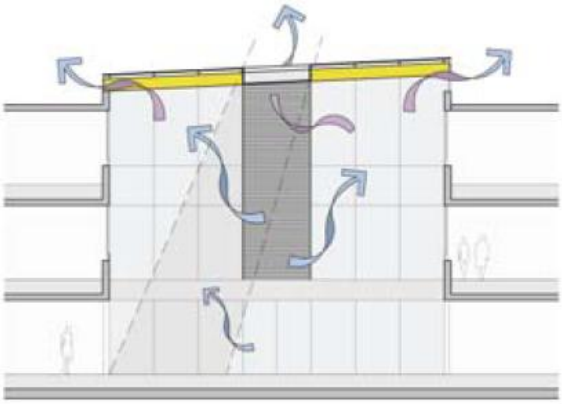


Figure 4. 40 Natural ventilation to atrium

“ www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf”

- End wall and roof edge louvers on BMS automatic actuators
- 20% shading to roof glazing to reduce solar gains

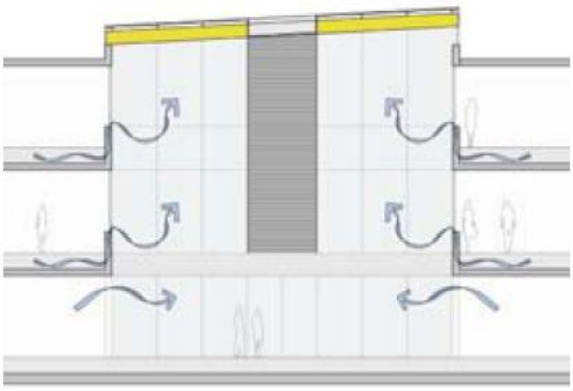


Figure 4. 41 Mixed mode ventilation to atrium

“ www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf”

- MVHR systems aids the natural ventilation at heat peak summer periods
- Free cooling is gained from classroom MVHR units
- Atrium is purged at night using BMS controlled louvers at high level

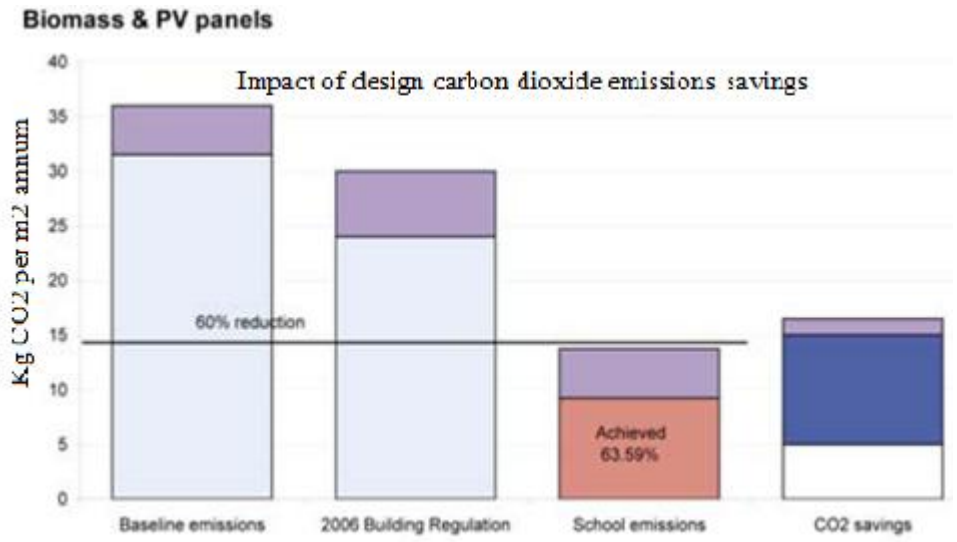


Figure 4. 42 Renewable energy and sustainability targets

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Targets

- 60% carbon emission reduction from 2002 building regulation to meet DCSF requirements
- BREEAM very good as minimum
- 20% renewable

Strategy

- Mix of technologies to minimize risk, maximize benefits
- Mixed mode strategy to maximize natural ventilation when feasible and reduce heat loss and costs during winter months through MVHR units
- Utilize photovoltaic, water controls, biomass, thin client IT and intelligent ventilation

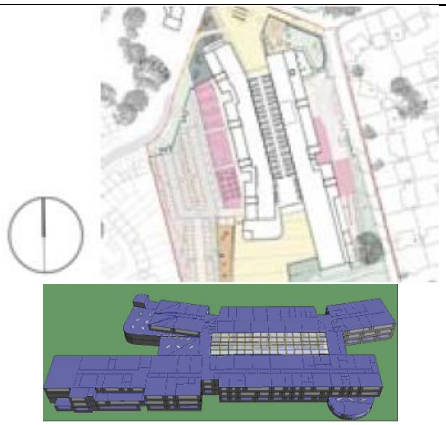


Figure 4. 43 Building orientation

" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Orientation

- Making the most out of the site constraints
- Communal break out space is south facing
- Double height volumes located at south end of the building to shield the classrooms and work as buffer

4.1.8 Feeling Safe

Figure 4. 44 visual links between external spaces.
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

A range of practical places for learning, socializing and exercising is shown. The fencing strategy has been well integrated with the building and landscape to define the use of the external spaces by students in the mainstream school, autistic spectrum disorder unit and local community. The strategy balances school security with the regard for the natural landscape, topography and openness of the site.

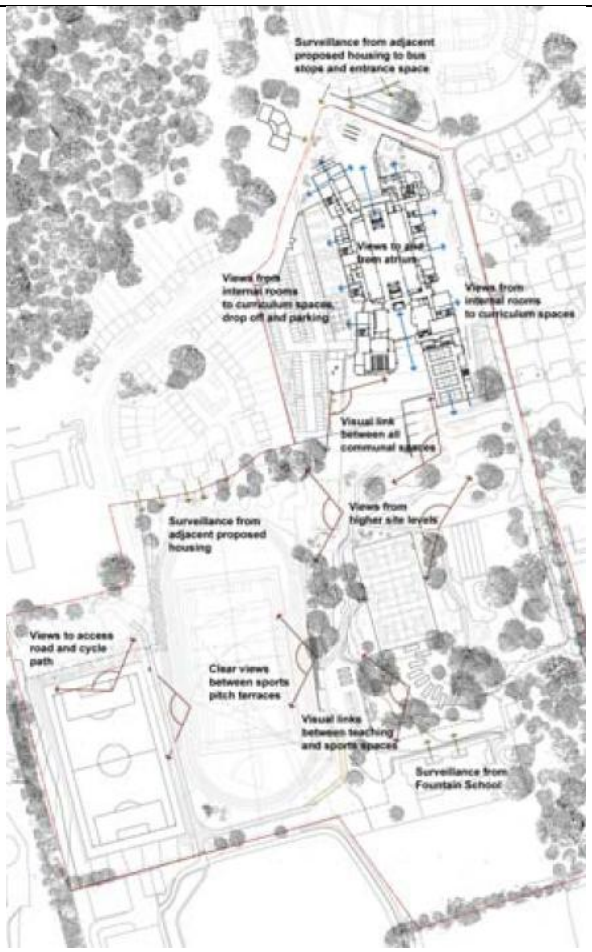


Figure 4. 45 feeling safe-visual links.
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

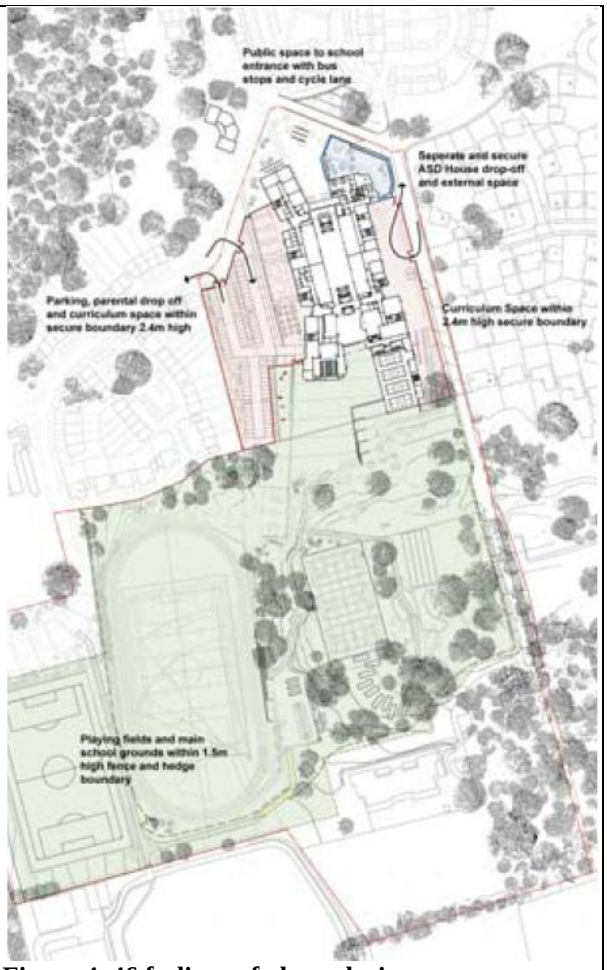
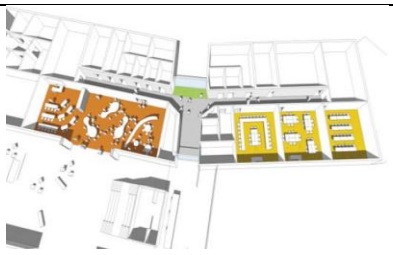
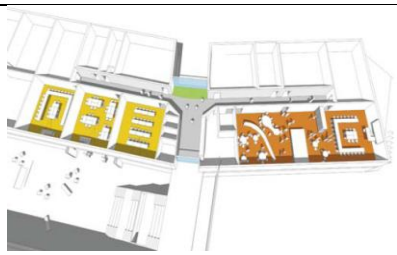


Figure 4. 46 feeling safe-boundaries.
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

4.1.9 Long Life/ Loose Fit



Current arrangement
Ground floor studios only



Potential for studios On upper floors

Potential for additional large studios

Figure 4. 47 Classrooms flexibility/adaptability.
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

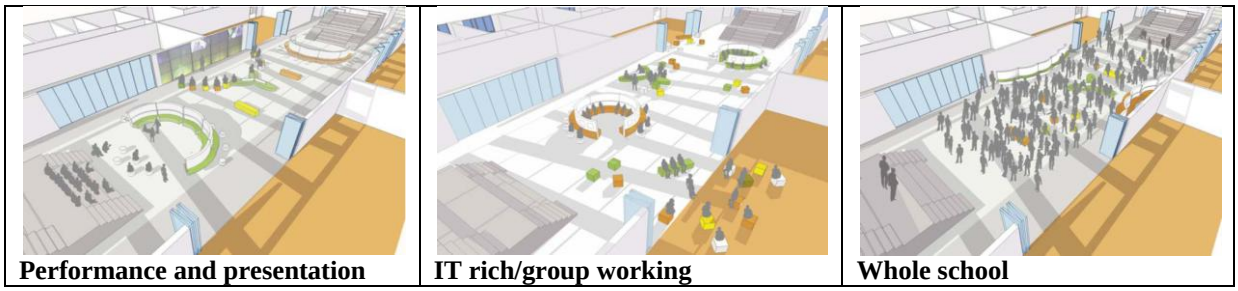


Figure 4. 48 Learning street flexibility/adaptability.
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

Figure 4. 49 Studio space flexibility/adaptability.
" www.stanleyparkhigh.co.uk/assets/downloads/CABE_review.pdf"

The definition of 'flexibility' can vary from school to school. In the brief for this school, it is understood in terms of time. Structural solutions for different options over time are shown. Expansion is not a possibility given planning constraints, and this is clearly noted.

4.1.10 Successful Whole

External and internal visualizations show the whole school experience – from entrance to informal play - and the quality of materials used. The interior visualization indicates the function and atmosphere as well as the details of ventilation, light and acoustics within the main 'street'.

At site level, the building's orientation, ecological response and access to green transport inform the sustainability strategy.

At building level, it is met through ventilation and heating strategies (illustrated for both summer and winter), which are demonstrated in more detail in the fenestration design.

Day lighting acoustics and ICT strategies are also addressed.

A range of practical places for learning, socializing and exercising is shown. The fencing strategy has been well integrated with the building and landscape to define the use of the external spaces by students in the mainstream school, autistic spectrum disorder unit and local community. The strategy balances school security with the regard for the natural landscape, topography and openness of the site.

4.2 Fossail Ridge High School (LEED Certificate)

4.2.1 Identity and Context

"Fossil Ridge High School located in Fort Collins, Colorado. Fossil Ridge High School (FRHS) is the third high school in the United States to attain LEED Silver certification."[1]

"The school opened in August 2004 intended to help better distribute students in Fort Collins and alleviate pressure on Rocky Mountain High School."[2]

"Fossil Ridge High School is one of the thirteen nation-wide LEED (Leadership in Energy and Environmental Design) buildings. The school was constructed out of "green" materials and utilizes double-pane windows, as well as solar panels to produce energy. The school saves approximately $100,000 a year in utilities. Due to Fossil Ridge's environmentally friendly design, The Discovery Channel hosted a special highlighting energy saving and its importance in our modern society at the school."[3]

[1] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, page 120

[2] Fcgov website (2005, May 27) The Power to Save, The Next Generation: Fossil Ridge High School,Available:http://www.fcgov.com/utilities/img/site_specific/uploads/cs-fossilridge.pdf (Accessed:2010, June 27)

[3]Available: http://en.wikipedia.org/wiki/Fossil_Ridge_High_School_%28Fort_Collins,_Colorado%29 (Accessed:2010, June 27)

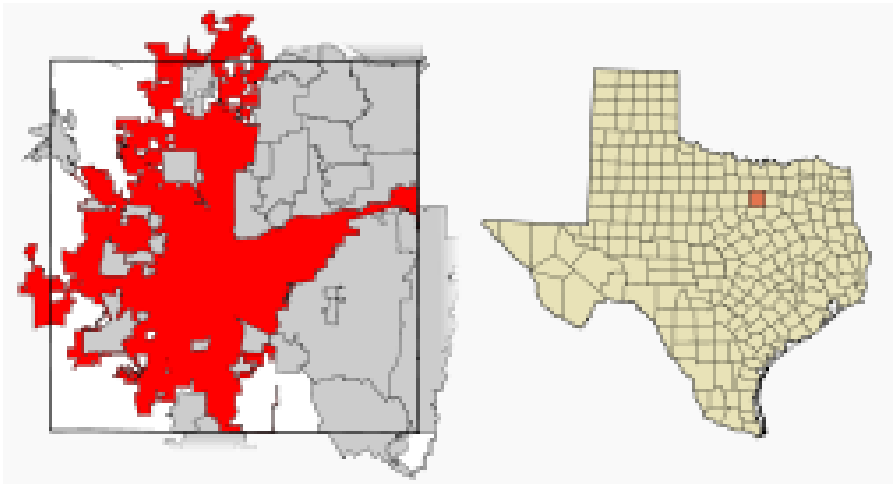


Figure 4. 50 Tarrant County Texas Incorporated Areas Fort Worth highlighted. "www.google..com/imghp"

"Fort Worth is the seventeenth-largest city in the United States of America and the fifth-largest city within the state of Texas. Located in North Texas and the western edge of the American South, The city is the second-largest cultural and economic center of the Dallas–Fort Worth–Arlington region.

The city was established in 1849 as an Army outpost on a bluff overlooking the Trinity River. Today Fort Worth still embraces its Western heritage and traditional architecture and design.

Fort Worth has a humid subtropical climate according to the Köppen climate classification system.

Because of its position in North Texas, Fort Worth is very susceptible to super cell thunderstorms, which produce large hail and can produce tornadoes.

Building on its western heritage and a history of strong local arts patronage, Fort Worth has, in recent years, begun promoting itself as the "City of Cowboys and Culture." Fort Worth Zoo has been named as a top zoo in the nation by Family Life magazine."[1]

[1] http://en.wikipedia.org/wiki/Fort_Worth,_Texas (Accessed: 2010, June)

4.2.2 Site Plan

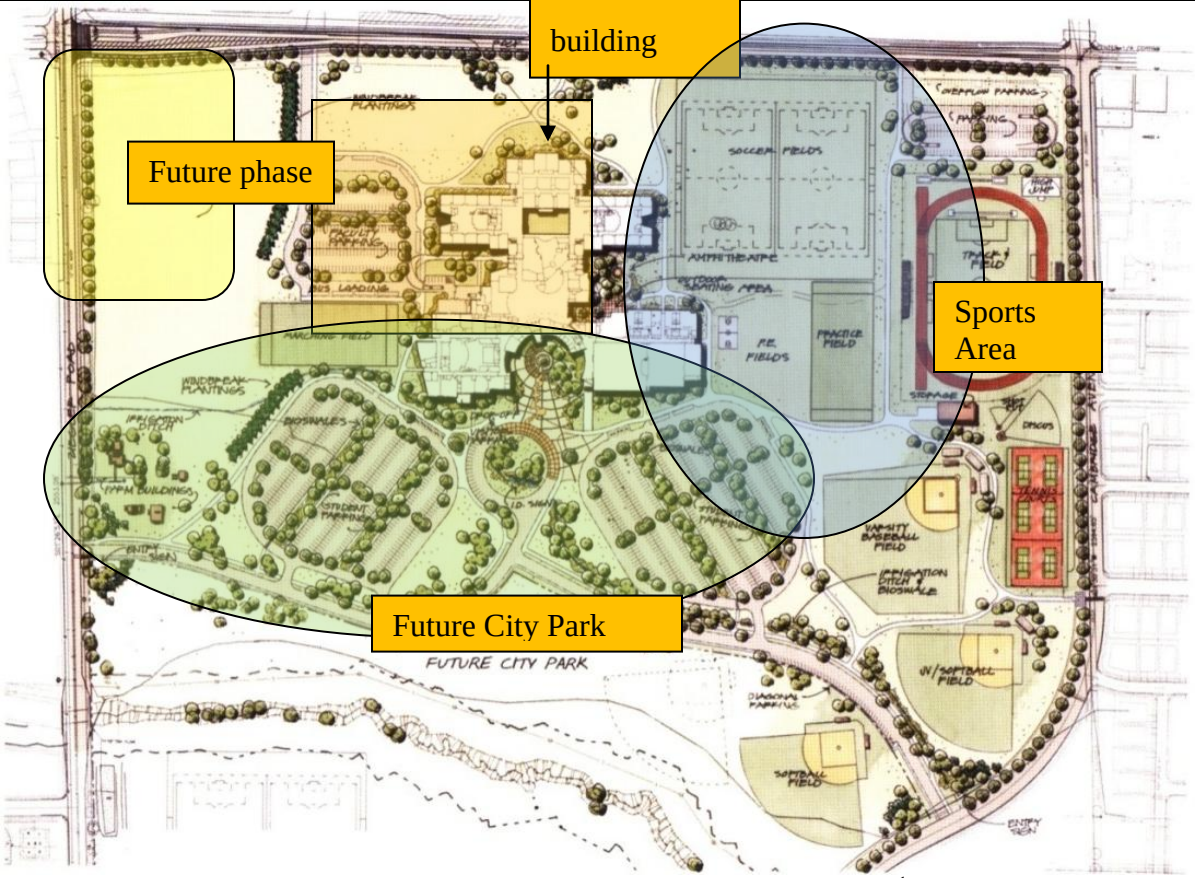


Figure 4. 51 Site plan with city parkland to the south."Sustainable School Book".[1]

Sustainable site:

• "1930's farm bldg now equipment storage PSD & City of Ft. Collins share ballfields Soccer field is recycled turf material White, reflec-ve roof lessens heat island Xeriscaping and bio-swales throughout site" [2]

[1] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, page 121.
[2] Poudre School District,(August 2004) Fossil Ridge High School,Available : http://usgbccolorado.com/green-buildings/documents/D.FossilRidgeFFinal4-16-08.pdf (Accessed: 2010, June)

4.2.3 School Grounds

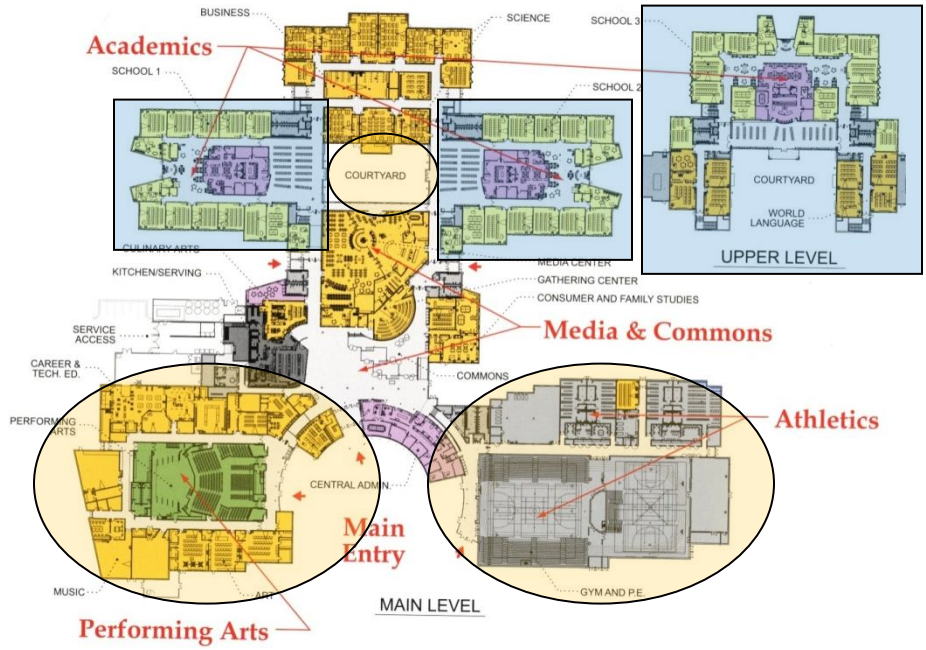


Figure 4. 52 Floor plan showing academic zones, media & commons, athletics, performing arts and main entrance. Academic zone has 3 schools: 1. Business school. 2. Science school. 3. World language school. At upper level. "Sustainable School Book".[1]

"The school is composed of three learning communities of 600 students each, with internal administration and student services." [2]

4.2.4 Organization

Design Goals

"Poudre School District in Fort Collins, Colorado is strongly committed to sustainable design, particularly minimizing energy use in their school buildings. In addition to the requirements and guidelines of the districts Sustainable Design Criteria, energy related goals for Fossil Ridge included:

1. Create a healthy and comfortable environment that would encourage learning.
2. Use the facility as a teaching tool for environmental design and stewardship.

[1] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, page 121.
[2] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, page 120

3. Make a resource- and energy-efficient building that would reduce operating costs, leaving more district money available for classroom spending.

4. Make the design flexible and adaptable to accommodate any future programmatic changes."[1]

"LEED certification was not an initial design goal. However, the district decided to seek LEED certification at the end of the design process."[2]

4.2.5 Building and Materials

Figure 4. 53 Main Entrance. "Sustainable School Book".[3]

Figure 4. 54 Fossil Ridge High School providing a comfortable learning environment for students."Sustainable School Book".[4]

Figure 4. 55 These articulated windows and exterior window coverings allow maximum daylight into the building while minimizing the amount of direct sunlight. ."Sustainable School Book".[5]

[1] EnergySmart Schools,(September 2009) ENERGYSMART SCHOOLS CASE STUDY, Fossil Ridge High School,Available : http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_fossil-ridge_cs.pdf (Accessed:2010, September)

[2] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 120

[3] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 121.

[4] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 121.

[5] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 121.

Windows

High-performance, low-E glazed windows provide insulation to reduce heating demand and reduce solar heat gains to lower cooling demand. All classroom windows open for natural ventilation. Automatic sensors turn off heating and cooling when windows are open.

Building envelope

R-values for the exterior walls and roof exceed the ASHRAE[1] 90.1-1999 standard by 37% and 43%, respectively."[2]

4.2.6 Interiors & Exterior Materials

The white roof reflects solar radiation, reducing the heat island effect and internal cooling loads.

Figure 4. 56 Most of the lighting for classrooms is natural, and operable windows allow fresh air inside without disrupting the heating, ventilating, and air conditioning (HVAC).
"Sustainable School Book".[3]

Figure 4. 57 the interior spaces such as the Media Center are spacious and attractive.
"Sustainable School Book".[4]

"The light fixtures throughout the school are high-efficiency and are controlled by light and occupancy sensors. The fixtures in the classrooms also have dimmable

[1] American Society of Heating, Refrigerating and Air Conditioning Engineers
[2] EnergySmart Schools,(September 2009) ENERGYSMART SCHOOLS CASE STUDY, Fossil Ridge High School,Available : http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_fossil-ridge_cs.pdf (Accessed:2010, September)
[3] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 121.

[4] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pge121.

ballasts that allow the occupants to further reduce artificial lighting when it is not needed.

Classrooms have operable windows, which allow natural ventilation. The windows are connected to the HVAC controls so that heating and cooling are turned off when the windows are open. The building envelope is tight and well insulated, and the HVAC equipment is high efficiency. An ice-storage system shifts cooling loads to off-peak hours in the evening and nighttime when electricity is cheaper.

The Poudre School District did everything it could to reduce environmental impact of this construction project. For example, 17% of all materials used in the school contain a high-recycled content, and more than half of (50%)all building materials are manufactured locally. The district took advantage of innovative ideas such capturing storm water in "bioswales"[1] and holding it in an adjacent pond for irrigating school grounds. In addition, the district preserved an historic 1930s farm building on the site, which will now be used for storing maintenance equipment.

The construction team recycled more than 70% of the building debris. This included grinding up the wasted pieces of gypsum board for use in landscaping.

To improve indoor air quality for students and faculty, the team used paints, finishes, and carpets that emit with low amounts of volatile organic compounds (VOCs). VOCs are known to degrade indoor air quality. Finally, the team also flushed the building with fresh air for two weeks after construction was complete and before it was occupied in order to rid the building of pollutants from construction. "[2]

[1] Bioswales are land scape elements designed to remove silt and pollution from surface runoff water. They consist of a swaled drainage course with gently sloped sides (less than six percent) and filled with vegetation, compost and/or riprap

[2] Colorado Renewable Energy Society,2005 Renewable Energy in Buildings Award (CRES website), Available : http://www.cres-energy.org/reba_2005_frhs.html (Accessed: November 2010)

4.2.7 Resources

1. Solar power Large shaded windows at the entrance support 5.2 kilowatts of photovoltaic panels that supply emergency power to the building.[1]

Figure 4. 58 Shaded high classroom windows with view windows below gives light and energy. "Sustainable School Book".[1]

Figure 4. 59 PV panel sun shades demonstrate ."Sustainable School Book".[2]

2. Electricity:100% of electricity needs are supplied by wind power purchased from the local utility. Energy Use (energy model) Approximately 30 kBtu[3] kBtu[3] per square foot is used annually for gas and electricity.[4][5]

Figure 4. 60 Eight large insulated tanks store ice made during off-peak hours when electrical rates are lower. "Available: www.cres-energy.org (Accessed 2008)"

[1] EnergySmart Schools,(September 2009) ENERGYSMART SCHOOLS CASE STUDY, Fossil Ridge High School,Available : http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_fossil-ridge_cs.pdf (Accessed:2010, September)

[2] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 121.

[3] KBTU Kilo British Thermal Units

[4] EnergySmart Schools,(September 2009) ENERGYSMART SCHOOLS CASE STUDY, Fossil Ridge High School,Available : http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_fossil-ridge_cs.pdf (Accessed:2010, September)

[5] Colorado Renewable Energy Society,2005 Renewable Energy in Buildings Award (CRES website), Available : http://www.cres-energy.org/reba_2005_frhs.html (Accessed: November 2010)

3. Day lighting

Windows provide 100% day lighting in most classrooms year round, using clerestories on the north and south sides. High-performance Sensors and dimming ballasts adjust artificial lighting based on available sunlight.[1]

Figure 4. 61 Students enjoy open, daylight spaces. "Sustainable School Book".[2]

Figure 4. 62 Fossil Ridge High School library. "Sustainable School Book".[3]

4. Air conditioning

Using energy recovery systems: Approximately 40% of the total airflow required to condition a classroom is outside air. Once this air is brought into the space, it has to be exhausted from the building. The exhausted air is passed through an energy recovery wheel to preheat or pre cool the incoming outside air, reducing the energy needed to heat or cool the air.

Chillers produce thermal storage ice at night for cooling during the day. Shifting the cooling load to off-peak demand creates savings of $9.00 per kilowatt, and allowed installation of a smaller chiller.

The cooling system incorporates a standard 135-ton chiller coupled with a partial ice storage system. The system makes ice during off-peak hours when electrical rates are lower. The ice is stored in eight large insulated tanks. During the day when cooling loads increase, the cooling system uses the stored ice to provide additional cooling.[4]

[1] EnergySmart Schools,(September 2009) ENERGYSMART SCHOOLS CASE STUDY, Fossil Ridge High School,Available : http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_fossil-ridge_cs.pdf (Accessed:2010, September)

[2] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 124.

[3] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 123.

[4] ASHRAEJournal,(May 2008) Energizing Education, Available : http://www.calmac.com/downloads/documents/ASHRAEJournal-TechnologyAwardFossilRidgeHSIB-200websize.pdf (Accessed: March 2010)

5. Heating

High-efficiency condensing boilers (up to 97%) are used to generate 140°F heating water. The water is circulated to all of the air handlers and terminal heating units by base-mounted pumps with high-efficiency motors. A fully interactive direct digital controls (DDC) system operates all the equipment to maintain a quiet, comfortable learning environment.[1]

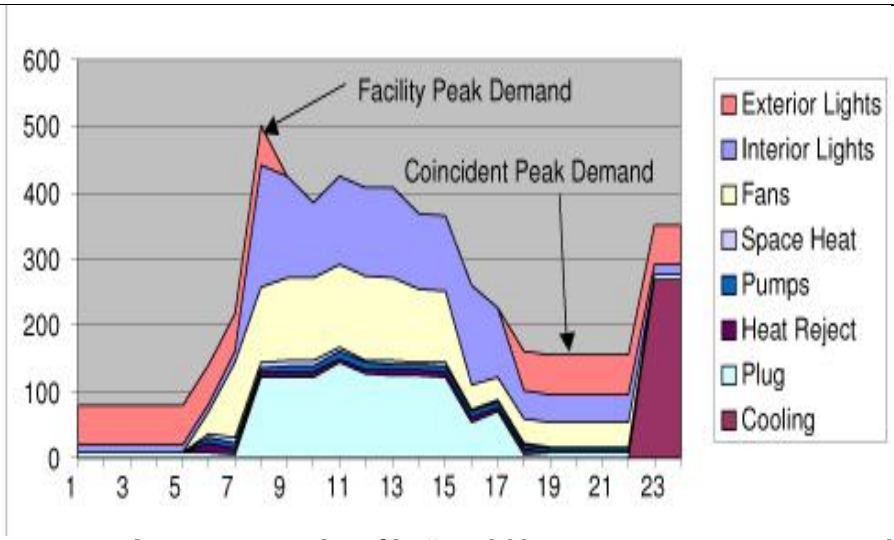


Figure 4. 63 December Day Demand Profile. "Available: www.cres-energy.org Accessed2008".

6. Water conservation is a key concern across Colorado. Fossil Ridge uses a raw water pond for campus irrigation, low-flow faucets and toilets, and artificial turf for the athletic field.[2]

7. Indoor air quality: A primary concern for Poudre, the building features operable windows to let in fresh air, carbon dioxide sensors, and paints and furnishings with low volatile organic compounds (VOCs).[3]

[1] ASHRAEJournal,(May 2008) Energizing Education, Available : http://www.calmac.com/downloads/documents/ASHRAEJournal-TechnologyAwardFossilRidgeHSIB-200websize.pdf (Accessed: March 2010).

[2] EnergySmart Schools,(September 2009) ENERGYSMART SCHOOLS CASE STUDY, Fossil Ridge High School,Available : http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_fossil-ridge_cs.pdf (Accessed:2010, September)

[3] EnergySmart Schools,(September 2009) ENERGYSMART SCHOOLS CASE STUDY, Fossil Ridge High School,Available : http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_fossil-ridge_cs.pdf (Accessed:2010, September)

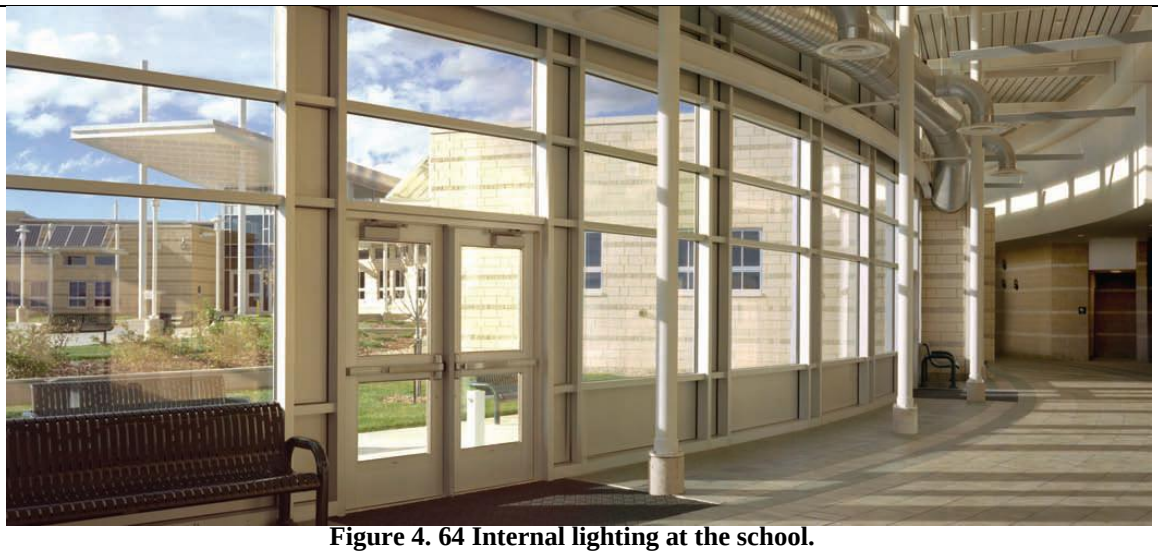


Figure 4. 64 Internal lighting at the school.
Poudre School District,(August 2004) Fossil Ridge High School,Available : http://usgbccolorado.com/green-buildings/documents/D.FossilRidgeFFinal4-16-08.pdf (Accessed: 2010, June)"

Fossil Ridge High School is attractive both inside and out, and includes a number of design features intended to minimize energy bills and at the same time maximize comfort conducive to a learning environment. The plan layout is oriented east to west for good solar exposure and maximum control of direct sunlight. Control is important because allowing direct sunlight into occupied spaces can cause glare that distracts students who are trying to study and can overheat south and west-facing rooms in the summer.

At the front entrance, a solar photovoltaic (PV) power system rated at 5.2 kilowatts (kW) greets arrivals at the front entrance and gives the entire school a modern, "high-tech" look. The PV array produces power at the same time it shades the front windows, which controls the direct solar gain to reduce overheating. [1]

[1] Colorado Renewable Energy Society,2005 Renewable Energy in Buildings Award (CRES website), Available : http://www.cres-energy.org/reba_2005_frhs.html (Accessed: November 2010)

4.2.8 Feeling Safe

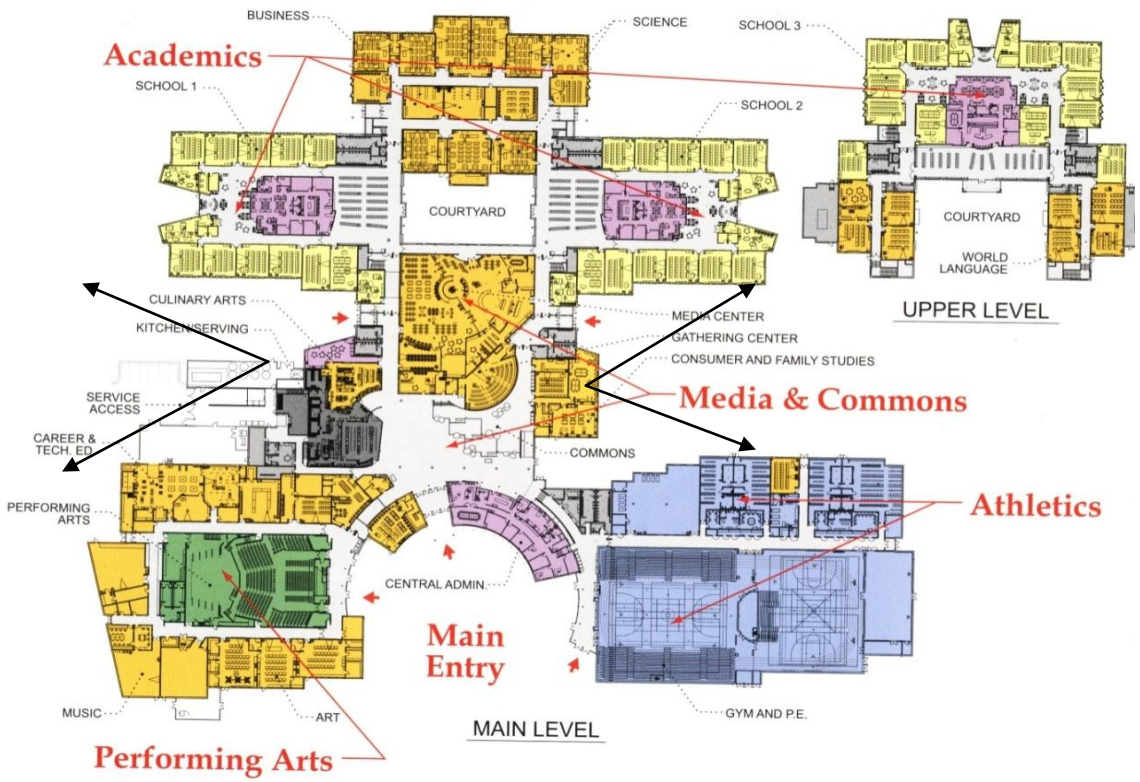


Figure 4. 65 The school is one Building has all the spaces that is help for the security. And the courtyard in the school make the students feeling safe from visual links. "Sustainable School Book".[1]

4.2.9 Long Life, loose Fit

Flexibility in the program is demonstrated by features such as retractable seating in the auditorium, which creates additional fine arts instruction space; an indoor running track, which is incorporated through the main and auxiliary gymnasiums; and sharing of the culinary arts and career and technical education programs with the local community college.[2]

4.2.10 Successful Whole

Students enjoy and benefit from the new school's environment, and families can be confident that the school district went to great lengths to provide the best learning environment.

[1] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 122.
[2] "Alan Ford,(2007) Designing the Sustainable School. Australia:The Imges Publishing Group Pty Ltd, pg 120"

4.3 Science Park High School

4.3.1 Identity and Context

"Science Park High School, formerly known as Science High School, is a magnet public high school located in Newark, in Essex County, New Jersey. The school opened in 1974.

Figure 4. 66 The new science magnet school, in a dense urban area, is the culmination of ambitious planning by the school district, local community groups, and public and private institutions. "Sustainable School Book".[1]

The mission of Science Park High School is to transform mathematics and science teaching and learning by developing ethical leaders who know the joy of discovery and forging connections within and among mathematics, science, the humanities and the arts by means of exemplary laboratory environments characterized by research, innovative teaching, and service."[2]

"Essex County is the second most densely populated county in the state after Hudson County, and has the third largest total population after Bergen County and Middlesex County.

Like many of the counties of Northern New Jersey near New York City — which tend to have sharp divides between relatively rich suburban neighborhoods and less wealthy, more densely-populated cities nearby — the eastern region of Essex County tends to be poorer and more urbanized, while the western parts tend to be more affluent and suburban.

[1] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 171.

[2]Available: http://en.wikipedia.org/wiki/Science_Park_High_School_(New_Jersey), (Accessed: November 2010).

Eastern Essex This wide area has significant pockets of areas that qualify as inner city: high building density, high poverty and high crime rates and underperforming school systems. Beginning at about the turn of the century, this region led the state in the rebuilding and rehab of its housing stock. Crime in this part of the county has traditionally been among the highest in the state and the country as well, but recently has also seen significant declines, in contrast, Western Essex tends to be suburban and affluent. Within this region are some of the most diverse and racially integrated municipalities in the state and nation." [1]

Figure 4. 67 Map of New Jersey.
"www.google.com/img"

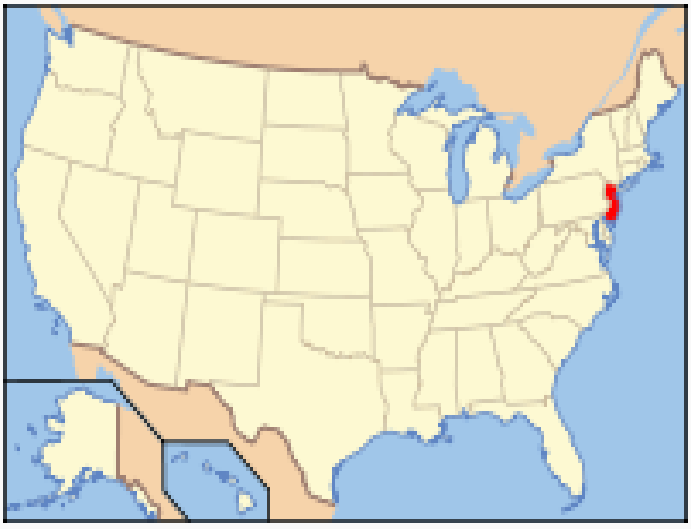


Figure 4. 68 Map of USA with New Jersey highlighted.
"www.google.com/img"

[1] http://en.wikipedia.org/wiki/Newark,_New_Jersey, (Accessed: November 2010)

Figure 4. 69 Site Photos. " http://www.designshare.com/index.php/projects/newark-science-park-high/images "

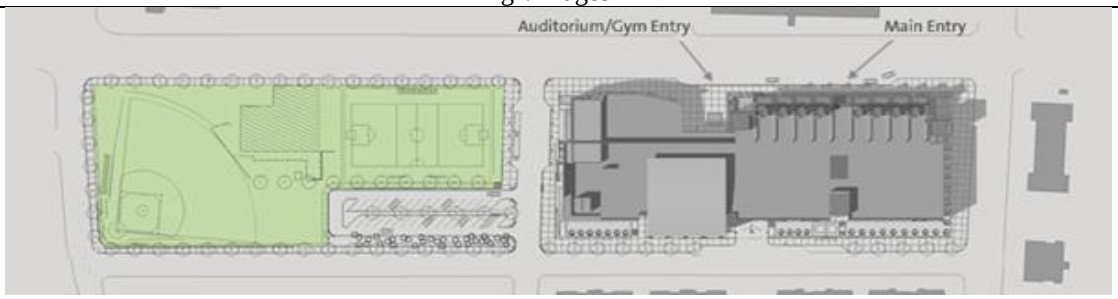


Figure 4. 70site plan" http://www.designshare.com/index.php/projects/newark-science-park-high/images "

4.3.2 Site Plan

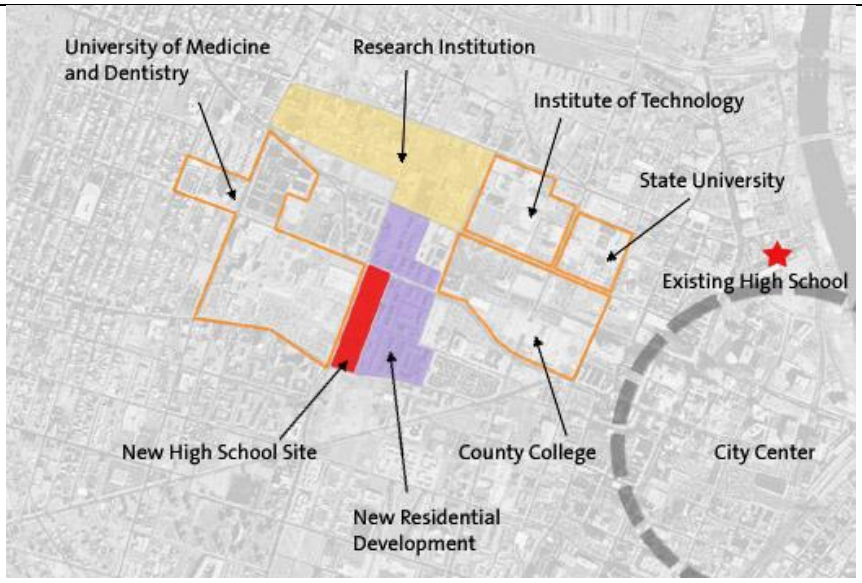


Figure 4. 71 school layout "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

"For 32 years, Science High School was at 40 Rector Street in Newark. The building was originally the Ballantine Brewery. After the brewery closed, it was

acquired by Rutgers-Newark and was converted into a facility for chemistry research and training. In the 1970s, the Newark Public Schools leased the structure and converted it for use as a high school.

Science High School officially left the Rector Street building in November 2006 to move to its new location adjacent to Newark's Science Park. Accordingly, the class of 2010–2011 will be the first class to graduate Science Park High School having spent full four school years in the new building located at 260 Norfolk Street.

The new building has a capacity of 800 students and is located on a 6-acre (24,000 m2) campus. The school was renamed Science Park High School because of its location near and connections with the University Heights Science Park.

University Heights Science Park is a collaborative venture between Newark's higher education institutions, the City of Newark, and private industry designed to harness university science and technology research as a force for urban and regional economic and community development.

University Heights Science Park is uniquely positioned to provide technology businesses with a competitive advantage through its ties with the three NJ public research universities located nearby: New Jersey Institute of Technology (NJIT), The University of Medicine & Dentistry of New Jersey (UMDNJ) and Rutgers University at Newark. The building includes a state of the art solar and geothermal energy system and highly efficient heating and cooling. "[1]

4.2.3 School Grounds

"The heart of the high school will be an “Academic Village.” The project team created an environment that facilitates a student-centered and interdisciplinary teaching team approach, in a building that must also function as a community

[1] Available: http://www.publicschoolreview.com/school_ov/school_id/52509 (Accessed: March 2010)

resource. Four distinct “neighborhoods” (Educational Learning Modules or ELM’s) will each house a maximum capacity of 300 students. Each will comprise Home Base Classrooms, Science Labs, Teacher Planning, Lecture rooms and support spaces. These four ELM’s will be paired and located on the second and third floors around a central atrium space.

Ground floor support spaces are organized around the “Village Commons” at the base of the atrium. The Instructional Media Center (IMC) the focal point of the school and the primary link to the community sits adjacent. It is directly accessible from the main entrance and clearly visible from the building exterior. Other functions include Administration, Student Support Services, and the Cafeteria.

Throughout the high school, Science Labs, Lecture, Seminar and Research rooms are all designed to maximize student-based inquiry. Fabrication areas with workstations provide for hands-on exploration of robotics, electronics and other technology based innovative processes. Multi-Media Labs, CAD and ITV areas will function as both communication production centers and as instructional areas for student and staff development. An Outdoor Habitat, designed with the assistance of the State Conservancy, will augment both Horticulture Lab-House and Art Studio areas.

To further support these activities, the Auditorium was designed to allow for large-event science demonstrations. Staff planning, development and mentoring areas will allow students’ easy access to school staff and visiting mentors."[1]

[1] Available: http://www.designshare.com/index.php/projects/newark-science-park-high/narratives (Accessed: March 2010)

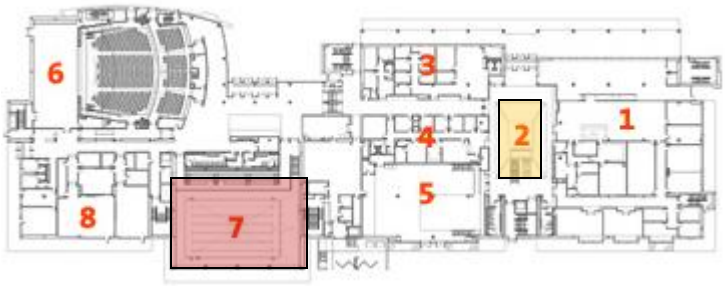


Figure 4. 72 First floor.
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

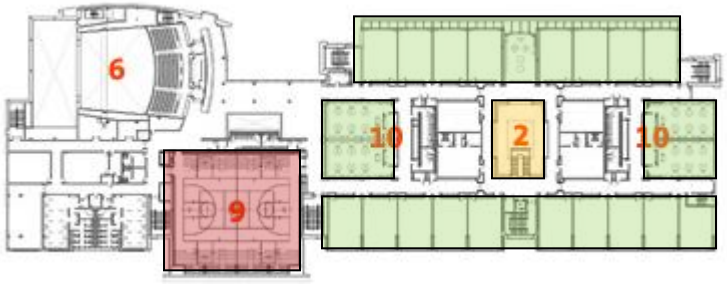


Figure 4. 73 Second floor.
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

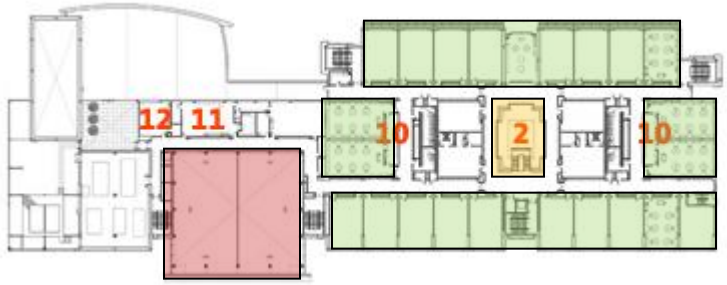


Figure 4. 74 Third floor.
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

Figure 4. 75 Education learning module.
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

1.Information media center
2.Atrium/village commons
3.Student services
4.Administration
5.Cafeteria
6.Auditorium
7.Swimming pool
8.Music
9.Gymnasium
10.Education learning module
11.Art
12.Green house
13.Classroom
14.Science lab
15.Preparation
16.Elective
17.Lecture
18.Teacher planning
19.Student research

4.2.4 Organization

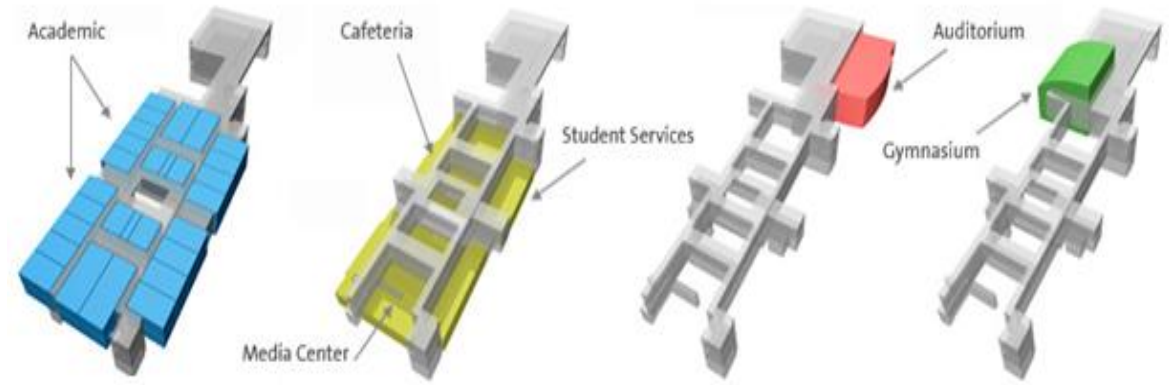


Figure 4. 76 Building organization. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

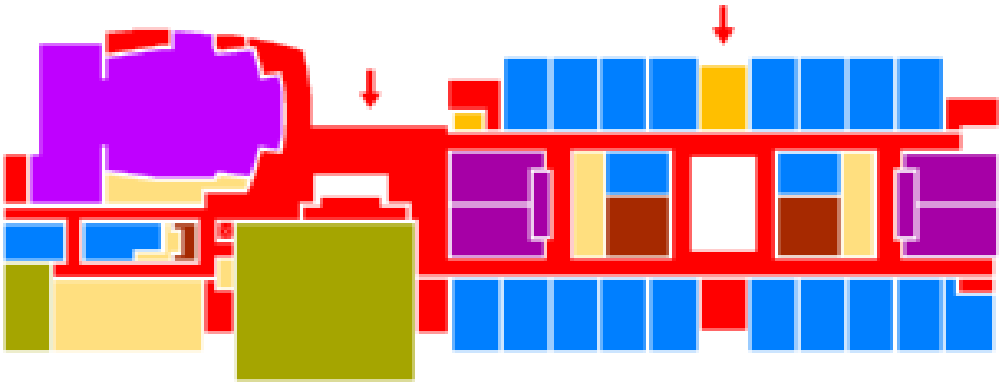


Figure 4. 77 Zoning and circulation. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

4.2.5 Buildings

"The building's exterior is intended to clearly communicate the use of the building as a science and technology high school, and as a community resource. Sustainable design features such as photovoltaic panels have been incorporated into the building aesthetic. Major building elements such as the ELM's, IMC, Auditorium and athletic program spaces are prominently articulated as distinct masses. The educational program is expressed through the building form, captured in a rich staccato of contemporary architectural materials seamlessly mixed with structural and MEP systems components. A stimulating vocabulary begins to hint at the amazing opportunities for exploring science within."[1]

[1] http://www.designshare.com/index.php/projects/newark-science-park-high/narratives (Accessed: March 2010)

Figure 4. 78 Conceptually, the building maximizes the use of tight site-the articulation of the building massing, the use of brick, metal panels, and glass, and the expression of photovoltaic panels celebrate science and the learning opportunities within. "Sustainable School Book".[1]

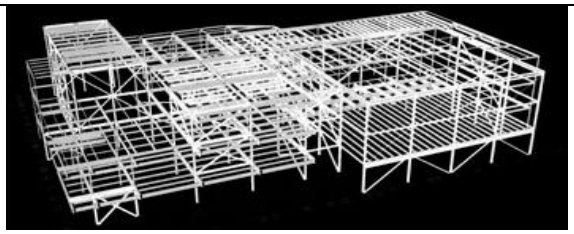


Figure 4. 79Masses
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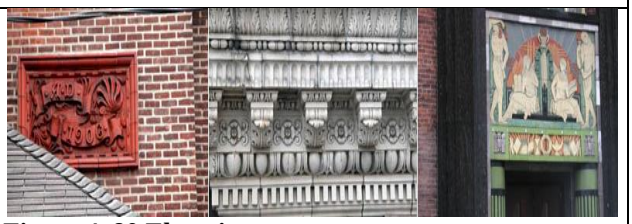


Figure 4. 80 Elevation
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

Figure 4. 81 West elevation. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

Figure 4. 82 North elevation.
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

Figure 4. 83 South elevation.
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

[1] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 171.

Figure 4. 84 East elevation. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

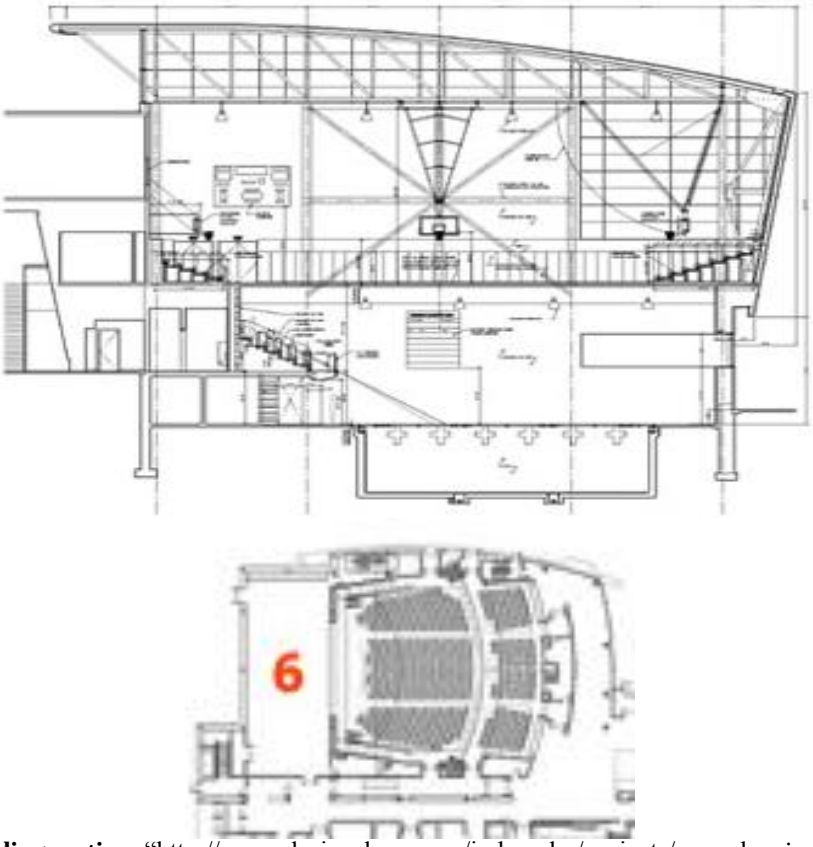


Figure 4. 85 Building section. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

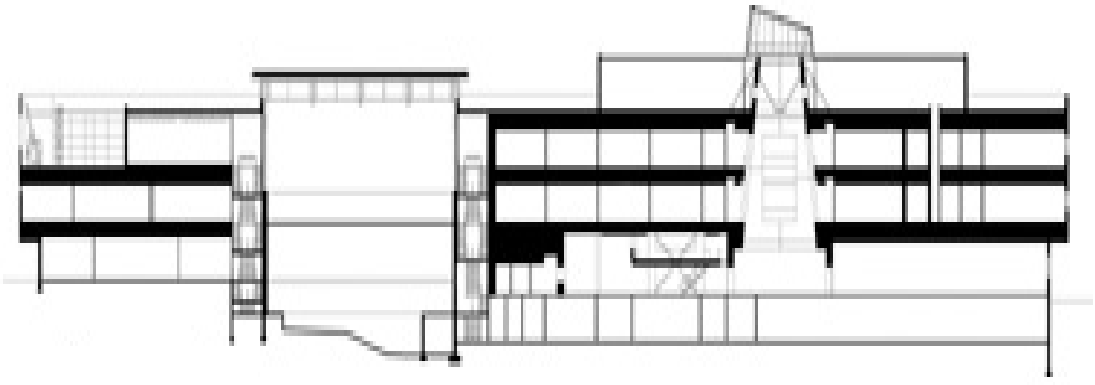


Figure 4. 86 Building section. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

4.3.6 Interiors

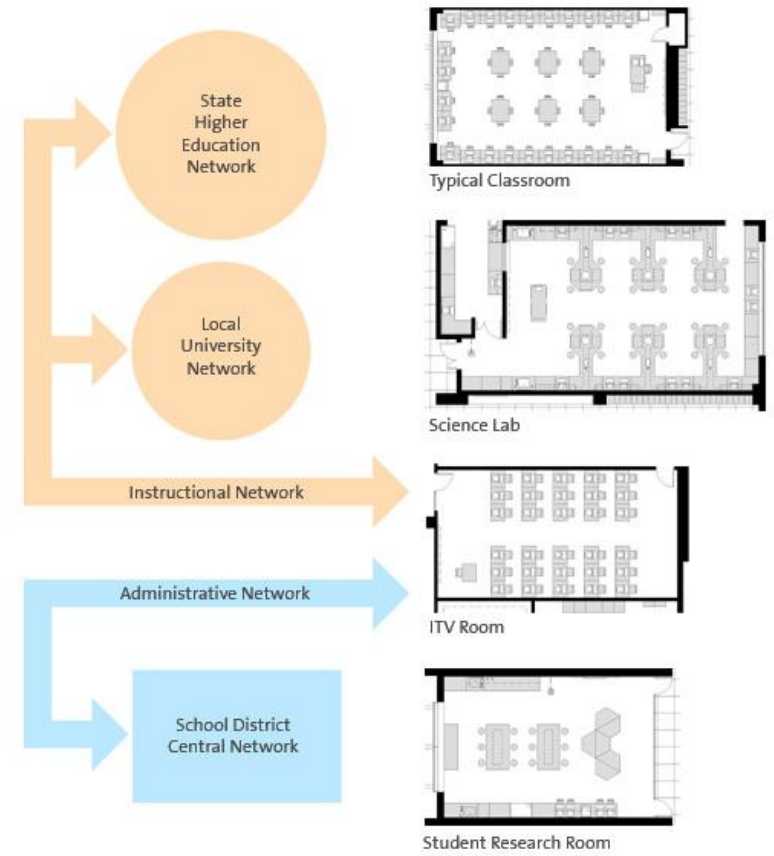


Figure 4. 87 Educational spaces. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

"Classrooms: Classrooms will provide each student an instructional home base at a research carrel. Students will work on multi-discipline inquiry projects under the supervision of a mentor or teacher. A 1:1 computer to student ratio with ample peripherals will permit effective use of digital and wireless technologies.

Science labs: Science labs will function as classrooms/labs with the flexibility to accommodate changes in curriculum goals and technological advancements. Computers will permit use of microscopes, probes, sensors and other data collection devices that augment the computer's role in scientific inquiry. Some labs have been equipped with FDA style food science workstations that allow student inquiry in this growing field of science."[1]

[1]Available: http://www.designshare.com/index.php/projects/newark-science-park-high/images (Accessed: March 2010)

"ITV Room: An ITV Room will allow students to participate in telementoring and video-conferencing for project research or to broadcast their own research to other facilities.

These areas will also allow students to participate in courses at centers of higher learning and give access to staff development programs.

Student research rooms: Students will have access to many large research databases through their multi-platform network and the equipment to analyze their own data collections such as tracking changes in the Earth's magnetic field or analyzing air quality.

Research rooms may include:

Computer controlled microscopes, digital imaging peripherals, virtual imaging screens, vernier sensors and probes that can work with computers or PDA's for data collection/analysis and virtual microscopy equipment."[1]

Figure 4. 88 The information network is linked to universities, supported by their staff; the school is the first to be connected to the state's higher education network. "Sustainable School Book".[2]

Figure 4. 89 The school is organized as four learning modules centered around an atrium, encouraging interdisciplinary team teaching. "Sustainable School Book".[3]

Figure 4. 90 The atrium serves as a gallery for student work. Historical elements from the site and original school will be displayed. Building systems data will be accessible through the information network. "http://www.designshare.com/index.php/projects/newark-science-park-high/images"

[1] http://www.designshare.com/index.php/projects/newark-science-park-high/images (Accessed: March 2010)

[2] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 172.
[3] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 171.

4.3.7 Resources

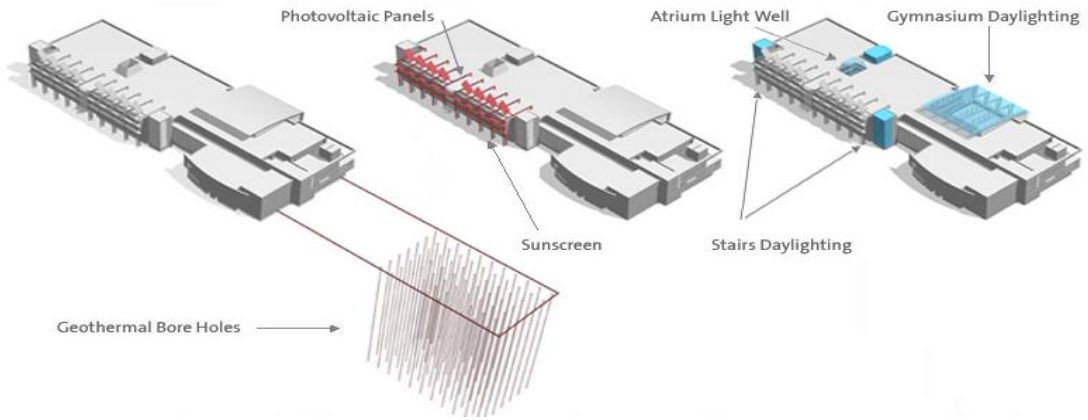


Figure 4. 91 Energy resources.
"http://www.designshare.com/index.php/projects/newark-science-park-high/images"

"Critical to building these skills of learning is the link between teaching science and using the school itself and the grounds as a hands-on laboratory to learn about sustainable design. Geothermal boreholes will be located over the playing fields and parking lots. Individual control zones are to be provided throughout the school. Energy recovery units will recapture exhaust air temperature to provide high-energy savings and comfort. Variable frequency drives and high efficiency motors will be located throughout the various systems. Besides being able to observe first-hand how these systems operate, building controls for all of these will be accessible to students for analysis through "read only" computer stations.

Sustainable features:

- The structure is expressed within the building, which serves as an educational tool in addition to material supplies and costs saved during construction
- Photovoltaic panels are used to power student experiments within the building
- 16-foot (5-meter) floor-to-floor heights allow day lighting controls using sunscreens, light shelves, indirect lighting with light sensor controls, and introducing natural day lighting at many opportunities such as the atrium, stairwells, and gymnasium"[1]

[1] Alan Ford,(2007) Designing the Sustainable School. Australia:The Imges Publishing Group Pty Ltd, page 170

- "The geothermal heat pump system cuts energy consumption by approximately 30%; room-by-room, zone-by-zone heating and cooling increase user comfort and allow heating energy to be moved from warm zones to cool zones
- The project includes a geothermal well field consisting of 375 holes
- The main atrium ("village commons") utilizes acoustical control. increased ventilation, and C02 monitoring
- The school incorporates healthy and high-performance features, designed for LEED silver certification, made possible by the aggressive pursuit of rebates totaling more than $1 million"[1]

Figure 4. 92 site work. www.designshare.com/ index.php/projects/newark-science-park-high/images

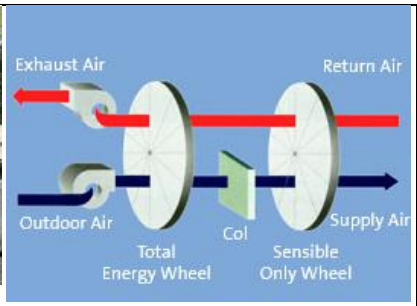


Figure 4.93 Air Condition system. Available: www.designshare.com/ index.php/projects/newark-science-park-high/images

Figure 4. 94 Solar Panels "Available:www.designshare.com/index. php/projects/newark-science-park-high/images"

Figure 4. 95 Natural day lighting in all public spaces was a priority from. The early design phases of the project. "Sustainable School Book".[2]

[1] Alan Ford,(2007) Designing the Sustainable School. Australia:The Imges Publishing Group Pty Ltd, page 170

[2] Alan Ford,(2007) Designing the Sustainable School. Australia: The Images Publishing Group Pty Ltd, pg 173.

4.3.8 Feeling Safe

A range of practical places for learning, socializing and exercising is shown.

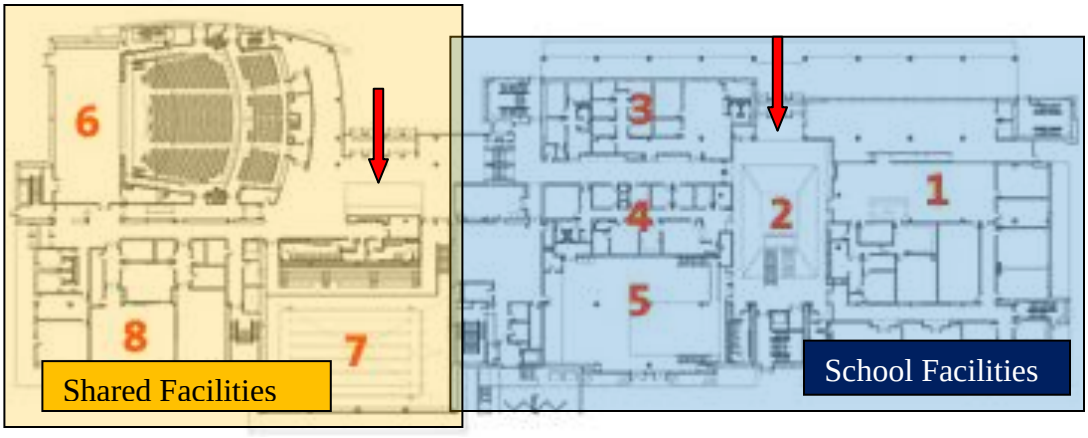


Figure 4. 96 the school design divided to two functions, first one is the school Facilities and the second one is the shared facilities between the school and community. "Available: http://www.designshare.com/index.php/projects/newark-science-park-high/images Accessed (2009)"

4.3.9 Long Life, loose Fit

Using the renewable resources make the school long life.

Figure 4. 97 School side elevation. "www.eypaedesign.com".

4.3.10 Successful Whole

"This new science magnet high school will be a dynamic model of how technology can be utilized in educational delivery. It is one of the first beneficiaries of a capital program spearheaded by a state construction program to build innovative new schools. In collaboration with a public/private partnership, that includes the school district, regional universities and high technology industries; this facility was planned utilizing Instructional Technology Standards that define infrastructure, equipment to student ratios, maintenance standards, and alignment of technology resources to curriculum goals. These groundbreaking educational ideas are the way in which the new school will help foster social progress and the renaissance of this economically depressed area."[1]

[1]Available: http://www.designshare.com/index.php/projects/newark-science-park-high/narratives (Accessed: March 2010).

Chapter Five

Applying Sustainability in Egyptian Secondary Schools

Chapter Five: Applying Sustainability in Egyptian Secondary Schools

5.1 Secondary schools in Egypt

5.2 Criteria for Selection of Case Studies

5.2.1 Elsaydeah Secondary school

5.2.1.1 Identity and context

5.2.1.2 Sustainable Site

5.2.1.3 School Grounds

5.2.1.4 Organization

5.2.1.5 Buildings and Materials

5.2.1.6 Interiors

5.2.1.7 Resources and energy

5.2.1.8 Feeling safe

5.2.1.9 Long life, loose fit

5.2.1.10 Successful whole

5.2.2 Imababah Secondary school

5.2.1.1 Identity and context

5.2.1.2 Sustainable Site

5.2.1.3 School Grounds

5.2.1.4 Organization

5.2.1.5 Buildings and Materials

5.2.1.6 Interiors

5.2.1.7 Resources and energy

5.2.1.8 Feeling safe

5.2.1.9 Long life, loose fit

5.2.1.10 Successful whole

Applying Sustainability in Egyptian Secondary Schools

5.1 Secondary Schools in Egypt

The design quality of secondary schools completed over the last years is not good enough to secure the government's ambition to developed educational Facilities.

For everyone involved in Educational process it is presents a major challenge. To fulfill future needs they have to recommit themselves to excellence in design and to double their efforts to turn aspirations into reality. Standards will need careful monitoring to ensure that children get the schools they deserve.

The aim is not just to update the current schools with new ones, but also to transform the way we learn. This represents the old way of doing things and should change the whole idea of 'school', from a physical place where youth are simply taught to one where learning experiences and activities shared by community individuals.

However, Egyptian regulations for secondary schools design criteria have been established since 1992[1], and most of Egyptian secondary schools are designed following those regulations, so the Governmental Schools are considered very old criteria for the current situation in all schools in the world, so this code need to be updated for the new development for Egypt.

Education for Sustainability calls a rearrangement and reform of current practice in all sectors of society, including formal education. The whole-school sustainability initiatives operating across the globe highlight the possibilities for schools to innovate and show examples of change in practice for a better future.

Some programs are documenting levels of change resulting in cultural shifts within schools and the wider community, because active participation and

[1] Ministry of Education Statistics Report, (2010), Avilable at : http://www.emoe.org.

partnerships for sustainability are not only occurring within the school (involving teachers, pupils and management/administration) but between the school and the community (organizations, business/industry and governments).

No. of Students	15656954
No. of Schools	37614
No. of Teachers	796034
No. of Full-day System Schools	12340
No. of Morning Period Schools	13843
No. of Evening Period Schools	2469
No. of Two Periods Schools	1584

Table 5. 1 Egypt Education Statistics 2007/2008
Ministry of Education, available at www.emoe.org, accessed 2010

5.2 Criteria for Selection of Case Studies

This research addresses the current educational buildings in Giza Governorate, such as Imbabah secondary school in Imbabah and Elsaedyah secondary school in Giza.

The criteria of selecting both case studies were based on the following:

1. Both schools are located in Giza Governorate with high population and high unemployment rates.
2. Both are governmental schools - the most common school type in Egypt- with serious design problems and high student population.
3. Details information about these two schools were easily accessible.
4. The two schools are located in Giza and Imbabah, with high potential for development and utilization and integration with the surrounding community.

Table 5. 2 Education Statistics in All Governorates of Egypt 2007/2008

Ministry of Education, available at www.emoe.org, accessed 2010

Indicator	Preschool		Primary School		Preparatory School		General Secondary School		Technical Secondary School		Agricultural Secondary School		Commercial Secondary School		Total		
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total
Students (Governmental)	254030	227551	4292919	4015084	1807478	1762490	341903	380343	430441	262879	109411	31896	151626	298230	7387808	6978473	14366281
Students (Private)	101786	95022	385612	357417	112700	98583	31945	30462	1147	909	0	0	31696	43394	664886	625787	1290673
Total Students	355816	322573	4678531	4372501	1920178	1861073	373848	410805	431588	263788	109411	31896	183322	341624	8052694	7604260	15656954
Schools (Governmental)	5910		15194		8308		1687		856		172		539		32666		
Schools (Private)	1468		1526		1132		597		11		0		214		4948		
Total Schools	7378		16720		9440		2284		867		172		753		37614		
Teachers (Governmental)	250	13661	136481	158005	106241	89271	54291	31752	53438	34508	8873	4421	17496	18398	377070	350016	727086
Teachers (Private)	210	9863	8662	27568	7783	7162	4100	2483	69	43	0	0	699	306	21523	47425	68948
Total Teachers	460	23524	145143	185573	114024	96433	58391	34235	53507	34551	8873	4421	18195	18704	398593	397441	796034
Full-day System Schools (Governmental)	1915		6241		2912		758		114		51		117		10193		
Full-day System Schools (Private)	925		990		796		329		3		0		29		2147		
Total Full-day System Schools	2840		7231		3708		1087		117		51		146		12340		
Morning Period Schools (Governmental)	3995		7093		3976		908		467		97		194		12735		
Morning Period Schools (Private)	543		534		335		211		7		0		21		1108		
Total Morning Period Schools	4538		7627		4311		1119		474		97		215		13843		
Evening Period Schools (Governmental)	-		1115		968		11		55		4		107		2260		
Evening Period Schools (Private)	-		1		1		56		0		0		151		209		
Total Evening Period Schools	-		1116		969		67		55		4		258		2469		
Two Periods Schools (Governmental)	-		744		452		10		220		20		122		1568		
Two Periods Schools (Private)	-		2		0		1		1		0		12		16		
Total Two Periods Schools	-		746		452		11		221		20		134		1584		

Objectives and Research Questions of the Field Study:

The aim is to review these schools and propose to transfer them to sustainable facilities by posing the following questions: How will a sustainable school in Egypt look like? How can we run an effective and wide-reaching whole-school sustainability program? Is there evidence of effective methods to engage the community in these endeavors? What are the critical success components of whole-school sustainability programs?

The research is not only documenting the models, but also this experience can be useful in strategic development of the Sustainable Schools by the initiative in Egypt.

To start the transformation of traditional secondary schools to sustainable educational buildings the guideline was the design criteria of secondary schools completed between 2000 and 2005 in England.

Elsaedyah secondary school and Imbabah secondary school are **the two examples** presented as a sample design for current school buildings that could be transformed to future sustainable schools. The research includes two sites and two projects, each with its own aspirations and challenges.

First example is **Elsaydyah** (It is located in Giza, it is an old area in an urban university area). The second one is **Imbabah** secondary school (it is located in a slums area of Giza), the population in both Imbabh and Giza are middle groups and low income.

The two cases suffer problems like most Egyptian schools, that will be discussed and analyzed to propose a development strategy to these schools and to transform them to sustainable educational building, in order to apply the sustainability process in Egyptian schools.

Giza Governorate:

Giza is the third largest city in Egypt. It is located on the west bank of the Nile River, some 20 km southwest of central Cairo. The city of Giza is the capital of the Giza Governorate, and is located near the northeast border of this governorate in

coordinates. It is located right on the banks of the River Nile. The city's population was 2,681,863 in the 2006 national census, while the governorate accommodated 6,272,571 people at the same census. Its large population makes it the second largest suburb in the world, tied with Inchon, South Korea and Quezon City, Philippines, second only to Yokohama, Japan. Giza is most famous as the location of the Giza Plateau: the site of some of the most impressive ancient monuments in the world, including a complex of ancient Egyptian royal mortuary and sacred structures, including the Great Sphinx, the Great Pyramid of Giza, and a number of other large pyramids and temples.[1]

Figure 5. 1 Giza Map. "Researcher 2010".

Figure 5. 2 The pyramids at Giza. "Researcher".

Figure 5. 3 River Nile."Researcher".

[1] The Giza Plateau Mapping Project", Lehner, Mark; Hunt, Brian V.

Table 5. 3 Education Statistics in Giza Governorate 2007/2008

Ministry of Education, available at www.emoe.org, accessed 2010

Indicator	Pre School		Primary School		Prearatory School		General Secondary School		Technical Secondary School		Agricultural Secondary School		Commercial Secondary School		Total		
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total
Students (Governmental)	8956	8128	343814	323277	137607	133981	33529	35614	20251	9354	2005	691	7577	11472	553739	522517	1076256
Students (Private)	19417	17465	80894	73006	27096	22841	5647	5308	0	0	0	0	10443	13410	143497	132030	275527
Total Students	28373	25593	424708	396283	164703	156822	39176	40922	20251	9354	2005	691	18020	24882	697236	654547	1351783
Schools (Governmental)	144		678		369		106		33		6		20		1356		
Schools (Private)	308		322		276		125		0		0		46		1077		
Total Schools	452		1000		645		231		33		6		66		2433		
Teachers (Governmental)	30	739	6884	9737	5809	4777	3757	1843	1873	1002	161	141	689	701	19203	18940	38143
Teachers (Private)	50	2056	1856	5363	1991	1443	890	469	0	0	0	0	157	44	4944	9375	14319
Total Teachers	80	2795	8740	15100	7800	6220	4647	2312	1873	1002	161	141	846	745	24147	28315	52462
Full-day System Schools (Governmental)	93		258		160		58		9		2		6		586		
Full-day System Schools (Private)	232		243		213		79		0		0		6		773		
Total Full-day System Schools	325		501		373		137		9		2		12		1359		
Morning Period Schools (Governmental)	51		297		147		47		20		4		10		576		
Morning Period Schools (Private)	76		79		63		29		0		0		1		248		
Total Morning Period Schools	127		376		210		76		20		4		11		824		
Evening Period Schools (Governmental)	-		90		51		1		1		0		1		144		
Evening Period Schools (Private)	-		0		0		17		0		0		35		52		
Total Evening Period Schools	-		90		51		18		1		0		36		196		
Two Periods Schools (Governmental)	-		33		11		0		3		0		4		51		
Two Periods Schools (Private)	-		0		0		0		0		0		3		3		
Total Two Periods Schools	-		33		11		0		3		0		7		54		

5.2.1 Elsaydeah Secondary School in Urban University Area

5.2.1.1 Identity and Context:

Figure5. 4: Elsaeedyah Secondary school."Researcher (2006)"

Elsaydyah secondary school was built in 8 September 1906 beside Cairo University at Khedawy Saeed Era, many famous Egyptian leaders graduated from it. This School is considered the second best oldest school in the Middle East. The school witnessed several revolutionary appraisals and events against the British Occupation at 1935, 1946 and supported the Egyptian Military action at 1973.

This research aimed to provide a sustainable school model for the 21st-century teaching and learning spaces through an educational model that organizes the school into departments.

This is accomplished through a mix of refurbishment and building of new structures to the existing ones since 1906s school in an urban university area.

The research also aimed to establish interaction between the school building and the surrounding community being an educational university environment itself.

To solve the lack of money resources, which reflects the lack of facilities in the school, the research applied an investment strategy through designing cafe, cafeterias, book shops, gallery, computer labs, theater, classrooms, playgrounds and library after the school time, all such facilities can be utilized by university students using the university complex.

The following new future educational vision for the school was established:

1. Sustainability is the core of design improvement.
2. Organize the school departmentally, cultural center zone, sports zone, food court zone and educational zone.
3. Organization of circulation throughout the school.
4. Ensure that the school provides high quality community service, after the educational period at 2:00 pm.
5. Make new Library, art galleries, social spaces, sport spaces, updated technology labs, updated science labs and updated classrooms buildings.
6. Financial resources are important to fulfill the new educational vision, designing the investment section for long-term use, through designing new Cafeteria, Book Shop and Computer Labs for external courses is an important objective.
7. School will gain money through using renewable energy in the school.
8. Good management of water in the school is through recycle of potable water and growing treatment plants to treat water, and irrigation of these plants in the school.

5.2.1.2 Sustainable Site

The Context

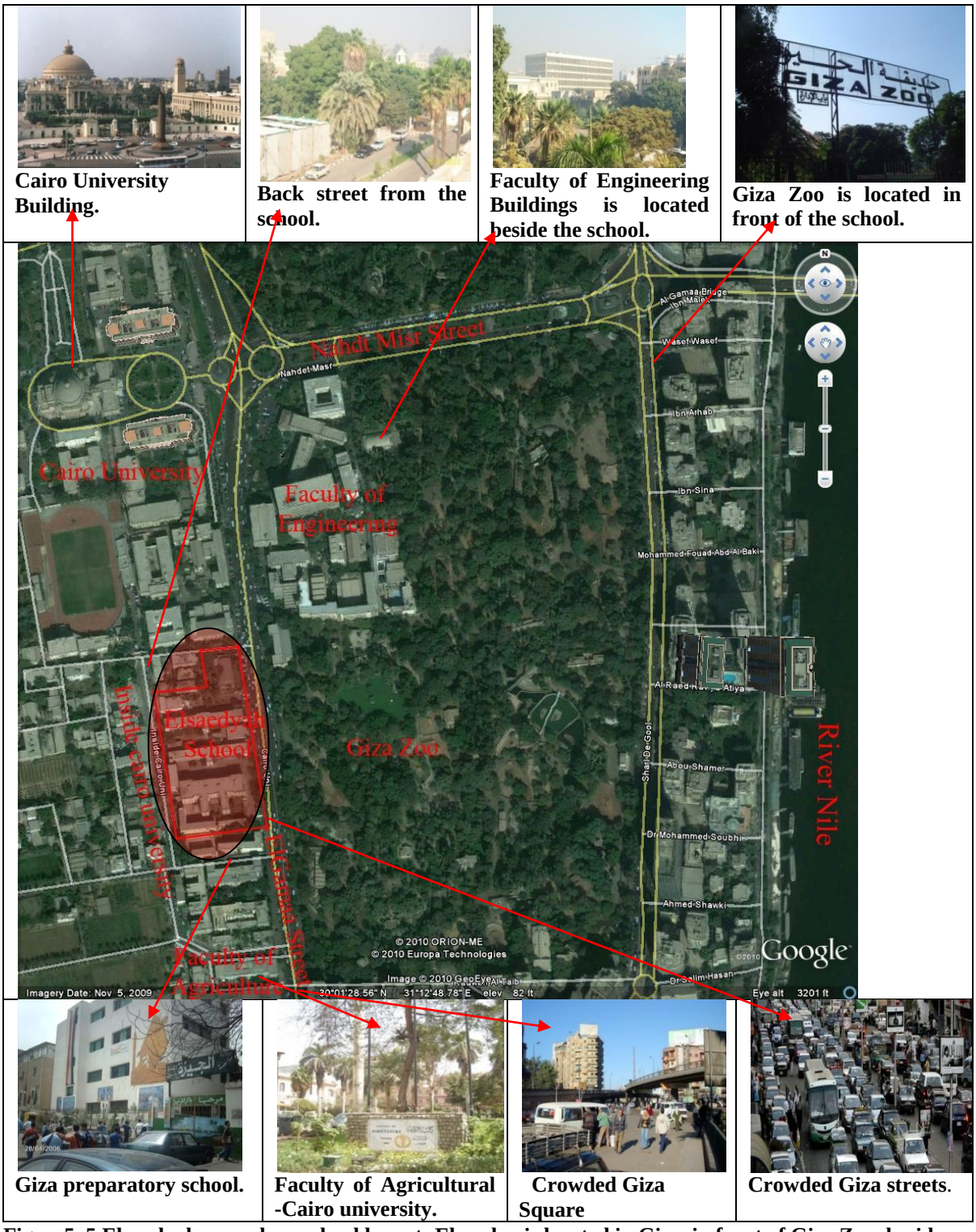


Figure5. 5 Elsaydyah secondary school layout- Elsaydya is located in Giza, in front of Giza Zoo, beside Cairo University. The school location is in a crowded area in Giza. "Researcher, www.googleearth.com (2010)"

El Saedyah is in crowded location in Giza; it is located beside Cairo University at North direction and Faculty of Engineering. Giza Zoo is located In front of the school, and beside the school faculty of agricultural and Giza preparatory school. Moreover, the School is located between two important squares in Giza; Giza Square and University Square.

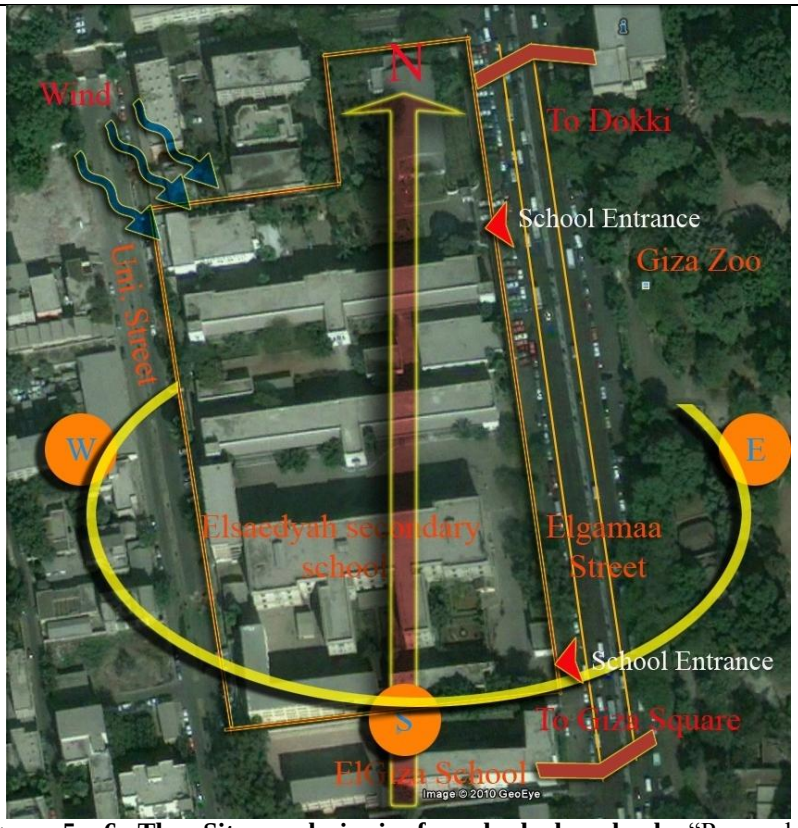
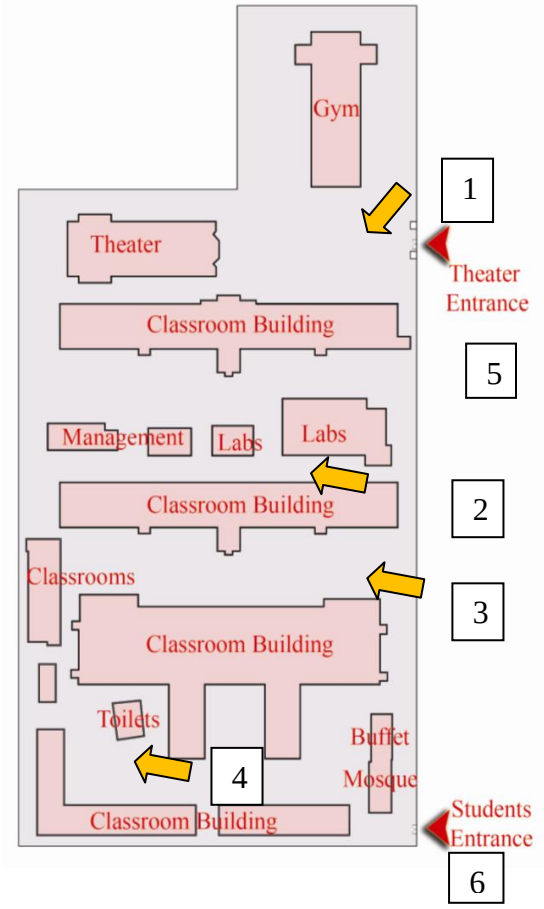


Figure 5. 6 The Site analysis is for elsedyah school. "Researcher, www.googleearth.com (2010)".

5.2.1.3 School Grounds

This school is a separate classroom buildings or science facilities. In order to create a campus school, the design should consider whether it enhances the school's educational objectives and whether the climate is appropriate for walking from building to building. The security must also be addressed; a linked structure with a limited number of access points is clearly easier to secure and monitor than an open campus setting.



1. Good landscape found in the front of the theater. This area is not available for the students. It is for administration at the school. "Researcher (2006)"

2. Outdoor spaces not used in the school between labs and classroom buildings. The lab building is very old. "Researcher (2006)".

3. The sports area is the only space is available for students to make their activities. "Researcher (2006)"

4. Back area in the school is not used. "Researcher (2006)"

5.The theater entrance. "Researcher (2006)"

6.The student entrance. "Researcher (2006)"

Entry sequence
The school has two entrances; the first one is accessing to the theater building, the second one is the students Entrance. "Researcher (2006)".

Figure 5. 7the current design for Elsaedyah School. "Researcher (2006)".

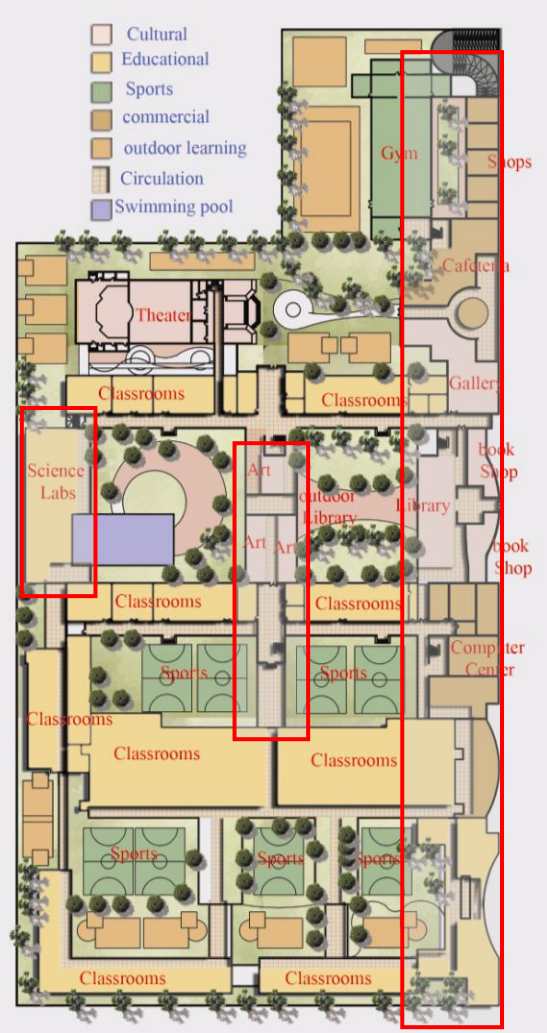


Figure 5. 8 The suggested Buildings. "Researcher (2010)".

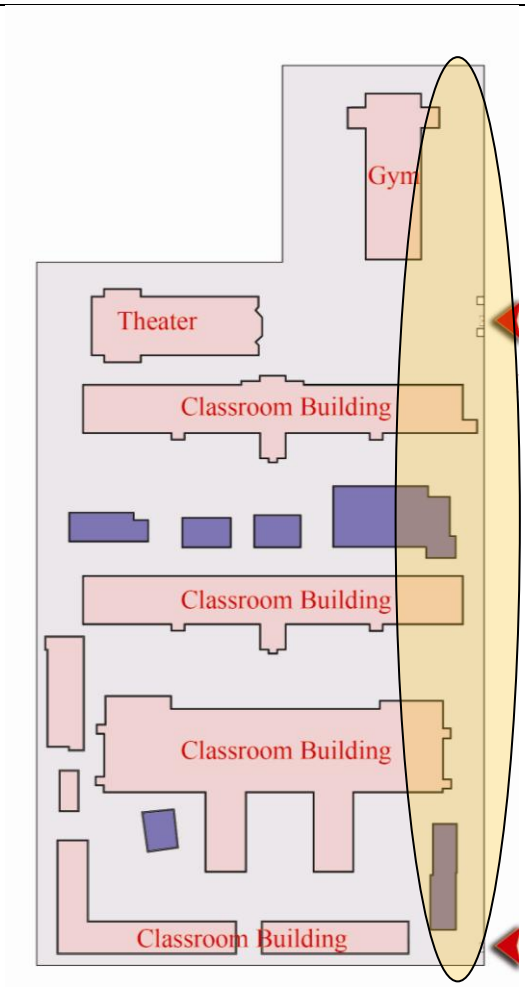


Figure 5. 9 The blue buildings are relocated. "Researcher (2010)".

Internal Circulation

During the school day, where do students have to go and how often? Do some travel the corridors as a class, such as in Secondary school, while other classes are in session? Do they travel individually at each class period, such as in upper grade levels? How much time is available between periods, and how far are the distances?[1]

[1] Building type basics for elementary and secondary schools Book.

School Size:

How large is the school's enrollment? Is there a need to create sub groupings within the building to mitigate the anonymity found in facilities with large enrollments? If sub grouping is a goal, what are the differentiating factors for grouping: by grade level, by full-grade microcosm spectrums such as "houses," by different magnet programs, or otherwise? [1]

Efficiency & Cost:

The amount of corridor space needed to serve each room in the building is a major component in the determination of building efficiency and resultant costs. Different organizational strategies yield varying efficiencies. Compact plans tend to be lower in first cost but are not often the best educational environment. [2]

Sustainable Design

Concept Design

1. The design aims to replace number of expired buildings (physically and educationally) with state-of-the-art facilities that allow innovative teaching techniques, for example; wet and dry science areas and clear pupils circulation.

2. The design seeks simplicity in student movement and making use of the limited outdoor spaces to their full potential, providing a range of external teaching and social facilities, such as a second floor roof deck as an outdoor teaching space.

3. The local community will continue using sports, drama and hall areas, and can also use the new social club adjacent to the shops.

4. The school will need a lot of money to build the new school buildings; because social facilities, new library, computer labs, science labs and galleries made in this area will increase the crowding (most of people in this street are students), so we will need new building and new Classroom Building for courses at the front Elevation.

[1] Building type basics for elementary and secondary schools. Book
[2] Building type basics for elementary and secondary schools. Book

5.2.1.4 Organization

Diagram 5. 1 school organization "Researcher (2010)"

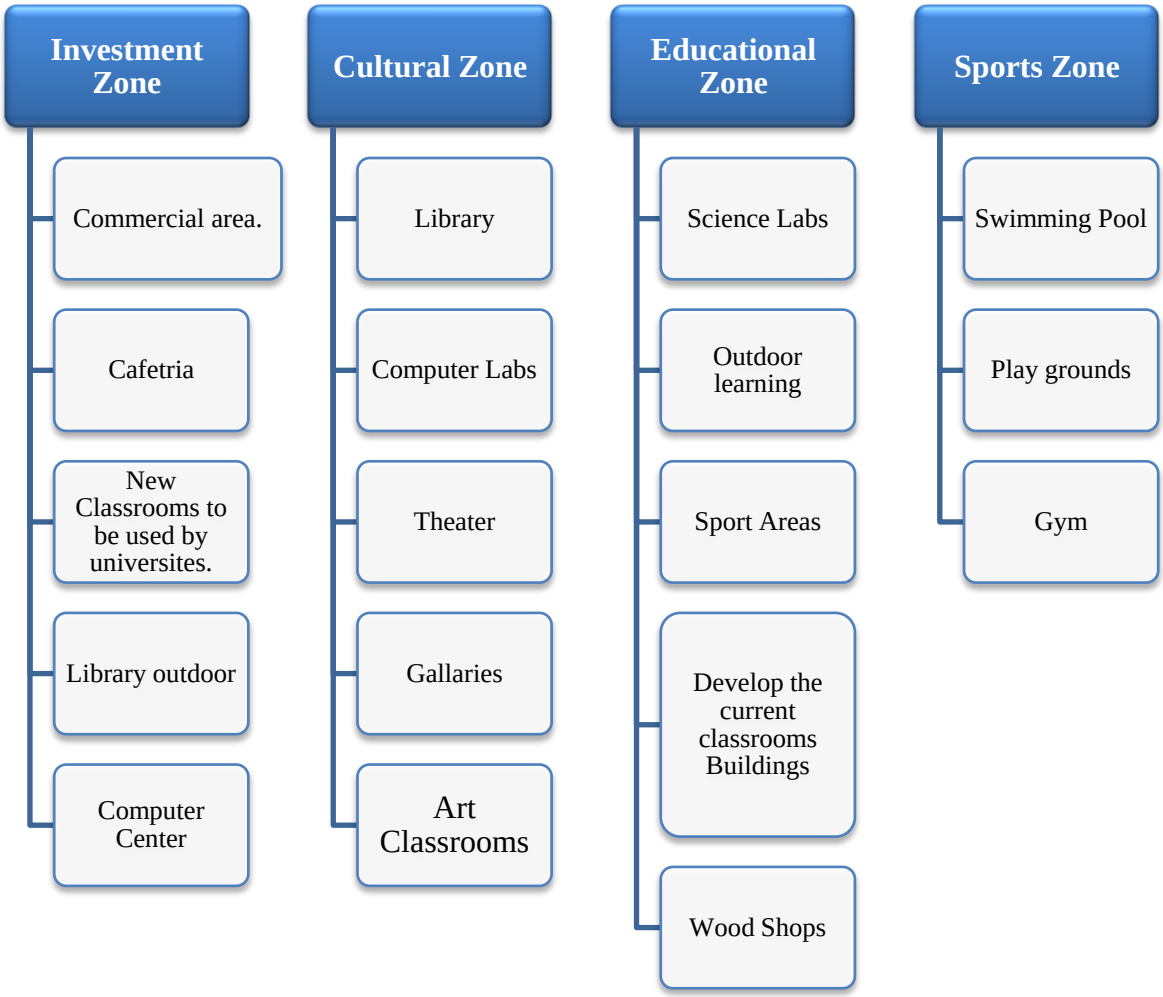


Diagram 5. 2 school organization "Researcher (2010)".

Sustainable to Community Strategies

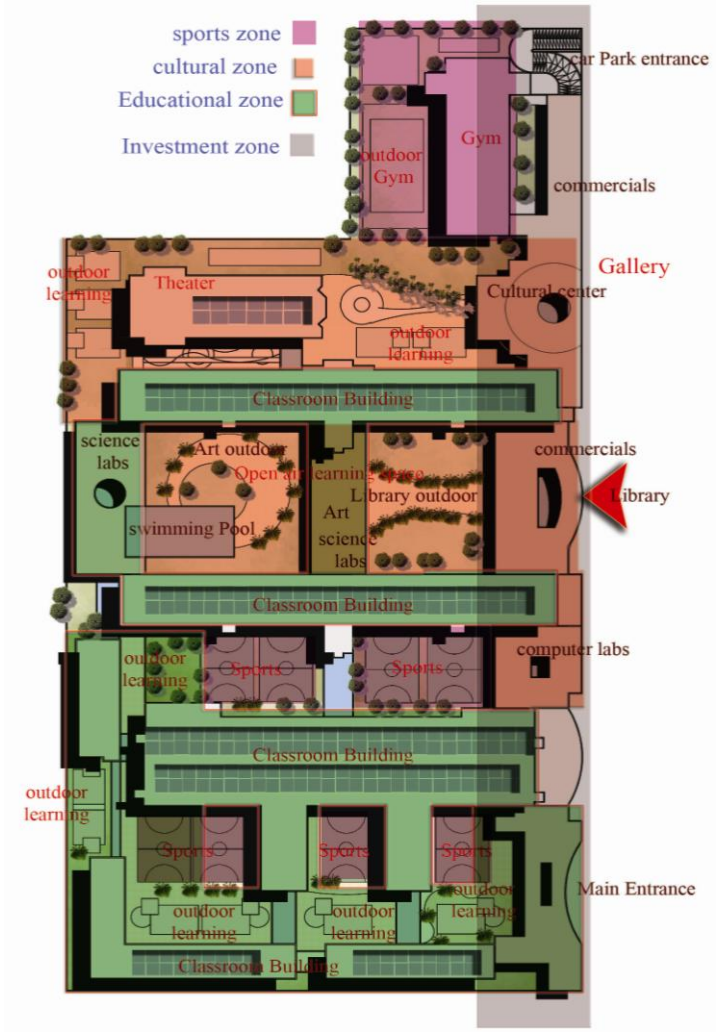


Figure 5. 10 The School zoning. "Researcher (2010)"

There are four main targets to develop the school.

1. We need to develop the educational process. "Green color".
2. The school will reflect at the community cultural. "Orange color".
3. The Investment Zone is very important to develop the school. We cannot develop the school without money and Egyptian government fund not Avilable. The school will make an investment zone to support the Educational &cultural zones needs. "Grey color".
4. A physical activity in the school is very important for the students in this age. "Purple color".

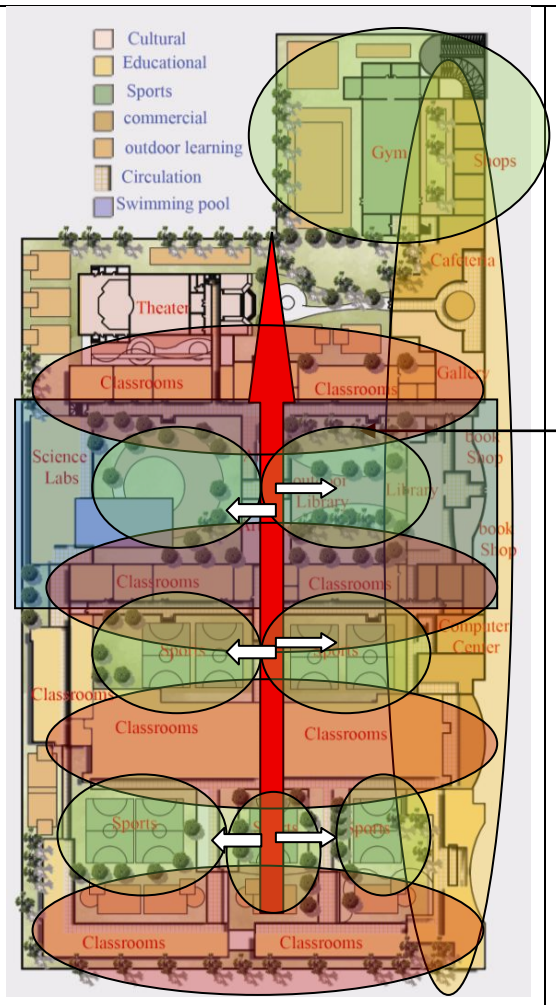


Figure 5. 11 Main axe is for school building and outdoor learning spaces from this axe. Playgrounds are oriented to the north direction. "Researcher (2010)".

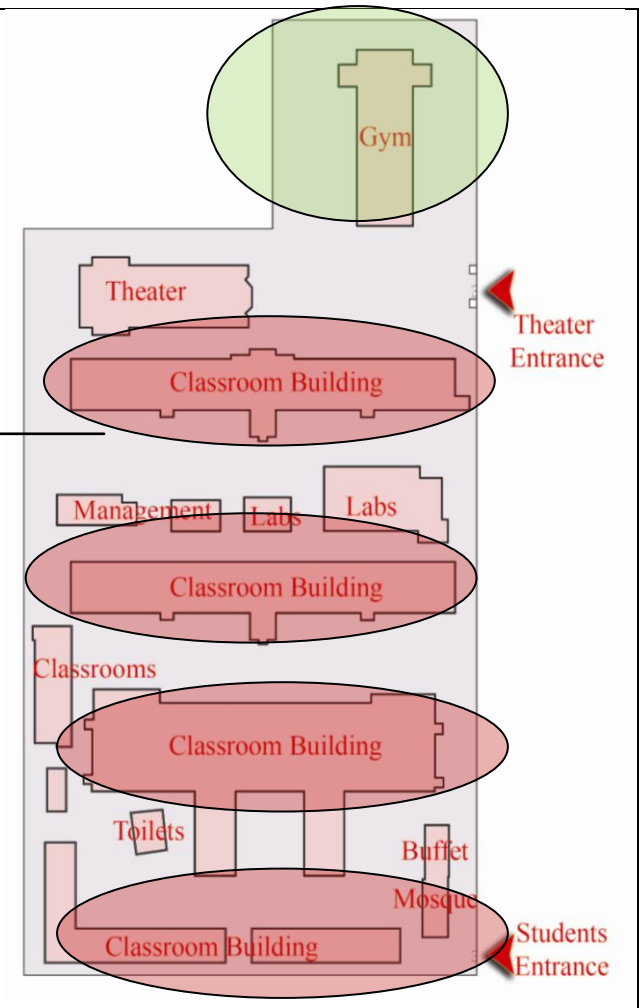


Figure 5. 12 the classroom buildings are in the same location. The classroom building will connect in the new proposal. "Researcher (2010)".

The main concept is that in school time from 8:00 am till 2:00 pm all the buildings are available for the student and for the public after 2:00 pm.

Investment zone:

The school new design is using the fence as a commercial area.

1. The Cafeteria is serving the school theatre.

2. The Computer centre has Copy, printing and computer labs.

3. The gallery has display for students' art and after the school time, the gallery can be rent as a display for the students from Cairo University.

4. New classrooms will be available for students till 2:00 pm. While after the school time the classrooms will be used for language and management courses for Cairo University students.

5. Library is very important for the students in Elsaedyah. The outdoor spaces for the library can attract the students to read and study in the garden and will be available also after school time.

The investment can help in developing the school buildings, science labs, increase teachers' salaries, making course for students and teachers, and increasing the technology in the school.

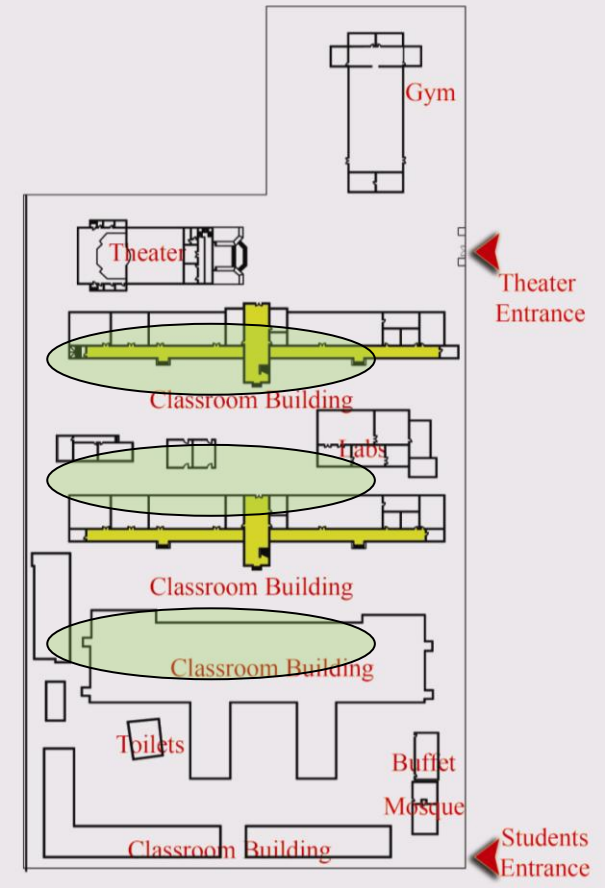


Figure5. 13 the current design is many buildings and each building has its circulation. "Researcher (2010)".

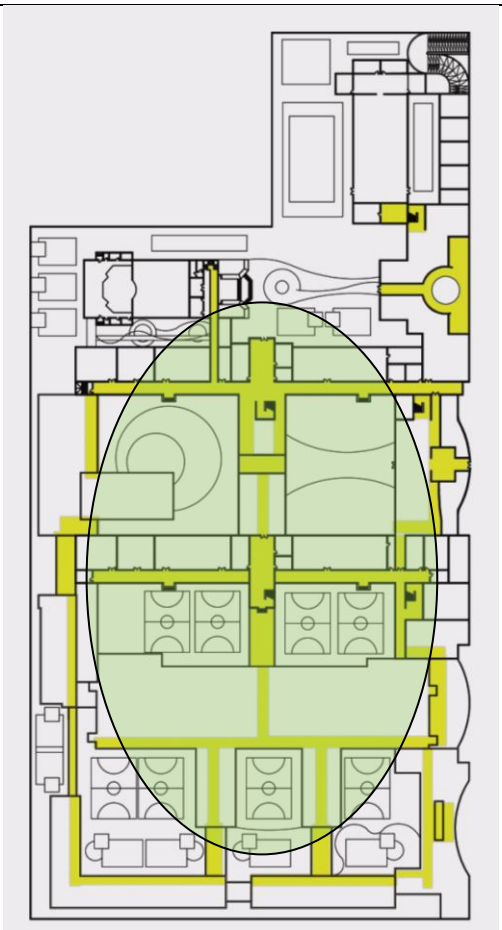


Figure5. 14 the suggested design is one building with one circulation. "Researcher (2010)".

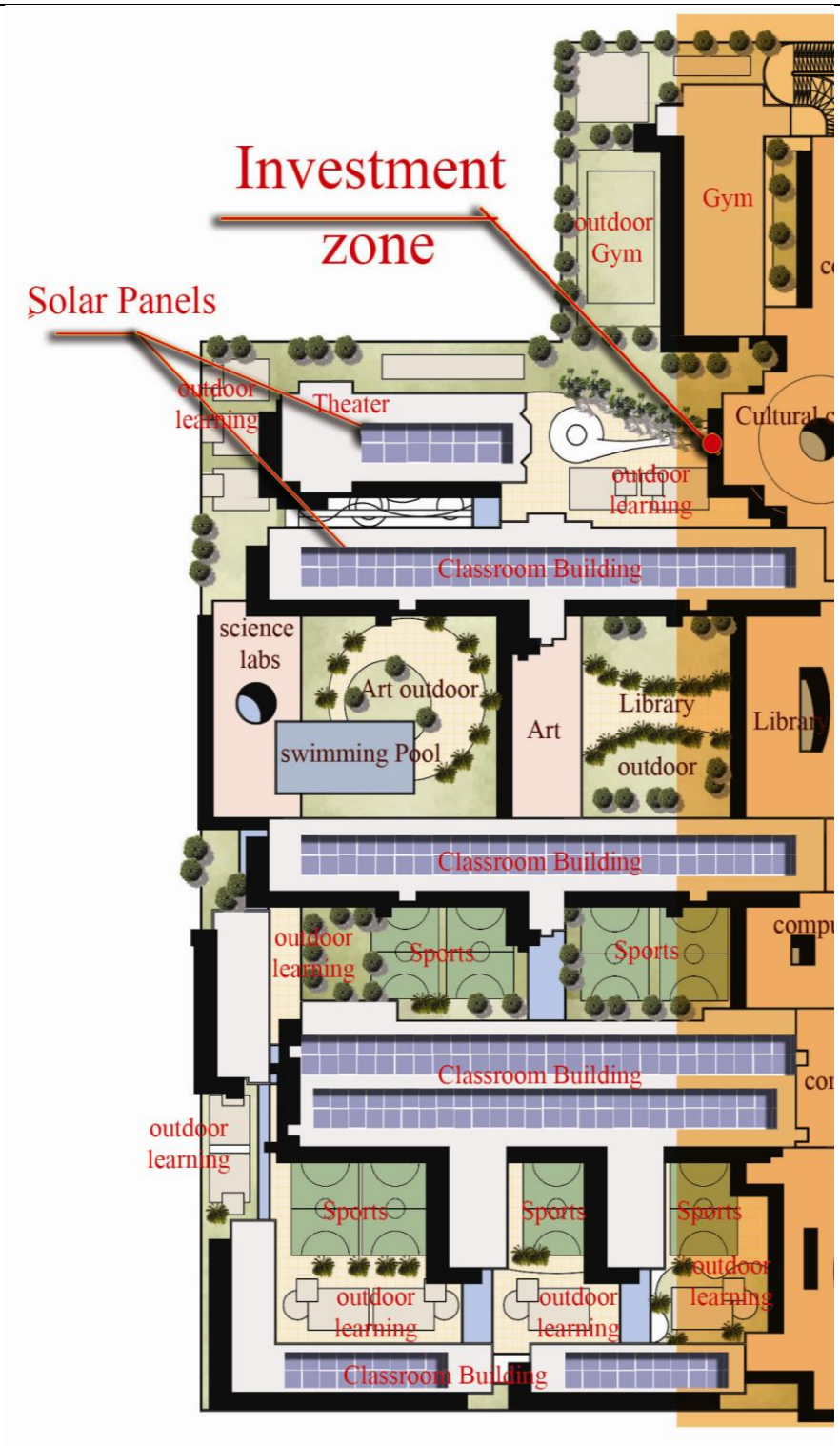


Figure 5. 15 investment zone has a cultural center, library, computer labs and Art gallery. "Researcher (2010)".

Fence Entrance. Camera 1 "Researcher (2010)"

The current fence has cloth in the school. Camera 3 "Researcher (2010)"

Current canteen. Camera 5 "Researcher (2006)"

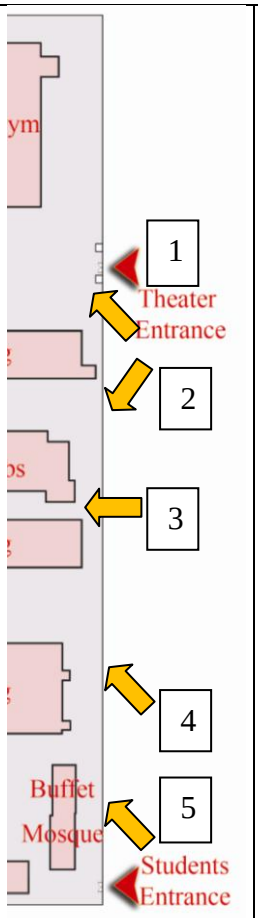


Figure 5. 16 Current case "Researcher (2010)"

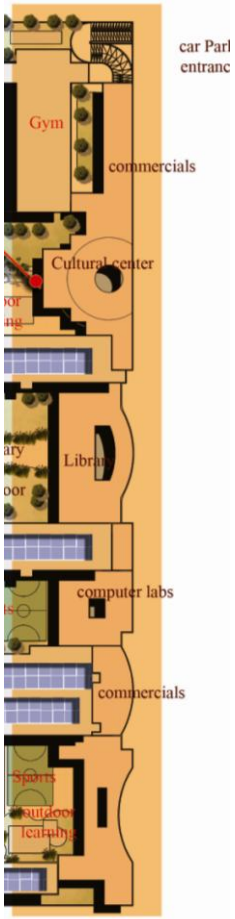


Figure 5. 17 the proposed design "Researcher (2010)"

Camera 2 "Researcher (2010)"

Camera 4 "Researcher (2010)"

Camera 5 "Researcher (2010)"

5.2.1.5 Buildings and Materials: Existing Buildings "current situation"

Site photographs of the school buildings showed that site characterized by collection of separate buildings added to the original 1906's building through the years. Due to the varying topography of the site and piecemeal development, the buildings are isolated resulting in lack of cohesion and unclear circulation routes.

Problems with existing school building

1. Poor way finding.
2. Canteen space is poor.
3. No internal student social spaces.
4. Shared student and vehicle entrance
5. The older buildings are not clear circulation.

6. Science department on the top floor of the 1906's building and is not fit for its purpose.

7. Courtyard not used by school because of the lack of passive supervision

9. Science lab department is difficult to modify due to load bearing walls in 1906's building.

10. Newer buildings are in good condition

Figure 5. 18 The current school buildings. "Researcher (2006, 2010)"

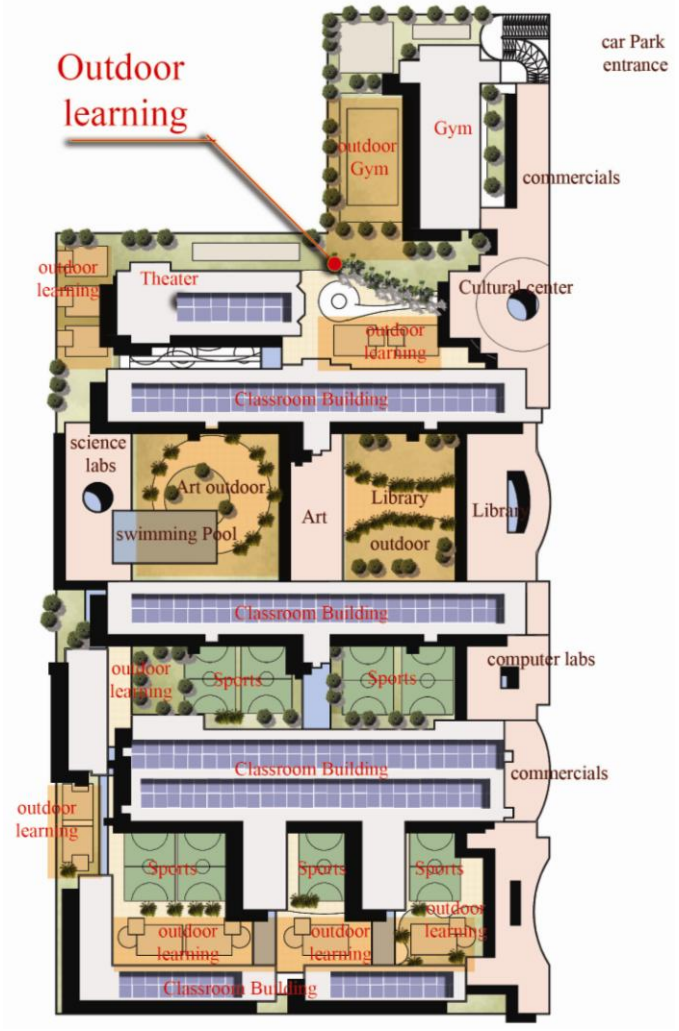


Figure 5. 19 Landscape diagram
Clear external zones are defined including green sports fields, hard play, drama/music performance space and service areas "Researcher (2010)"

Sustainable Materials

Reused Materials

The sustainable materials in the school will be through reusing materials, such as the building will relocate. The stone can be reused in the new buildings, the doors also can reused. More than 10% of the building materials can be reused.

The current building material was built with stone. It is a good sustainable material to reduce the heating in the classrooms.

Figure 5. 20 the classroom ceiling is stone. "Researcher (2010)".

Figure 5. 21 the current school wall was built with stone. "Researcher (2010)".

Figure 5. 22 Reuse
The proposed design is removing this building .the new buildings will reuse the building materials. "Researcher (2010)".

New Building Materials

Low VOC materials and indoor Environmental Quality provide a tremendous incentive to choose materials they are low in volatile organic compounds – materials that give off much fewer pollutants and contaminations. These choices can be made for both existing buildings as well as new construction school buildings.[1]

5.2.1.6 Interiors

Figure 5. 23 The new concept for proposed Science Labs. "www.imges.google.com/imghp"

Figure 5. 24 the current labs. "Researcher (2006, 2010)".

[1] GBES_LEED_Green_Associate_Study_Guide p.198

The new concept is for proposed Science Labs is moveable furniture designed to match the permanent lab tables. This allows for flexible furniture configurations and setups for both classroom lectures and group lab work.

Figure 5. 25 the money from investment can change the classrooms. "www.imges.google.com/imghp"

Figure 5. 26 current classrooms. "Researcher (2006)"

The new classrooms and disks can be used for the students from 8.00 am until 2.00 pm. This new classroom will help in the educational process. After 2.00 pm, the classrooms will be used from the community as a cultural center for courses like English and management and so on.

Figure5. 27 The new computer labs like this style in interior design will be attractive for the community people. Available:http://www.turfah.net/Catalogs.html (Accessed 2011).

Figure5. 28 Current computer labs. "Researcher (2006)".

The new computer center in the new school buildings will help the students to be updated with the new technology. The computer center also will be used for the computer courses.

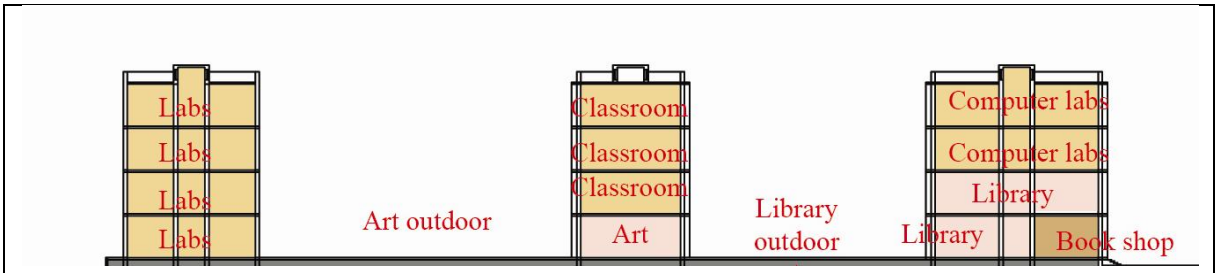


Figure5. 29: Site section

The main existing buildings and spans give new building levels across varying site levels to provide spaces of differing scales for appropriate use. "Researcher (2010)"

Design strategies explained through key diagrams, including the scope of works, massing studies, access routes, and figure ground diagrams. The site plan integrated these aspects into a clear, cohesive proposal.

5.2.1.7 Resources and Energy

The school can use solar panels

The school Area is about 10000 m2

10000 m2 x100 volt / Ampir =1000000=1000 kva

1000 x 0.8= 800 Kilowatt[1];

The electricity we need for the school is a transformer 800 Kilowatt by using solar panels at roof floor and we can select the solar panels for the school.

[1] Study with electrical engineer.

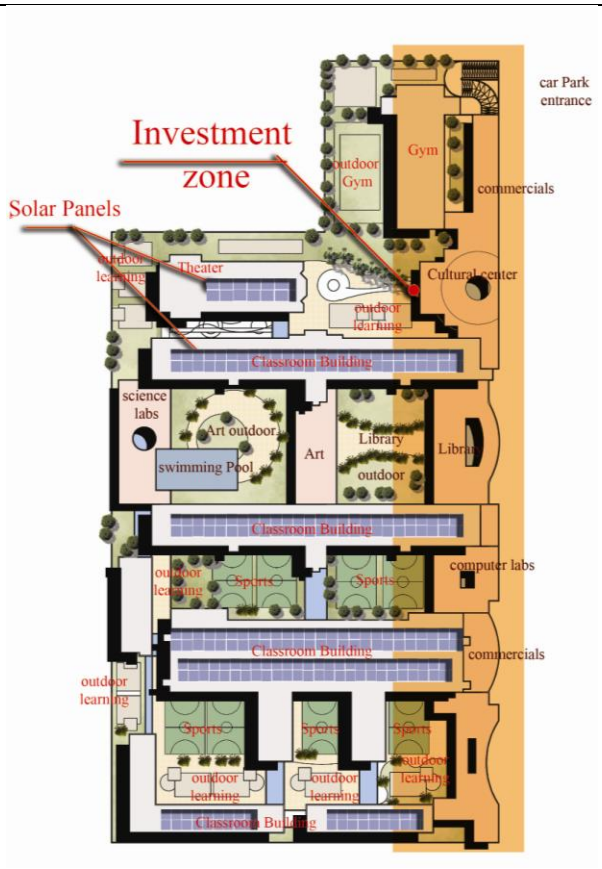


Figure5. 30:Using solar panels in the school. "Researcher (2010)"

Figure5. 31 Elsaedyah current roof "Researcher (2010)"

Figure5. 32
solar Panels for the school. "www.imges.google.com/imghp"

Elevations and Sections

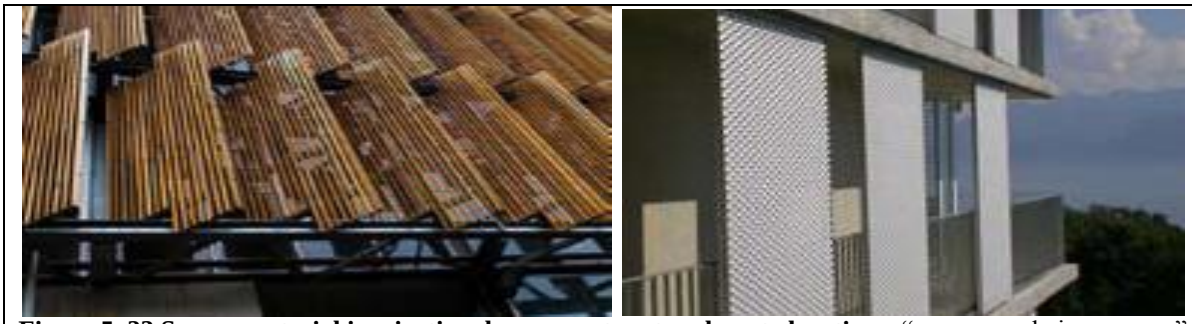


Figure 5. 33 Screen material inspirational can use at east and west elevations. "www.google.image.com".

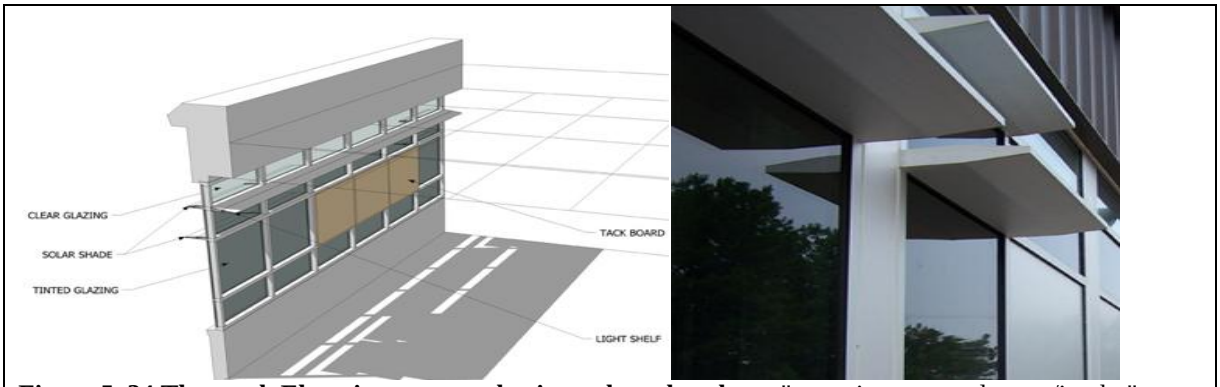


Figure 5. 34 The south Elevations can use horizontal sun breakers. "www.imges.google.com/imghp"

Environments

The environmental strategy presented at various scales.

The different bay elevations indicate how the visual appearance influenced by the building's orientation and environmental strategy. The section illustrates how internal comfort conditions achieved. Key dimensions and graphic scales are extremely useful for the purposes of review.

Landscapes

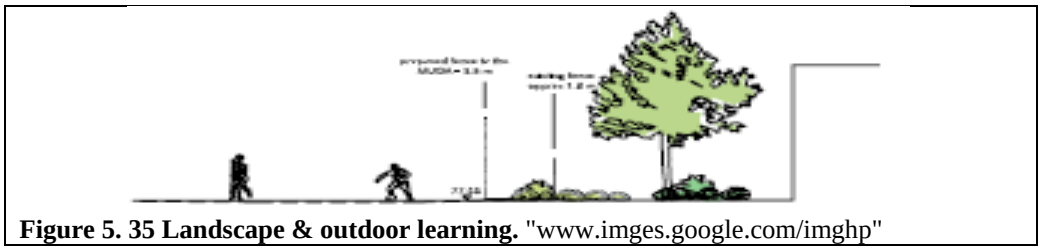


Figure 5. 35 Landscape & outdoor learning. "www.imges.google.com/imghp"

The proposal for school grounds is supported by sectional studies, which describe the quality of external spaces and how they relate to the school's immediate surroundings.

5.2.1.8 Feeling Safe

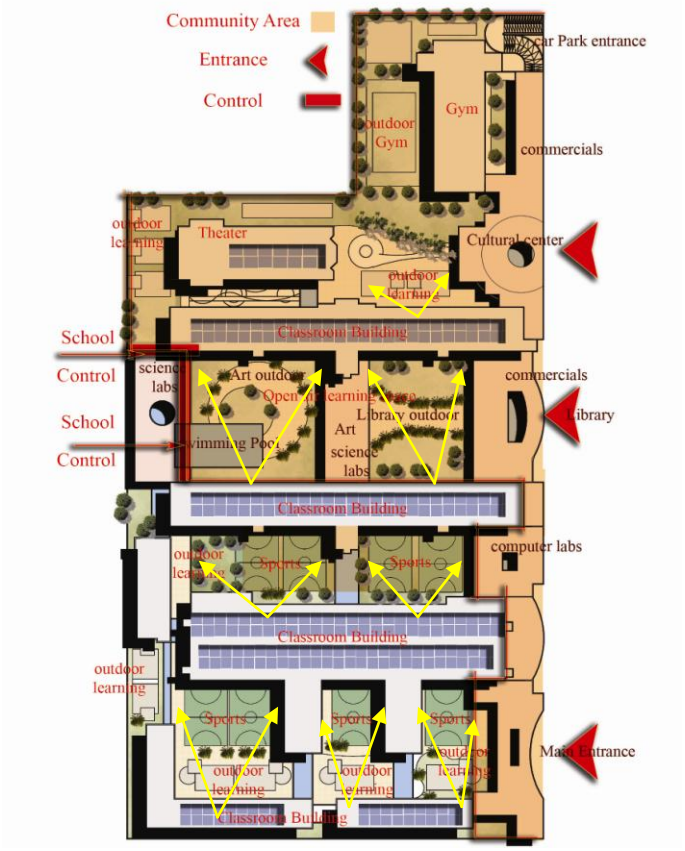


Figure 5. 36 the fence now is a building, it has 3 access points and visual links between external spaces . "Researcher (2010)".

The connection between public "Cultural center" and the educational buildings controlled from building entrance. The vision from the space gives feeling of privacy and security.

5.2.1.9 Long Life, Loose Fit

The new buildings have flexibility in design so the change in the future is possible according to school need.

5.2.1.10 Successful Whole

The Educational building can work as a cultural center, Library, computer center, Theater, Gallery, Fine Arts, club and school, while students use these buildings during the school day. Therefore, Elsaedyah sustainable school is able to change students' culture, develop the community, save energy and gain money.

5.2.2 Imababah Secondary school

5.2.2.1 Identity and Context

Location

Imbaba secondary school is in a neighborhood in north Egypt, located in Giza governorate, and part of the greater Cairo metropolitan area. Bounded in north by El-Delta (agricultural areas), river Nile, Elzamalek Island and Elqualyobia governorate in the east, from the west 6 October governorate (Industrial areas), and on south downtown and El-Mohandeesin (commercial areas and office buildings).

Imbabah is like most of the Egyptian neighborhoods; it is a mix of cultural, social and education levels. Relative poverty in Imbabh is the outcome of fewer resources and low income. Some locations in Imbabah have lack of basic human needs, such as nutrition, health care, education and shelter, because of the inability to afford them.

The school is a reflection of Imbaba community; and these are some school problems:

1. The poverty in the area is a reflection of unemployment[1] for the residents, the unemployment rate about 10.3% in Egypt (2006 statistic).
2. Youth's time wasted in the café (Kahwaa).
3. Strategy for development is not available; this explains random urban issues, and bad state of most buildings.
4. Illiteracy, Ignorance is at least in 35% of the population that is reflecting the religion Intolerance.
5. Imbabh community has different levels of culture; it has well educated youth, who suffer from lack of employment chances.

[1] SURVEY OF ICT AND EDUCATION IN AFRICA: Egypt Country Report Egypt – 1
www.infodev.org ICT in Education in Egypt by Amr Hamdy June 2007

6. Imbaba is suffering from Lack of resources; it has more than 1.5 million people, population growth rates 1.75% (2006 statistic).
7. The **2008 survey** for Imbaba Solidarity people revealed that:
   About 32% of Imbabh resident's doesn't like their life,18.2% of the residents suffer from the transportation and crowded streets, crime is spreading, about 9% feel unsafe, about 11.60 % are suffering from lack of education, about 7% is suffering from lack of electricity and gas services.[1]
8. The unemployment explains the spread of drug addiction between the youth in imbabah.
9. Imbabah only has 2 youth centers.

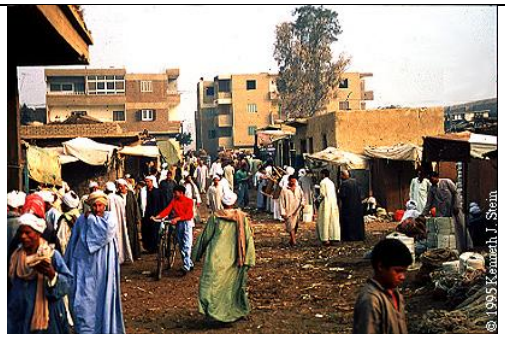


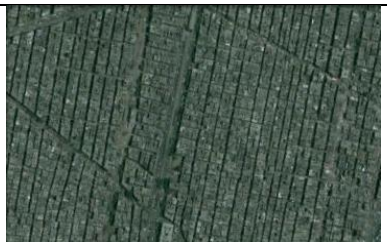
Figure 5. 37 Public Market for Camels in Imbabah. "Researcher (2010)".

Figure 5. 38 The Youth Waste there time in the café. "Researcher (2010)".

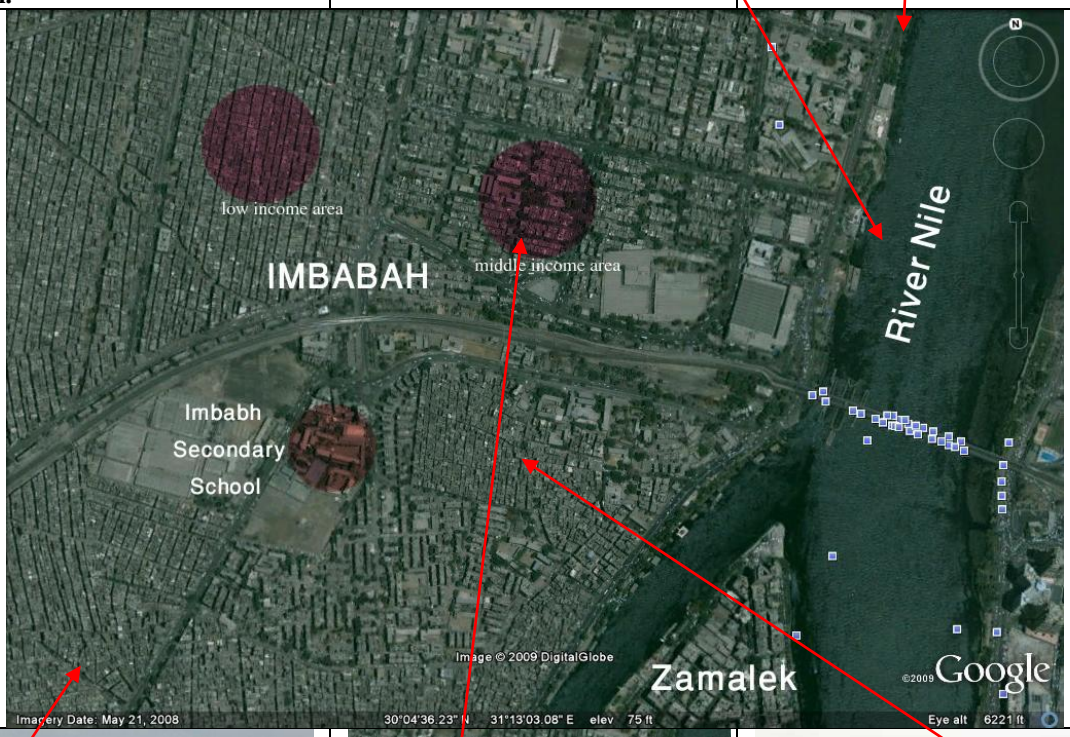
Figure 5. 39 Imbabh Urban Issue "Researcher (2010)".

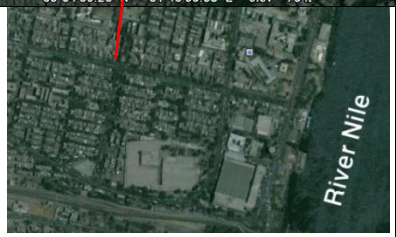
Figure 5. 40 Imbabh layout. "Researcher (2010)".

[1] The Survey was been at 2008 for Imbaba Solidarity, by nirmeen khafagy.



Low income area
Imababa urban style contains low and medium category of population.
The surrounding informal residential areas and slums had grown.





Middle income area

Figure 5. 41 Imbaba secondary school layout "Researcher, www.googleearth.com (2010)"

Relationship with neighborhood

Imbabah school design does not respond and contribute positively to its locality.

The research aimed to transfer Imbabah Secondary school to be sustainable educational building in Imbabah to solve the problems and develop Imbabah.

There is a need to focus in order to do that

1. Focus on pupils and teachers needs, Provision of a center to the school, and generous place in which students feel friendly.
2. Sharing more facilities and collaboration between schools and other organizations "community in the school rather than school in the community" should be proposed.
3. The sustainable school must have good education, and can modify the education programs to students according to labor market needs. This is through updated computer labs, high level of languages courses that can help students to work in available firms in the surrounding community.
4. The school works after the educational time as a cultural center, sporting club and production workshop.

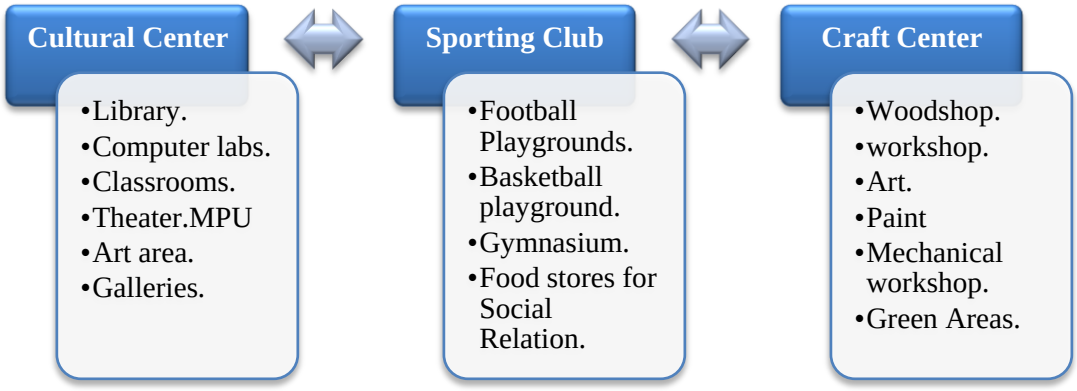


Diagram 5. 3 new proposed Spaces at Imbabah School. "Researcher (2010)".

5.2.2.2 Sustainable Site Plan:

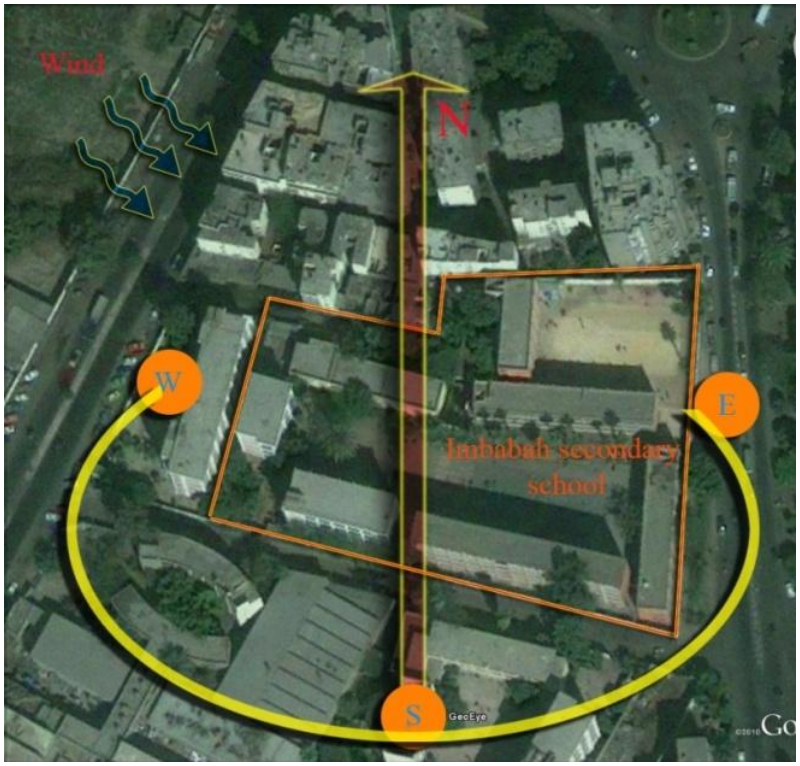


Figure 5. 42 Site analysis "Researcher, www.googleearth.com (2010)"

For making best use of the site, we addressed the following questions;

Does the design foster a sense of place? How does the design will deal with site-specific Constraints? Are buildings, grounds and facilities well arranged on the site? Does the configuration of buildings create positive internal and external spaces? Are the external circulation routes clear and do they balance the demands of different users? Therefore, we worked on the following points:

1- Enhancing the character of the site

2- Working with existing site constraints and opportunities

3- Strategic site organization

Figure 5. 43 Currant Layout of Imbabah secondary school.
"www.googleearth.com (2010)".

Figure 5. 44 Imbabah Secondary school entrance
"Researcher (2006)"

Sense of place and entrance: A school will be 'inspiring' and 'welcoming'. It will have visual impact, for example an attractive entrance. It will have innovative teaching spaces and a well-placed sports area. Other definitions are 'the way it fits into the community and sits on the site' and 'the way it interacts with the local neighborhoods'. [1]

Ease of movement

1. A good school will have wide corridors. It will be a building that facilitates easy and logical movement without congestion and has clear sight lines.
2. 'Too much reliance on Building bulletin results in cellular accommodation and narrow corridors 'Better circulation and social spaces' 'Circulation/social space' 'Circulation'.
3. Good clear organization, an easily legible plan, and full accessibility.
4. A layout that encourages broad community access and use out of hours.
5. Attractive external spaces with a good relationship to internal spaces and offering appropriate security and a variety of different settings. [2]

[1] http://www.cabe.org.uk/files/assessing-secondary-school-design-quality.pdf
[2] http://www.cabe.org.uk/files/assessing-secondary-school-design-quality.pdf

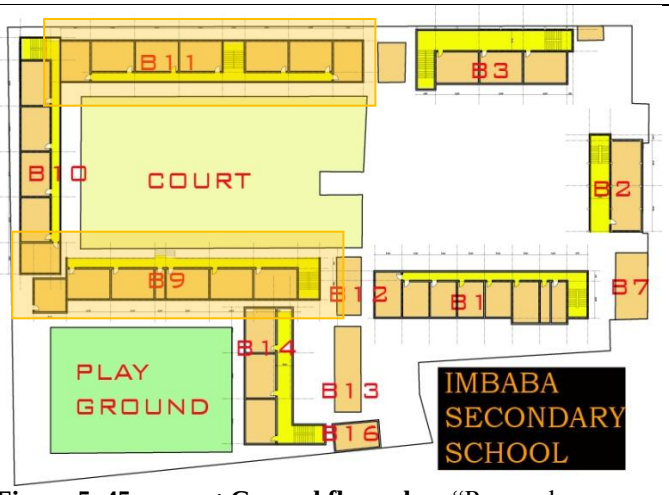


Figure 5. 45 current Ground floor plan. "Researcher (2008)".

Figure 5. 46 school courtyard and B-10 from layout. "Researcher (2006)"

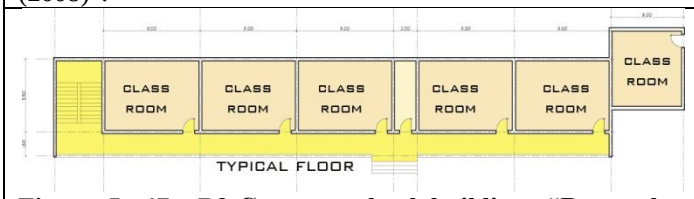


Figure 5. 47 B9-Current school building. "Researcher (2008)".

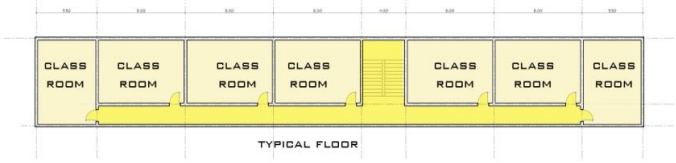


Figure 5. 48 B11-Current school building. "Researcher (2008)".

Figure 5. 49The New Design for the Building."Researcher 2010".

The concept of school design were main corridor has all the spaces and at the end of corridor stair as a vertical circulation for spaces.

At the middle of school main court and school buildings around the court.

5.2.2.3 School Grounds

The new design planned to make use of the outdoor spaces, and enhance relationship between the grounds and building, social spaces, outdoor learning, and physical activity.

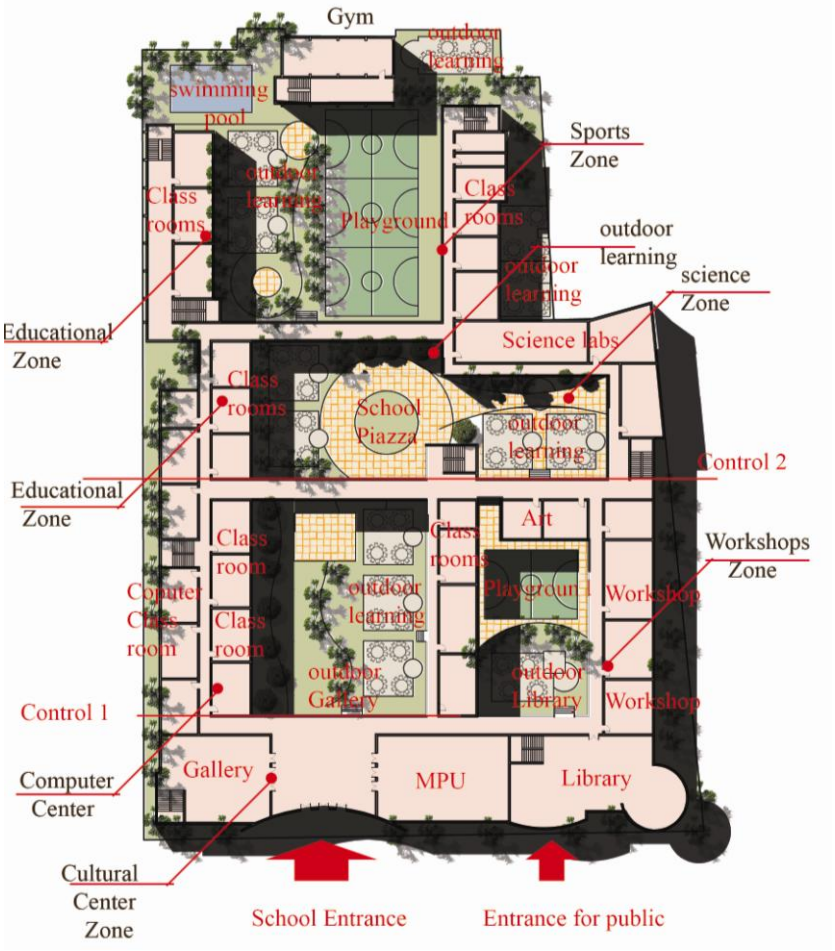


Figure 5. 50 the proposal for ground floor plan. "Researcher (2010)".

5.2.2.4 Organization

For creating a clear diagram of the buildings, we addressed the following questions Is there successful accommodation in the internal arrangement of spaces? Is there a clear spatial diagram for the building? Are the learning spaces well arranged across the school? Is there a clear hierarchy of circulation routes? Are links between indoor and outdoor spaces optimized?

Therefore, we worked on the following points:

1. Accommodating the educational agenda.

2. Spatial organization

3. Movement routes

4.Functionality

Good-sized classrooms will have adequate natural and artificial lighting.

Their shape will be right for their purpose, for example, very large spaces for arts and design teaching. The school will be a building that encourages good behavior and is easily managed with active supervision. It will have integrated technology with built-in projectors and television screens.

Flexibility

It will have spaces that can be used for different purposes, allowing teachers to teach mixed classes. The spaces might have sliding doors or be able to be extended for community use. Buildings will be 'future-proofed' and able to accommodate future changes in delivering education.

Ensuring they are flexible and adaptable, Improvisational space (in and outside).

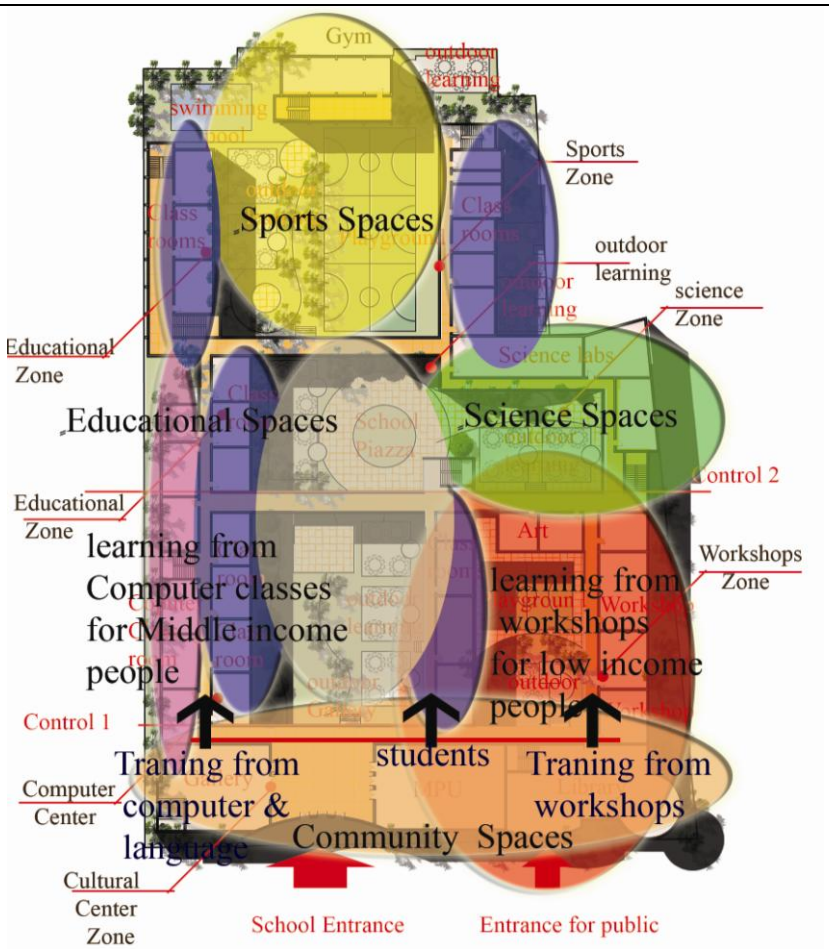


Figure 5. 51 school Organization. "Researcher (2010)".

5 .2.2.5 Buildings

For making form, massing and appearance work together, we addressed the following questions: Is there a coherent design idea that relates plans, sections and elevations? Is the building's form and massing appropriate to the site? Does the massing create well-proportioned internal and external spaces? Do the elevations reflect the design concept to create an inspiring building? Is the building good architecture in its own right? Do the materials contribute positively to the quality of the scheme? Will the fabric of the buildings be durable and easy to maintain?

Therefore, we worked on the following points:

1.Concept
2. Form and massing
3. Appearance
4.Construction and materials

Figure 5. 52 The same Building in most of Egyptian schools."Researcher (2006)"
The new building after Earthquake at 1992 is same design as the old design main corridor and classrooms.

Figure 5. 53 the proposed layout is one school building."Researcher (2010)".

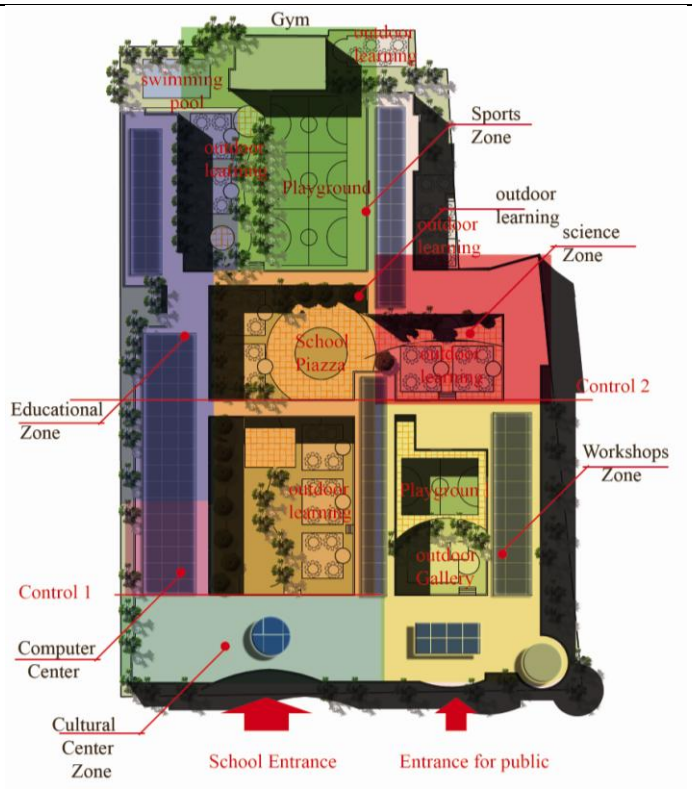


Figure 5. 54 proposed layout. "Researcher (2010)"

5.2.2.6 Interiors

For creating excellent spaces for learning and teaching, we addressed the following questions: Will occupants experience variety and delight as they move around the school? Are circulation and social spaces inviting to students? Will the internal environment help students and staff to feel valued and motivated? Are learning spaces well proportioned and pleasant? Is the building will be working well if in full use? Have acoustic requirements of different spaces achieved?

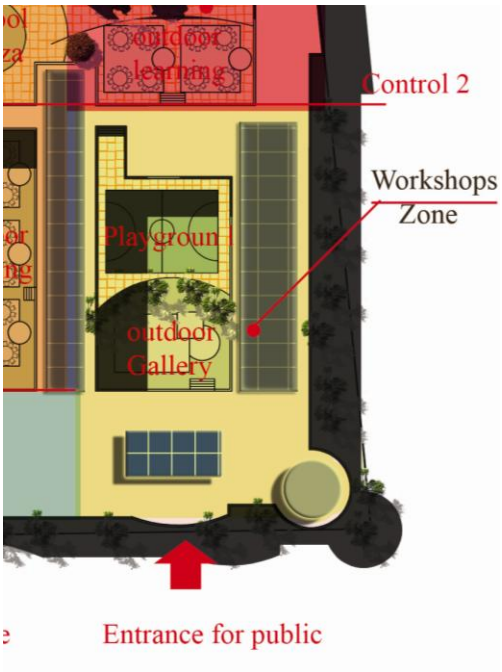
Therefore, we worked on the following points:

1. Variety and delight

2. High quality

3. The building in use

The proposed design will change the location of Workshops. At the craft center, the woodshop will be useful for the pubic people in the craft center.



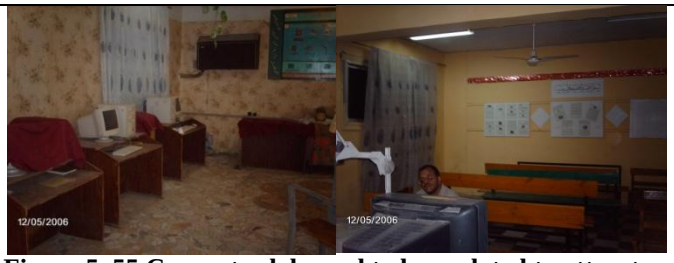


Figure 5. 55 Computer lab need to be updated to attract people for computer courses."Researcher (2006)".

Figure 5. 56 the new design will change the location of Workshops to be at the craft center. The woodshop will be useful for the pubic people in the craft center."Researcher (2006)".

Figure 5. 57 New Classrooms is available for courses for community. "Middle income people in imbabah". "www.imges.google.com/imghp"

Figure 5. 58 Bad desks, bad materials at windows, bad painting, flooring all these elements reflect bad classroom and bad education. "Researcher (2006)"

Figure 5. 59The theater will be used for educational purposes, will be open to the public and for use by other institutions. "www.imges.google.com/imghp"

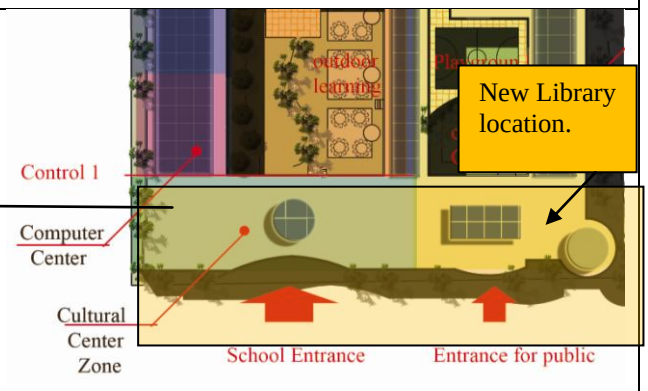


Figure 5. 60 proposed MPU location, it is beside the main entrance. "Researcher (2010)".

Figure 5. 61 The result of the library spaces one student in the library. "Researcher (2006)"

Figure 5. 62 The library As the symbol for learning and education the Library, or the Space of Knowledge, is beside the public entrance it will be access from public to develop the cultural level in Imbabah. "sustainable school book".

5.2.2.7 Resources

Sustainable Environmentally will address the following points:

1-Orientation
2-Ventilation
3-Day lighting
4-Energy and services strategies

Architectural Features

Day lighting control principles have two major requirements: directing diffuse daylight delivery into interior spaces and the control of electric lighting output in response to the available daylight.

An integrated approach must be conceived from the beginning of the project including building sitting and orientation, window and/or skylight design, and lighting and shading control systems design, as well as ongoing maintenance.

Daylight, electric lighting, and shading systems cannot be separated because day lighting affects electric lighting use and has the potential of introducing direct sunlight and glare that may be uncomfortable for building occupants.

This requires cooperation between architects and lighting engineers. Daylight, electric lighting, controls and building design features must be an integral part of the overall energy optimization program.

Light shelves or other reflector system can be increased to two times or more. A light shelf is a horizontal light-reflecting overhang placed above eye-level with a transom window placed above it. This design, which is most effective on southern orientations, improves daylight penetration, creates shading near the window, and helps reduce window glare. Exterior shelves are more effective shading devices than interior shelves. A combination of exterior and interior shading devices will work best in providing an even illumination gradient.[1]

Figure 5. 63 Natural lighting not found and that reflect bad lighting in the space.West Elevation "Researcher (2006)"

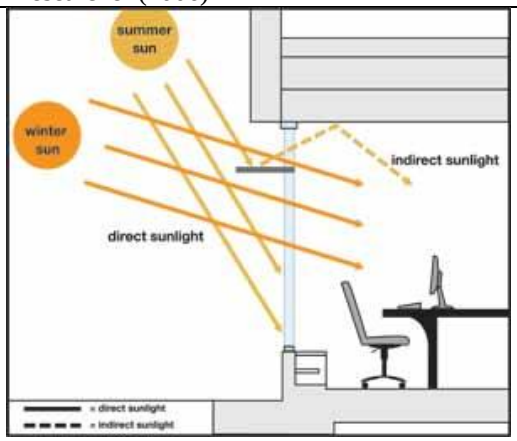


Figure 5. 65 This section indicates daylight bouncing off light shelf onto ceiling, diffusing light throughout the space.South Elevation. "Sustainable School Book".

Figure 5. 64 The light shelf will use only in this south elevation "Current case". The new design is oriented to the north direction. "Researcher (2010)".

5.2.2.8 Feeling Safe

The new design is creating a secure and welcoming place

External environment

[1] http://continuingeducation.construction.com/article.php?L=48&C=252&P=3

External routes and boundaries are clear and well defined and the security strategy balanced with opening.

Internal environment

There is passive surveillance of key points in the school.

The design of spaces allows for visibility so that they feel safe.

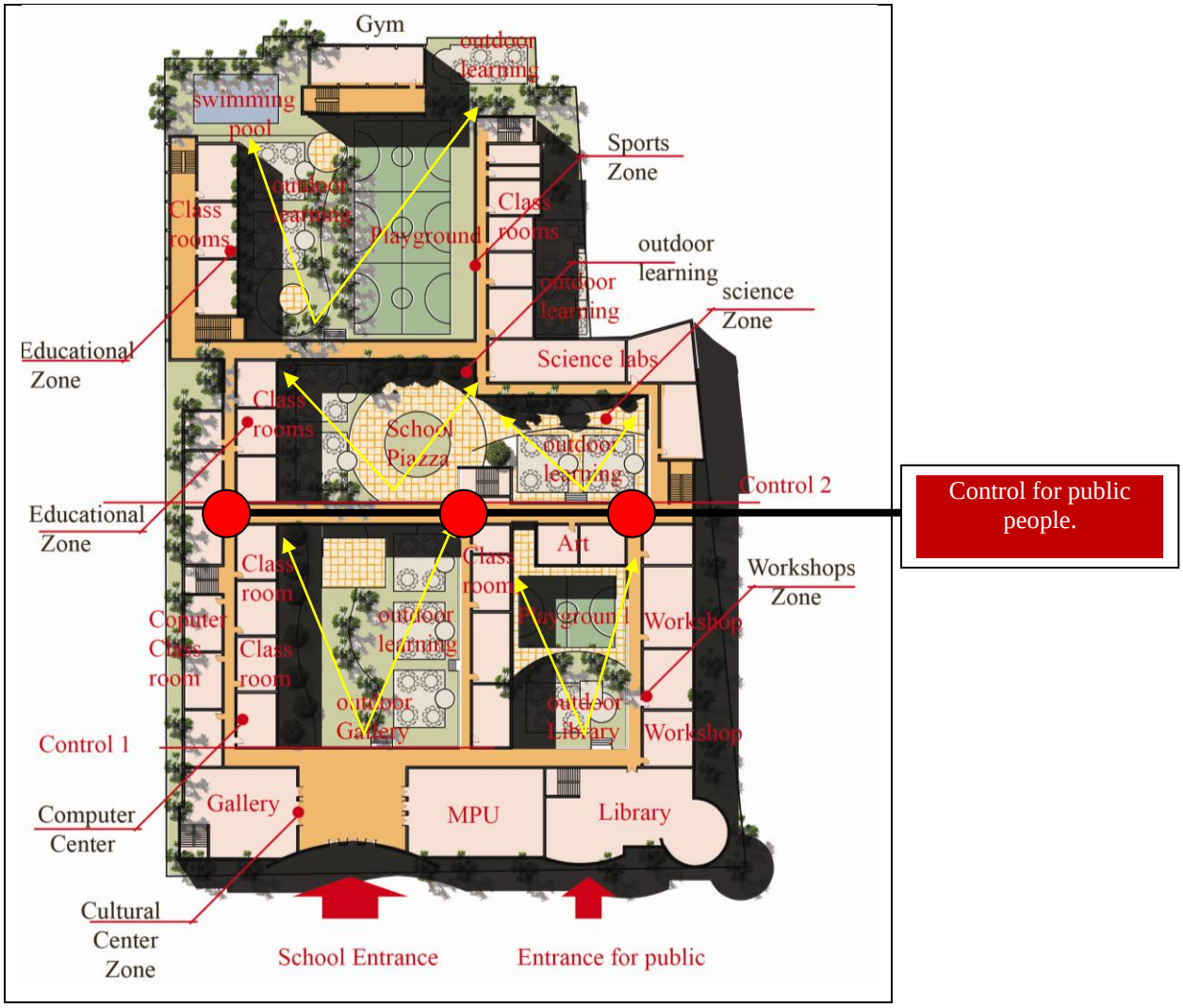


Figure 5. 66 the visual links between external spaces, the school has control 2 in the plan. This gate can control access of the public into the school."Researcher (2010)"

5.2.2.9 Long Life, Loose Fit

The design provides day-to-day adaptability for different types of learning and teaching in outdoor spaces and classrooms students can use for courses, education and the MPU space can use for general lectures or as a Gallery.

5.2.210 Successful Whole

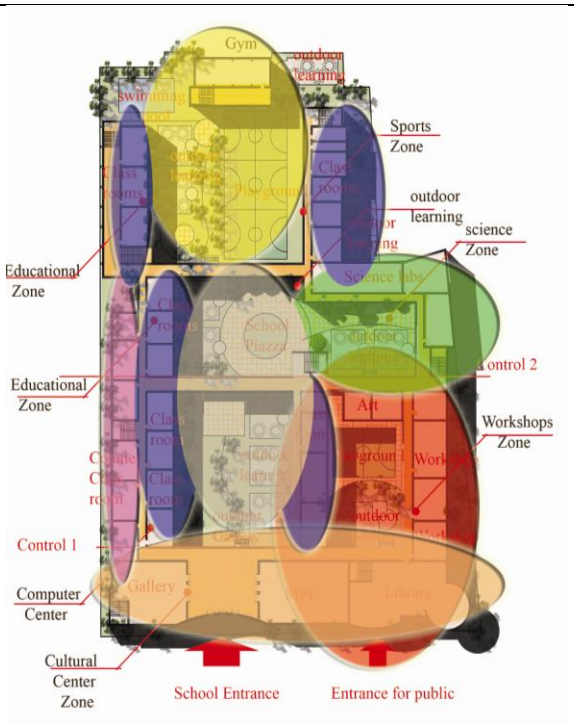


Figure 5. 67 ImbabahSuccessful Club and craft & cultural center and school "Researcher (2010)"

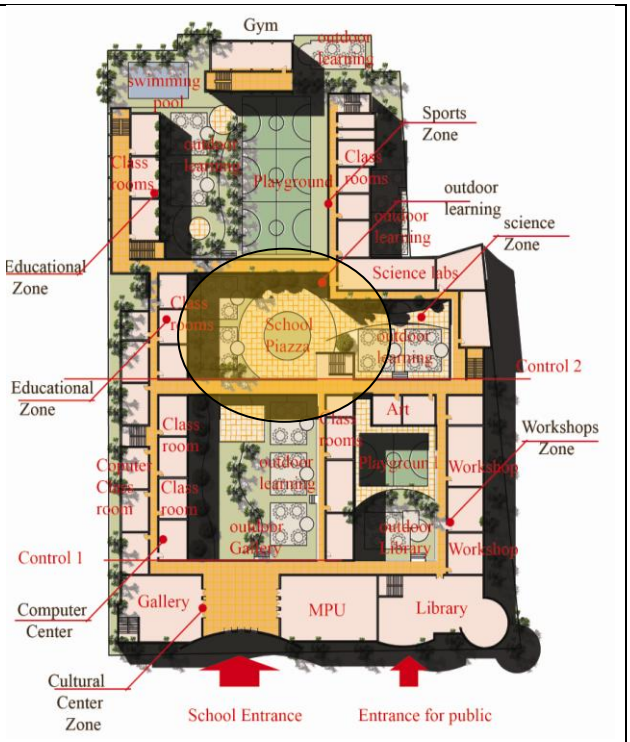


Figure 5. 68 Imbabh Piazza is working for the club, school, Cultural center and that will increase the social relations between the users. "Researcher (2010)"

Schools perform best:

1. Halls are an appropriate size and design for their intended purpose.
2. The school grounds have adequate space to meet all school and community needs.
3. Learning resource areas are sufficient and appropriately located.
4. The building is accessible to pupils, staff and visitors with special educational needs, and/or disabilities.
5. The building is the right size for its functions.

   The school grounds have adequate space to meet all school and community needs.

Chapter Six

Conclusion

Guideline to Sustainable School Design

- Good design for schools is both a creative process and an outcome. It should be responsive to the context in Egypt; be a clear expression of the requirements of the brief; adaptable to future needs; uses resources efficiently and delivers whole-life value for Egyptian youth.
- Good design for schools is fit for purpose, soundly built and attractive to the students. It is about more than iconic, big budget projects in the same way that sustainability is about more than the mechanics of carbon reduction.
- Sustainability for school community is a dynamic process that enables all the students and the community to realize their potential and improve their quality of life.
- Good design is synonymous to sustainable design, addressing social equity and inclusion. Well-designed, low-carbon schools in good quality neighborhoods with local services add to the quality of life for everyone.
- We must learn to use resources in our schools such as energy, wood, masonry materials, and water much more efficiently than we do at present.
- We must turn to renewable resources such as wind and solar energy to fuel our society.

Research basic findings

This thesis addressed problems in current educational buildings in Egypt based on observation for contemporary educational buildings in Egypt in comparison to international educational buildings.

The research approaches the sustainable school design in Egypt is based on a framework adopted from the 10 points criteria suggested by CABE, as well as, LEED guidelines.

Leed certification system provides verification that a building or community was designed and built using strategies aimed at improving performance across all the

metrics that matter most: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Finally, the research applied CABE 10 points in the research case study, that the research needs to change the public sector in Egypt.

The research concludes that:

Creating a sustainable society in Egypt requires many changes in our current practices as follows:

1. A sustainable human society will have to comply with social principles, which mean that in order for Egyptian Schools to become sustainable buildings, the home to be linked to community needs, and must learn to use resources such as energy, wood, masonry materials and water much more efficiently.

2. Sustainability is a dynamic process that enables all people to realize their potential and improve their quality of life.

3. Sustainable School Buildings can lead the development and change the cultural of the people, through the school spaces like library, computer centers, courses in the classrooms after the school hours and sometimes workshops can be used from the community as craft centers.

4. Egyptian schools must turn to renewable resources such as wind and solar energy to fuel our society.

References .

1. Sustainability Accounting in UK Local Government. The Association of Chartered Certified Accountants. http://www.accaglobal.com/publicinterest/activities/research/reports/sustainable_and_transparent/rr-078. Retrieved 2008-06-18.
2. Abbey, E. (1968). *Desert Solitaire*. New York: Ballantine Books, Random House. ISBN 0345326490. Actual quote from novel is: *growth for the sake of growth is the ideology of the cancer cell*
3. Adams & Jeanrenaud, (2008).
4. Adams, W.M. (2006). "The Future of Sustainability: Re-thinking Environment and Development in the Twenty-first Century." Report of the IUCN Renowned Thinkers Meeting, 29–31 January 2006. Retrieved on: 2009-02-16.
5. Samir Sobhi and Malak Luka with Ramzi Abdel-Malek, an expert in the educational process and educational planning.
6. Anderberg, S. (1998). "Industrial metabolism and linkages between economics, ethics, and the environment". *Ecological Economics* 24: 311–320.
7. Baden, S., et al., "Hurdling Financial Barriers to Lower Energy Buildings: Experiences from the USA and Europe on Financial Incentives and Monetizing Building Energy Savings in Private Investment Decisions." Proceedings of 2006 ACEEE Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Washington DC, August 2006.
8. Beddoea, R., Costanzaa, R., Farleya, J., Garza, E., Kent, J., Kubiszewski, I., Martinez, L., McCowen, T., Murphy, K., Myers, N., Ogden, Z., Stapleton, K., and Woodward, J. (February 24, 2009). "Overcoming systemic roadblocks to sustainability: The evolutionary redesign of worldviews, institutions, and technologies." *Proceedings of the National Academy of Sciences.* 106 8 2483–2489. Retrieved on: 2009-08-20.
9. Bell, Simon and Morse, Stephen 2008. *Sustainability Indicators. Measuring the Immeasurable?* 2nd edn. London: Earthscan. ISBN 978-1-84407-299-6.
10. Billon, P. (ed.) (2005) The Geopolitics of Resource Wars Retrieved on: 2009-04-05.
11. Blakemore, (1996), p.107
12. Blewitt (2008) p. 96.
13. Blewitt, J. (2008). *Understanding Sustainable Development*. London: Earthscan. pp. 21-24. ISBN 9781844074549.
14. Bookchin, (2004) .
15. Botkin, (1990).
16. Bournay, E. *et al*. (2006). *Vital waste graphics 2*. The Basel Convention, UNEP, GRID-Arendal. ISBN 8277010427.
17. Bromley, Daniel W. (2008). "sustainability," *The New Palgrave Dictionary of Economics*, 2nd Edition. Abstract.
18. Brower & Leon (1999).
19. Brower, Michael; Cool Energy, The Renewable Solution to Global Warming; Union of Concerned Scientists, 1990

20. Buchenrieder, G., und A.R. Göltenboth: Sustainable freshwater resource management in the Tropics: The myth of effective indicators, 25th International Conference of Agricultural Economists (IAAE) on "Reshaping Agriculture's Contributions to Society" in Durban, South Africa, 2003.
21. Building Emissions Study accessed at California Integrated Waste Management web site
22. BUILDING TYPE B A S I C S book for elementary and secondary schools Stephen A. Kliment, Series Founder and Editor BRADFORD PERKINS Perkins Eastman Architects PC JOHN WILEY & SONS, INC.New York,
23. Building type basics for elementary and secondary schools.
24. Clarke & King (2006).
25. Clarke, W. C. (1977). "The Structure of Permanence: The Relevance of Self-Subsistence Communities for World Ecosystem Management," in *Subsistence and Survival: Rural Ecology in the Pacific.* Bayliss-Smith, T. and R. Feachem (eds). London: Academic Press, pp. 363–384.
26. Cleveland, C.J. "Biophysical economics", *Encyclopedia of Earth*, Last updated: 14 September 2006. Retrieved on: 2009-03-17.
27. Cohen, J.E. (2006). "Human Population: The Next Half Century." In Kennedy D. (Ed.) "Science Magazine's State of the Planet 2006-7". London: Island Press, pp. 13–21. ISSN 15591158.
28. Conceptual Framework Working Group of the Millennium Ecosystem Assessment. (2003). "Ecosystems and Human Well-being." London: Island Press. Chapter 5. "Dealing with Scale". pp. 107–124. ISBN 155634030.
29. Costanza *et al*. (2007).
30. Costanza, R. & Patten, B.C. (1995). "Defining and predicting sustainability." *Ecological Economics* 15 (3): 193–196.
31. Dalal-Clayton, Barry and Sadler, Barry 2009. *Sustainability Appraisal. A Sourcebook and Reference Guide to International Experience.* London: Earthscan. ISBN 978-1-84407-357-3.
32. Daly & Cobb (1989).
33. Daly & Farley (2004) .
34. Daly H.E. (1990). "Toward some operational principles of sustainable development." *Ecological Economics* 2: 1–6.
35. Daly, H. (1996). *Beyond Growth: The Economics of Sustainable Development*. Boston: Beacon Press. ISBN 0807047090.
36. Daly, H. (1999). Uneconomic growth and the built environment: in theory and in fact. In C.J. Kibert (ed.). *Reshaping the Built Environment: Ecology, Ethics, and Economics*. Washington DC: Island Press.
37. Daly, H. (2007). Ecological economics: the concept of scale and its relation to allocation, distribution, and uneconomic growth. pp. 82–103. In H. Daly. *Ecological Economics and Sustainable Development: Selected Essays of Herman Daly*. Cheltenham, UK: Edward Elgar.
38. David Boyle, "Sustainability and social assets: the potential of time banks and co-production", *Grassroots Initiatives for Sustainable Development*, June 10, 2005.

39. Design with distinction: the value of good design in higher education, CABE,
40. Designing Learning Spaces for 21st Century Learners.
41. Devall & Sessions (1985) p. 70.
42. Diamond, J. (2005).*Collapse: How Societies Choose to Fail or Succeed*. New York: Viking Books. ISBN 1586638637.
43. Diane Brook-Head eLearning-Archdiocese of Sydney Catholic Education Office-14.6.09
44. Dieter Arnold, Byron Esely Shafer Temples of Ancient Egypt, I.B.Tauris, 2005
45. Doerr Architecture, Definition of Sustainability and the Impacts of Buildings
46. Dunning, B. (2006). "Sustainable Sustainability." *Skeptoid.* Retrieved on: 2009-02-16.
47. Duurzaam en Gezond Bouwen en Wonen by Hugo Vanderstadt
48. Ehrlich, P.R. & Holden, J.P. (1974). "Human Population and the global environment." *American Scientist* 62(3): 282–292.
49. Emden & Peakall (1996).
50. EurActiv (2004). "Sustainable Development: Introduction." Retrieved on: 2009-02-24
51. Ewing, R "Growing Cooler - the Evidence on Urban Development and Climate Change". Retrieved on: 2009-03-16.
52. Feenstra, G. (2002). "Creating Space for Sustainable Food Systems: Lessons from the Field". *Agriculture and Human Values* 19 (2): 99–106. doi:10.1023/A:1016095421310.
53. Forestry Commission of Great Britain. Sustainability. Retrieved on: 2009-03-09
54. Forum for the Future, UK
55. Fred Harris, the president of Harris Originals Inc, an Olympia firm, specializing in sustainable architecture
56. Fuad-Luke (2006).
57. Fujixerox "Carbon Calculator Demonstration". One of many carbon calculators readily accessible on the web. Retrieved on: 2009-04-07.
58. G.Z. Brown, Mark DeKay. Sun, Wind & Light. 2001
59. Gape, Paul; Wind Power: Renewable Energy for Farm and Business; Chelsea Green Publishing, 2004
60. Garfinkel, Simpson. "Building 20: the Procreative Eyesore". Technology Review 94 (November/December 1991): MIT11.
61. Gipe, Paul; Wind Power: Renewable Energy for Farm and Business; Chelsea Green Publishing, 2004
62. Global Footprint Network. (2008). "Living Planet Report." Retrieved on: 2008-10-01.
63. Goodall (2007).
64. Gro Harlem Brundtland is a Norwegian politician, diplomat, and physician, and an international leader in sustainable development and public health.
65. Groombridge & Jenkins (2002).
66. Hak, T. *et al*. 2007. *Sustainability Indicators*, SCOPE 67. Island Press, London.

67. Hargroves, K. & Smith, M. (eds.) (2005). *The Natural Advantage of Nations: Business Opportunities, Innovation and Governance in the 21st Century*. London: Earthscan/James&James. ISBN 1844071219. (See the book's online companion)
68. Hasna, A.M., Sustainability and Economic Theory : an Organism in Premise. The International Journal of Knowledge, Culture and Change Management,9(11): p. 1-12.
69. Hassall (1990).
70. Hawken *et al*. (1999).
71. Hawkinson, John A., "MIT settles with Gehry over Stata Ctr. defects", The Tech, MIT, v.130, issue 14, March 19, 2010
72. Hegerl, G.C. *et al*. (2007). "Climate Change 2007: The Physical Science Basis." Chapter 9, "Understanding and Attributing Climate Change." Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. p. 676. Cambridge: Cambridge University Press. Full report at: [2] IPCC Report. Retrieved on: 2009-03-18.
73. Heitschmidt R.K., Vermeire L.T., Grings E.E. (2004). "Is Rangeland Agriculture Sustainable?". *Journal of Animal Science.* 82 (E-Suppl): E138–146. PMID 15471792. Retrieved on: 2009-03-18.
74. Herman Daly (born 1938) is an American ecological economist and professor at the School of Public Policy of University of Maryland, College Park in the United States.Ott, K. (2003). "The Case for Strong Sustainability." In: Ott, K. & P. Thapa (eds.) (2003).Greifswald's Environmental Ethics. Greifswald: Steinbecker Verlag Ulrich Rose. ISBN 3931483320. Retrieved on: 2009-02-16.
75. Hilgenkamp, K. (2005). Environmental Health: Ecological Perspectives. London: Jones & Bartlett. ISBN 9780763723774.
76. Hoekstra, A.Y. & Chapagain, A.K. (2007). "The Water Footprints of Nations: Water Use by People as a Function of their Consumption Pattern." *Water Resource Management* 21(1): 35–48.
77. Hoekstra, A.Y. (2006). "The Global Dimension of Water Governance: Nine Reasons for Global Arrangements in Order to Cope with Local Problems." *Value of Water Research Report Series* No. 20 UNESCO-IHE Institute for Water Education. Retrieved on: 2009-03-18.
78. Holling, C. S. (2000). "Theories for Sustainable Futures" Conservation Ecology 4(2): 7. Retrieved on: 2009-02-24.
79. Imhoff, M.L. *et al*. (2004). "Global Patterns in Human Consumption of Net Primary Production." *Nature* 429: 870–873.
80. Information on low-emitting materials may be found at www.buildingecology.com/iaq_links.php IAQ links
81. International Institute for Sustainable Development (2009). What is Sustainable Development?. Retrieved on: 2009-02-18.]
82. IPCC (2007)."*Climate Change 2007: the Physical Science Basis. Summary for Policymakers*." Retrieved on: 2009-03-18.
83. IUCN/UNEP/WWF (1991). "Caring for the Earth: A Strategy for Sustainable Living." Gland, Switzerland. Retrieved on: 2009-03-29.

84. Jackson, T. & Michaelis, L. (2003). "Policies for Sustainable Consumption". The UK Sustainable Development Commission. [5]
85. James, S. (2003). "Eco-municipalities: Sweden and the United States: A Systems Approach to Creating Communities". Retrieved on: 2009-03-16.
86. James,J.P., Yang,X. Indoor and Built Environment, Emissions of Volatile Organic Compounds from Several Green and Non-Green Building Materials: A Comparison, January 2004.[6] Retrieved: 2008-04-30.
87. John Randolph and Gilbert M. Masters, 2008. "Energy for Sustainability: Technology, Planning, Policy," Island Press, Washington, DC
88. John Ringel., University of Michigan, Sustainable Architecture, Waste Prevention
89. Kates, R., Parris, T. & Leiserowitz, A. (2005). "What is Sustainable Development?" *Environment* 47(3): 8–21. Retrieved on: 2009-04-14.
90. Kerr, R.A. (2004). "A slowing cog in the North Atlantic ocean's climate machine." *Science* 304: 371–372.[3] Retrieved on: 2009-04-19.
91. Kinsley, M. (1977). "Sustainable development: Prosperity without growth." Rocky Mountain Institute, Snowmass, Colorado, USA. Retrieved on: 2009-06-17
92. Kobtzeff, O. (2000). "Environmental Security and Civil Society". In Gardner, H. (ed.) *Central and South-central Europe in Transition*. Westport, Connecticut: Praeger, pp. 219–296.
93. Krebs (2001) p. 513.
94. LaColla, T. "It's Easy to be Green! Eco-Municipalities: Here to Stay". theplanningcommission.org. Retrieved on: 2009-03-16.
95. Leo Hickman, "The future of work is green" *The Guardian*, February, 2009.
96. Lisbon is the capital and largest city of Portugal.
97. London, 2005
98. Lutz *et al*. (2004).
99. Marken C. (2009) solar collectors - behind the glass. Home power magazine 133,70-76
100. Markus J., Milne M.K., Kearins, K., & Walton, S. (2006). Creating Adventures in Wonderland: The Journey Metaphor and Environmental Sustainability.
101. Marshall, J.D. & Toffel, M.W. (2005). "Framing the Elusive Concept of Sustainability: A Sustainability Hierarchy." Environmental & Scientific Technology 39(3): 673–682.
102. arshall, J.D. & Toffel, M.W. (2005). "Framing the Elusive Concept of Sustainability: A Sustainability Hierarchy." *Environmental & Scientific Technology* 39(3): 673–682.
103. Mason & Singer (2006).
104. Master thesis -Cairo university- contemporary environmental architecture.
105. Meadows, D.H., D.L. Meadows, J. Randers, and W. Behrens III. (1972). *The Limits to Growth.* New York: Universe Books. ISBN 0876631650.
106. Michaelis, L. & Lorek, S. (2004). "Consumption and the Environment in Europe: Trends and Futures." Danish Environmental Protection Agency. Environmental Project No. 904.

107. Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Biodiversity Synthesis.* World Resources Institute, Washington, DC. pp. 1-85. Retrieved on: 2009-07-08-01.

108. Millennium Ecosystem Assessment, pp. 51–53.

109. Nemetz, P.N. (2003). "Basic Concepts of Sustainable Development for Business Students." *Journal of International Business Education* 1(1).

110. Onions, Charles, T. (ed) (1964). *The Shorter Oxford English Dictionary*. Oxford: Clarendon Press. p. 2095.

111. Operations & Maintenance (LEED-EB: O&M) maximizes operational efficiency while minimizing environmental impacts.

112. Organic Gardening Techniques, *Missouri University Extension*. October 2004. Retrieved June 17, 2009.

113. Ott, K. (2003). "The Case for Strong Sustainability." In: Ott, K. & P. Thapa (eds.) (2003).*Greifswald's Environmental Ethics.* Greifswald: Steinbecker Verlag Ulrich Rose. ISBN 3931483320. Retrieved on: 2009-02-16.

114. Porritt, J. (2006). Capitalism as if the world mattered. London: Earthscan. p. 46.

115. Prensky 2001, Oblinger 2003.

116. Price water house Coopers, Research Report No 242, Building performance: an empirical assessment of the relationship between schools capital investment and pupil performance, Department for Education and Skills (DfES),London, 2000

117. Quotes and Stories about Building 20". MIT Libraries, Massachusetts Institute of Technology. 1998-03-02.

118. R. G. Blake more, History of Interior Design and Furniture: From Ancient Egypt to Nineteenth-Century Europe, John Wiley and Sons 1996, p.100

119. Ratner, B.D. (2004). "Sustainability as a Dialogue of Values: Challenges to the Sociology of Development." *Sociological Inquiry* 74(1): 50–69.

120. Redclift, M. (2005). "Sustainable Development (1987–2005): an Oxymoron Comes of Age." Sustainable Development

121. REN21 (2010). Renewables 2010 Global Status Report p. 15-16.

122. Robert Costanza *et al*., "Complementary Currencies as a Method to Improve Local Sustainable Economic Welfare", University of Vermont, Burlington, VT, December 12th, 2003.

123. Roman concrete self-healing

124. Ruffing, K. (2007). "Indicators to Measure Decoupling of Environmental Pressure from Economic Growth." In: Hak *et al*. (2007) pp. 211–222.

125. Salingaros, Nikos (2007). Anti-Architecture and Deconstruction. Umbau-Verlag. ISBN 978-393794080.

126. Scholars, R. (2003). Stories from the Stone Age. Beyond Productions in association with S4C and S4C International. Australian Broadcasting Corporation. Retrieved on: 2009-04-16.

127. Scott Cato, M. (2009). *Green Economics*. London: Earthscan, pp. 142–150. ISBN 9781844075713.

128. senior partner and design director at Foster + Partners

129. Shiklamov, I. (1998). "World Water Resources. A New Appraisal and Assessment for the 21st century." A Summary of the Monograph World Water Resources prepared in the Framework of the International Hydrological Programme.[6] Retrieved on: 2009-03-18.

130. Small Wind Turbine Size to Meet Household Consumption

131. Smil (2000)

132. Soederbaum (2008).

133. Steinfeld H., Gerber P., Wassenaar T., Castel V., Rosales M., de Haan, C. (2006). "Livestock's Long Shadow - Environmental Issues and Options" 390 pp. Retrieved on: 2009-03-18.

134. Stockholm Environment Institute "Great Transitions". Retrieved on: 2009-04-12.

135. SURVEY OF ICT AND EDUCATION IN AFRICA: Egypt Country Report Egypt – 1

136. Sustainable Architecture and Simulation Modeling", Dublin Institute of Technology,

137. Sustainable Environment for Quality of Life. "100 Ways to Save the Environment." Retrieved on: 2009-06-13.

138. Sustainable Gardening & Food Production, *Daniel Boone Regional Library*. Retrieved June 17, 2009]

139. Sustainable school book

140. Suzuki, D. (2009)."Small Steps." David Suzuki Foundation. Retrieved on: 2009-06-13.

141. The Earth Charter Initiative (2000). "The Earth Charter." Retrieved on: 2009-04-05.

142. The Earth Charter Initiative (2000). "The Earth Charter." Retrieved on: 2009-04-05.

143. The Earth Charter is an international declaration of fundamental values and principles considered useful by its supporters for building a just, sustainable, and peaceful global society in the 21st century.

144. The Economics and Social Benefits of NOAA Ecosystems Data and Products Table of Contents Data Users. NOAA. http://www.economics.noaa.gov/?goal=ecosystems&file=users/. Retrieved 2009-10-13.

145. The Holy (Quran complete online text) English translation by Abdullah Yousouf Ali.htm

146. The Survey was been at 2008 for Imbaba Solidarity, by nirmeen khafagy.

147. The U.S. Green Building Council is a Washington, D.C.-based 501(c) (3) nonprofit organization committed to a prosperous and sustainable future for our nation through cost-efficient and energy-saving green buildings.

148. The value of good design, CABE, London, 2002

149. Time:Cementing the future

150. Toward a Healthy, Sustainable Food System (Policy Number: 200712)". American Public Health Association. 2007-06-11. http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1361. Retrieved : 2008-08-18.

151. Transport and energy manager for the World Bank’s Middle East and North Africa region

152. Turner, G.M. (2008). " A Comparison of The Limits to Growth with 30 Years of Reality." *Global Environmental Change* 18: 397–411. Online version published by CSIRO Sustainable Ecosystems. Retrieved on: 2009-01-03

153. U.S. Department of Commerce. Carbon Cycle Science. NOAA Earth System Research Laboratory. Retrieved on: 2009-03-14

154. U.S. Department of Energy, Energy Efficiency and Renewable Energy, Solar Water Heaters, March 24, 2009 [5]

155. U.S. Department of NOAA Research. "The Carbon Cycle." Retrieved on: 2009-03-18.

156. UCN. 2006. The Future of Sustainability: Re-thinking Environment and Development in the Twenty-first Century. Report of the IUCN Renowned Thinkers Meeting, 29–31 January 2006 http://cmsdata.iucn.org/downloads/iucn_future_of_sustanability.pdf

157. UNEP Grid Arendal. [1] A selection of global-scale reports. Retrieved on: 2009-3-12

158. UNFCC (2009). "*United Nations Framework Convention on Climate Change*." Retrieved on: 2009-03-18.

159. United Nations Department of Economic and Social Affairs, Population Division (2009). "World Population Prospects: The 2008 Revision." Highlights. Retrieved on: 2009-04-06.

160. United Nations Environment Programme (2009). "United Nations Decade of Education for Sustainable Development." Retrieved on: 2009-04-09.

161. United Nations Environment Programmer Global Trends in Sustainable Energy Investment 2007: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency in OECD and Developing Countries (PDF), p. 3.

162. United Nations General Assembly (1987) Report of the World Commission on Environment and Development: Our Common Future. It's transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment. It's retrieved on: 2009-02-15.

163. United Nations General Assembly (1987) *Report of the World Commission on Environment and Development: Our Common Future*. Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment. Retrieved on: 2009-02-15.

164. United Nations General Assembly (2005). 2005 World Summit Outcome, Resolution A/60/1, adopted by the General Assembly on 15 September 2005. Retrieved on: 2009-02-17.

165. United Nations General Assembly (2005). 2005 World Summit Outcome, Resolution A/60/1, adopted by the General Assembly on 15 September 2005. Retrieved on: 2009-02-17.

166. Water and Political Conflicts" from United Nations Environment Programme 2008 "Vital Water Graphics" Retrieved on: 2009-03-16.

167. WBCSD's 10 messages by which to operate *World Business Council for Sustainable Development*. Retrieved 2009-04-06.

168. William C. Clark, Nancy M. Dickson, "Sustainability science: The emerging research program", *PNAS*, Vol. 100, No. 14, June 6, 2003.

169. Wind turbine, a powerful investment", Rapid City Journal, February 20, 2008 [4]

170. World Business Council for Sustainable Development This web site has multiple articles on WBCSD contributions to sustainable development. Retrieved on: 2009-04-07.

171. World Health Organisation (2004). "Global Strategy on Diet, Physical Activity and Health." Copy of the strategy endorsed by the World Health Assembly. Retrieved on: 2009-6-19.

172. World Resources Institute (1998). *World Resources 1998–1999.* Oxford: Oxford University Press. ISBN 0195214080.

173. World Wide Fund for Nature (2008). *Living Planet Report 2008*. Retrieved on: 2009-03-29.

174. Wright, R. (2004). *A Short History of Progress.* Toronto: Anansi. ISBN 0887847064.

175. William Ford Gibson (Born March 17, 1948) is an American-Canadian writer who has been called the "noir prophet" of the cyberpunk subgenre of science fiction.

176. Hardin, G. (December 1968). "The Tragedy of the Commons." *Science* 162(3859), 1243–1248. Retrieved on: 2009-03-17.

177. United Nations General Assembly (March 20, 1987). "Report of the World Commission on Environment and Development: Our Common Future; Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment; Our Common Future, Chapter 2: Towards Sustainable Development; Paragraph 1". United Nations General Assembly.

178. Kinsley, M. and Lovins, L.H. (September 1997). "Paying for Growth, Prospering from Development." Retrieved on: 2009-06-15.

179. Wright, Sarah H. (1998-03-18). "Building 20's last engineering project: a time capsule". MIT News Office.

180. Torcellini, Paul A.; Ron Judkoff, and Sheila J. Hayter (2002-08-23). "Zion National Park Visitor Center: Significant Energy SavingsAchieved through A Whole-Building Design Process" (PDF). Office of Scientific and Technical Information

181. Robert Campbell (April 25, 2004). "Dizzying heights - In Frank Gehry's remarkable new Stata Center at MIT, crazy angles have a serious purpose". The Boston Globe (The New York Times Company).

182. Kantrowitz, Barbara (August 2004). "America's 25 Hot Schools". Newsweek via MSNBC.com (Microsoft Corporation).

183. Holmgren, D. (March 2005). "Retrofitting the suburbs for sustainability." CSIRO Sustainability Network. Retrieved on: 2009-07-07.

184. A Theory of Power" ISBN 0-595-33030-4 Vail, Jeff (2005-06-28). "Passive Solar & Independence".

185. Booming nations 'threaten Earth'". BBC News. January 12, 2006.

186. Sale, Kirkpatrick (24 February 2006). "Economics of Scale vs. the Scale of Economics - Towards Basic Principles of a Bioregional Economy". Vermont Commons. http://www.vtcommons.org/journal/2006/02/kirkpatrick-sale-economics-scale-vs-scale-economics-towards-basic-principles-bioregi. Retrieved 2009-10-13.

187. The Sunday Times, April 16, 2006, "Home wind turbines dealt killer blow" [3]

188. Food and Agriculture Organization (June 2006). "Food and Agriculture Statistics Global Outlook." Rome: FAO Statistics Division. Retrieved on: 2009-03-18.

189. Baroni L., Cenci L., Tettamanti M., Berati M. (February 2007). "Evaluating the Environmental Impact of Various Dietary Patterns Combined with Different Food Production Systems." (PDF). *Eur. J. Clin. Nutr.* 61

(2): 279–86. doi:10.1038/sj.ejcn.1602522. PMID 17035955.
http://www.personal.umich.edu/~choucc/environmental_impact_of_various_dietary_patterns.pdf. Retrieved on: 2009-03.

190. See, for example: Zhexembayeva, N. (May 2007). "Becoming Sustainable: Tools and Resources for Successful Organizational Transformation." Case Western University, Center for Business as an Agent of World Benefit 3(2) and websites of The Sustainable Business Institute, and the WBCSD." Retrieved on: 2009-04-01.
191. Harmon A.H., Gerald B.L. (June, 2007). "Position of the American Dietetic Association: Food and Nutrition Professionals Can Implement Practices to Conserve Natural Resources and Support Ecological Sustainabiility" (PDF). *Journal of the American Dietetic Association* 107 (6): 1033–43.. doi:10.1016/j.jada.2007.05.138. PMID 17571455. http://www.eatright.org/ada/files/Conservenp.pdf. Retrieved on: 2009-03-18.
192. McMichael A.J., Powles J.W., Butler C.D., Uauy R. (September 2007). "Food, Livestock Production, Energy, Climate change, and Health." (PDF). *Lancet* 370 (9594): 1253. doi:10.1016/S0140-6736(07)61256-2. PMID 17868818. http://www.eurekalert.org/images/release_graphics/pdf/EH5.pdf. Retrieved on: 2009-03-18.
193. Glahn, Lisa F. of Mintz Levin (October 31, 2007). "Massachusetts Institute of Technology v. Frank O. Gehry & Associates, Inc., n/k/a Gehry Partners, LLP and Beacon Skanska Construction Company, n/k/a Skanska USA Building, Inc." (PDF). The Tech.
194. LEED for Schools Rating System 1st Edition, Updated November 2007
195. Silber, John (November 2007). Architecture of the Absurd: How "Genius" Disfigured a Practical Art. Quantuck Lane. ISBN 978-1593720278.
196. Murphy, Shelley (November 6, 2007). "MIT sues Gehry, citing leaks in $300m complex; Blames famed architect for flaws at Stata Center". The Boston Globe (The New York Times Company).
197. Robin Pogrebin and Katie Zezima (November 6, 2007). "M.I.T. Sues Frank Gehry, Citing Flaws in Center He Designed". The New York Times (The New York Times Company): p. A19.
198. Dey, Arkajit (November 9, 2007). "MIT Sues Gehry Firm Over Stata Problems; Lawsuit Describes Persistent Leaks, Sliding Ice and Snow, and Cracking Masonry". The Tech: p. 1.
199. Jackson, T. (February 2008). Tim Jackson, Roland Clift, "Where's the Profit in Industrial Ecology?" *Journal of Industrial Ecology* 2:(1): 3–5.
200. WWF. (April, 2008). "Weathercocks and Signposts: The Environment Movement at a Crossroads". Summary also available here. Retrieved on: 2009-03-13.
201. Adams, D. (March 2009) "Stern attacks politicians over climate 'devastation'". *The Guardian*. Retrieved on: 2009-03-18.
202. University of Copenhagen (March 2009) "Key Messages from the Congress" News item on Copenhagen Climate Congress in March 2009. Retrieved on: 2009-03-18.
203. Product Stewardship Council (US). Retrieved on: 2009-04-05.
204. University of Oregon, Eugene , Jun 14, 2009 Brook, Dian

205. Earth Stats." Gardensofbabylon.com. Retrieved on: 2009-07-07.
206. Black, Richard (21 September 2009). "Recession and policies cut carbon". BBC. http://news.bbc.co.uk/1/hi/sci/tech/8267475.stm. Retrieved 2009-10-13.
207. Clean Edge (2009). Clean Energy Trends 2009 pp. 1-4.
208. Costanza *et al*. (2007). Ch. 1, pp. 1–4, Ch.3, p. 3.
209. Millennium Ecosystem Assessment, pp. 6–19.

Internet

1. www.cabe.org.uk
2. www.Dictionary.com
3. www.docstoc.com/docs/2280777/What-is-Sustainability.
4. www.gaiagroup.org/CGschools.pdf
5. www.makai.com
6. www.realgoodssolar.com/solar/p/Creating-Sustainable-Shelter.html
7. www.rhs.org.uk
8. www.rhs.org.uk/SCHOOLGARDENING/uploads/documents/DCSF_brief_introduction_to_sustainable_schools_570.pdf
9. www.sustainableschools.dgs.ca.gov/SustainableSchools/introduction.html
10. www.wikipedia.org
11. www.wikipedia.org/wiki/Sustainable_architecture#cite_note-18
12. www.wisegeek.com/what-is-water-management.htm
13. www.infodev.org ICT in Education in Egypt by Amr Hamdy June 2007
14. http://www.un-documents.net/ocf-02.htm. It's Retrieved 1 March 2010.
15. http://biofriendly.com/blog/energy/first-net-zero-energy-public-school-set-to-open-this-year/
16. http://continuingeducation.construction.com/article.php?L=48&C=252&P=3
17. http://continuingeducation.construction.com/article.php?L=48&C=252&P=3
18. http://libraries.mit.edu/archives/mithistory/building20/quotes.html#lettvin. http://www.boston.com/ae/theater_arts/articles/2004/04/25/dizzying_heights/.
19. http://tech.mit.edu/V127/N53/lawsuit.html.
20. http://tech.mit.edu/V127/N53/lawsuit/stata_lawsuit.pdf.

References

21. http://web.mit.edu/newsoffice/1998/capsule-0318.html.
22. http://www.archinnovations.com/featured-projects/academic/orestad-college/
23. http://www.buzzle.com/articles/education/
24. http://www.buzzle.com/articles/importance-of-education.html
25. http://www.buzzle.com/articles/importance-of-education-to-youths.html
26. http://www.cabe.org.uk/design-review/schools/identity-and-context-a
27. http://www.cabe.org.uk/files/assessing-secondary-school-design-quality.pdf
28. http://www.citymayors.com/education/green_schools.html
29. http://www.cres-energy.org/reba_2005_frhs.html
30. http://www.dbrinc.com/featured/West_Brazos_Junior_High_School
31. http://www.eia.doe.gov/cneaf/alternate/page/renew_energy_consump/rea_prereport.html
32. http://www.ewindea.org/index.php/egypt-wind-facts
33. http://www.greenschoolbuildings.org/resources.aspx
34. http://www.gwec.net/index.php?id=122
35. http://www.msnbc.msn.com/id/5626574/site/newsweek/.
36. http://www.solarbuzz.com/Moduleprices.htm
37. http://www.toolbase.org/Technology-Inventory/Plumbing/solar-water-heaters
38. http://www.uh.edu/engines/epi2521.htm
39. http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988
40. http://www.wbdg.org/resources/bipv.php
41. http://pruned.blogspot.com/2009/06/wetland-machine-of-sidwell.html
42. http://www.nytimes.com/2007/11/07/us/07mit.html.
43. http://www.nrel.gov/docs/fy02osti/32157.pdf. Retrieved 2007-03-10.
44. http://www.boston.com/news/education/higher/articles/2007/11/06/mit_sues_gehry_citing_leaks_in_300m_complex/.

Appendix .

1. Newspapers comments at educational buildings

2.

خـــرابات.. والاســـم مـــدارس

ترميم وصيانة وتطوير ١٠٣٠ مدرسة فى الدقهلية خلال العام الدراسى

خلال الفصل الدراسى الثانى من العام الماضى قامت وزارة التربية والتعليم بعمليات ترميم وصيانة وإعادة تأهيل لبعض مدارس المحافظات ومنها الدقهلية واستمرت هذه الأعمال بدون خطة واضحة للتأكد من حسن التطبيق والبدء والانتهاء من الأعمال وفقا لبرنامج زمنى محدد وسط تساهل تام لقضية استقرار التلاميذ، والعام الدراسى الذى ضاع وضاعت معه أهداف مشروع الوزارة فى التطوير والجودة والتحسين.

ومع بدايات العام الدراسى الحالى شهدت مدارس محافظة الدقهلية باختلاف المدن والمراكز والقرى عمليات هدم وإحلال وصيانة وترميم مكثفة لتتضمن عشرات المدارس إلى غيرها من المدارس الأخرى التى كانت قد بدأت فيها هذه الأعمال خلال العام الدراسى الماضى، ولم تنته إلى الآن؟

سمير خالد

ونسب غياب التخطيط وعشوائية التطبيق فى حدوث حالة من الهرجلة وضياع عام دراسى جديد على تلاميذ مدارسهم لتنفيذ هذه الأعمال فى وجودهم وآخرين شتتوا على مدارس ليصبح يومهم الدراسى ٤ ساعات فقط؟

بالذمة ده كلام

وأكدت المصادر أن عدد المدارس التى شملها التطوير والصيانة والإحلال والترميم يصل إلى ١٠٣٠ مدرسة على مستوى محافظة الدقهلية، تم طرحها وتسلمتها هيئة الأبنية التعليمية.. كما أكدت المصادر بدء التنفيذ فى أكتوبر الماضى، أى بعد بدء العام الدراسى الجديد؟

فى حين كشف التقرير الذى أعدته لجنة التعليم بمجلس محلى محافظة الدقهلية تطبيق مشروع التأهيل والجودة بـ ٢٤٠ مدرسة على مستوى المحافظة بمعرفة هيئة الأبنية التعليمية على ثلاث مراحل تم تنفيذ المرحلة الأولى منها، وتشمل ٨٠ مدرسة.. كما أشار التقرير إلى أن المرحلتين الثانية والثالثة تشمل ١٦٥ مدرسة؟

أثاثات مبعثرة

من مركز تمى الأمديد كشف سمير خالد العضو الوفدى بمجلس محلى محافظة الدقهلية عن طرح مدرسة صدفا الاعدادية المشتركة للصيانة فى يوليو الماضى، فى حين بدأت تنفيذ الأعمال بعد بعثرة وتوزيع تلاميذها على مدرسة صدفا التجارية خلال فترة مسائية فى أكتوبر الماضى، أى

3.

صدرت لها قرارات إزالة منذ سنوات

المدارس المتهالكة مصدر رعب للتلاميذ وأولياء الأمور فى بنى سويف

بنى سويف- حمدى الصايغ

شهد اجتماع المجلس المحلى لمركز الفشن فى بنى سويف مناقشات ساخنة حول مشكلات المبانى التعليمية حيث أكد الاجتماع أن بعض المدارس فى القرى وفى المدينة مبانيها متهالكة وقد صدرت قرارات إزالة لعدد منها منذ فترة ولكنها لم تنفذ حتى الآن.

وكان المجلس المحلى قد وجه الدعوة إلى مانى حلمى مسئول مشروع الطفاء محاوره التابع لهيئة «كير» الدولية ومنى إسماعيل منسقة مشروع التعليم فى المحافظة وقد حضرا بالفعل اجتماع المجلس الذى ناقش المشكلة حيث حذر أحمد على سعد رئيس المجلس المحلى من تجاهل مسئولى هيئة الأبنية التعليمية لما وصلت إليه بعض المدارس والتى أصبحت مهددة بالسقوط على رؤوس التلاميذ مثل مدرسة القلت الغربية.

وأكد رئيس المجلس أن الحلول المؤقتة لهذه المشكلة وتتمثل فى ضم المدرسة الابتدائى إلى المدرسة الإعدادى يترتب عليها انتقال التلاميذ إلى مدرسة الفضائى لأداء الامتحانات مما يهدد حياة التلاميذ حيث يمشون على الطريق السريع.

وقال زكى محمد زكى رئيس لجنة التعليم بالمجلس المحلى إن مدرسة الكنيسة صدر لها قرار إحلال وتجديد ولم يتم مع عدم استكمال مدرسة القلت الثانوية الفنية ومدرسة ٦ أكتوبر بمدينة الفشن صدر لها قرار إزالة منذ سنة ومازالت تعمل.

وطالب مدوح إسماعيل بازالة المدرسة خوفا على الأرواح وخاصة أن مدرسة الجمهور أزيلت وأصبحت المدرسة الأخرى تعمل فترتين.

وقال محمد معروف عضو المجلس إن مدرسة بنى منين أزيلت منذ ٥ سنوات ولم يتم بنائها والمسئولين يعملون على حسب الأولوية.

وتساءل الم تكف ٥ سنوات لدخول المدرسة فى الأولوية، وقال أحد أعضاء المجلس إن مدرسة تلت تم ترميمها لكن يجب إزالتها

وأكد أن القليمة ليس بها مدارس، وقال طالبة وهناك مدرسة بها ١٢ فصلا بينما تحتاج إلى ١٨ فصلا كذلك مدرسة الفشن الإعدادية المشتركة بها فصل طائر وقال طارق درويش إن المخازن بالمدرسة الثانوية تحولت إلى فصول.

وقال خالد إدريس عضو المجلس إن المدرسة الإعدادية الجديدة بدون دورات مياه

وان هناك ثلاث مدارس تعمل فى مدرسة واحدة بمدينة الفشن.

وقال رئيس محلى دلهاس إن هناك قطعة أرض مخصصة لمدرسة ثانوى لم يتم بنائها حتى الآن.

وقال سلامة محمد أن منطقة غرب البحر اليوسفى بالفشن تضم ثلث سكان المركز ولا يوجد بها مدرسة ثانوى عام وأنه تم تخصيص ٥ أفدنة لمدرسة صناعية لم يسأل عنها أحد وكذلك مدرسة أبسوخ مهددة بالانهيار على التلاميذ.

وقال علاء إسماعيل وكيل مجلس محلى القلت إن قرية منشأة عمرو تعمل بنظام الفصول الطائرة وتم ضغط الفصول لعدم وجود مدرسين رغم حصولها على اعتماد الجودة والتميز كذلك كشف فذا الحوار عن ارتفاع كثافة الفصول فى جميع المدارس وأن معظم المدارس تعمل بأسلوب الفصول الطائرة مما يؤثر سلبيا على سير العملية التعليمية وعدم التحصيل العلمى الجيد للتلاميذ.

كما ناقش المجلس مع مسئولى هيئة «كير» عدم مراعاة التوزيع الجغرافى للعرسنتن مما يؤثر على انتظام الدراسة وطالبوا بقرب المسافة للمعلم حتى يتحسن أدائه وطالبوا بإنشاء مدارس فى القرى المحرومة وزيادة المدارس الثانوية لتخفيف الضغط على مدارس البنين وتوفير الجهد والمال لأولياء الأمور خاصة محدودى الدخل وسرعة ترميم المدارس المحتاجة إلى الترميم وبناء المدارس التى تم إزالتها.

4.

لسد العجز فى أثاث المدارس

محلى الفيوم يطالب مسئولى التعليم باستئجار مقاعد وموائد من محلات الفراشة ليجلس عليها الطلاب

كشفت لجنة التعليم بمجلس محلى الفيوم فى اجتماعها مؤخرا برئاسة محمد يوسف عن عدة مخالفات ارتكبتها مديرية التربية والتعليم عند توزيع العقود المميزة لوظيفة الفصل الواحد والأخصائى الاجتماعى ومعلمى رياض الأطفال وهو ما أثر بالسلب فى العملية التعليمية التى أوشكت على الانهيار، بسبب سوء التخطيط من القائمين على التعليم بالفيوم خاصة أن هناك مدارس شبه مهجورة لنفس السبب فى مجمع مدارس دمو.

وقد أوصت اللجنة بضرورة سرعة البت فى الشكاوى المقدمة من المتظلمين قبل بداية الفصل الدراسى الثانى لإمكانية سد العجز فى المدارس.

كما ناقشت اللجنة العجز الذى تعانيه المدارس فى الأثاث حتى أن بعض المدارس لم تجد الأثاث المطلوب لفرش لجان امتحان النصف الدراسى الأول وقد طالب أعضاء اللجنة بأن توفر مديرية التربية والتعليم الاعتمادات اللازمة لاستئجار مقاعد وموائد من محلات الفراشة ليؤدى عليها الطلاب امتحانات الفصل الدراسى الأول على أن يتم الانتهاء من تكليف المدارس الصناعية بتصنيع الأثاث المطلوب للمدارس بعد توفير ملبونى جنيه لهذا الغرض.

وقد ناقشت اللجنة الاستعدادات من قبل المديرية والتكليفات الصادرة عنها لإنجاز الامتحانات على الوجه السليم بما يضمن انعدام نسبة الخطأ أثناء هذه الفترة الحساسة من العام الدراسى.

5.

تقرير التنمية البشرية فى محافظات مصر:

23 % من مدارس مصر لا تصلح للعملية التعليمية

كشف تقرير التنمية البشرية فى محافظات مصر أن أعلى مدينة فى التنمية البشرية فى مصر كانت مدينة بورفؤاد بمحافظة بورسعيد، بينما أدنى مرتبة للتنمية البشرية تحتلها قرية العزبى ذمولا/ مركز القرنة محافظة الأقصر.

أما بالنسبة لمؤشرات متوسط نصيب الفرد من الناتج المحلى، فتأتى شياخة عجرود/ حى عتاقة محافظة السويس فى المقدمة (٢٤٦٠٣ جنيهات)، وأدنى مؤشر يأتى فى نزلة عمرو مركز ومدينة بنى مزار بمحافظة المنيا ١٣٥٩٫٥ جنيه.

وأظهر التقرير الذى أعده فريق بحثى بمعهد التخطيط القومى، وحصلت «نهضة مصر» على نسخة منه وأنه بالنسبة لمؤشر معدل القراءة والكتابة فتأتى مدينة السادات حى عتاقة بمحافظة السويس فى الترتيب الأول بنسبة ١٠٠٪، وتتساوى معها عزبة الكنيسة بمركز ومدينة شبراخيت بمحافظة البحيرة، وبالنسبة لأدنى معدل للقراءة والكتابة فيوجد فى قرية كوم عياد مركز ومدينة شبين الكوم بمحافظة المنوفية بنسبة ١٠٠٪، وهذا يعنى أن معدل الأمية فى القرية يبلغ ٨٩٫٣٪.

أما مؤشر معدل البطالة فهناك أكثر من وحدة تتدنى بها معدلات البطالة إلى نحو ٠٫١٪ وهى كفر رماح مركز ومدينة سوهاج بمحافظة المنوفية وقرية حبارس القبلية مركز ومدينة أبشاى البارود بمحافظة البحيرة، وقرية منشاة طاهر مركز ومدينة أهناسيا بمحافظة بنى سويف بالإضافة إلى قرية بيت الحريرى مركز جرجا بمحافظة سوهاج.

وعن أعلى نسبة للبطالة فتوجد قرية منشاة بطاح بنسبة ٥٨٫٩٪ مركز نسوق محافظة كفر الشيخ.

وأفضل الوحدات المحلية بالنسبة لمعدل وفيات الرضع لكل ألف مولود، فتحققت فى كل من مدينة السخنة ٢٫٢ بحى عتامة، وحتى عتاقة أيضاً بمحافظة السويس، وتأتى شياخة قصر الدوبارة ٢٫٧ حالة وفاة لكل ألف مولود، بقسم قصر النيل بمحافظة القاهرة فى المركز التالى.

أما أسوأ الوحدات فى معدل وفيات الرضع فيتحقق فى قرية كوم أبو حجر ١٠٦٫٢ مركز صدفا محافظة أسيوط، وكذلك فى مدينة الفتايم ١٠٣٫٥ مركز الفتايم بمحافظة أسيوط.

وقال التقرير إنه بالنسبة لمؤشر القيد الاجمالية فى التعليم تأتى فيس منشأة سليمان ١٠٠٫٦٪ مركز ومدينة سمنطط بمحافظة بنى سويف فى المقدمة، تليها مدينة نسوق ٩٩٫٨٪ مركز نسوق بكفر الشيخ، وبالنسبة لأدنى نسبة قيد تأتى قرية غرندل ٢٣٫٧٪ قسم أبو زنيمة محافظة جنوب سيناء، أما نسبة القيد فى الابتدائى فتأتى شياخة النادى الأعلى ١٤٩٫٥٪ من شرق مدينة نصر محافظة القاهرة فى المقدمة، ويرجع هذا الارتفاع إلى تركز المدارس فى تلك المنطقة، أما أدنى نسبة قيد فتحققت ضحاريف قسم نعب ٢١٫٨٪ محافظة جنوب سيناء.

وبالنسبة لمعدل المواليد فتظهر أدنى نسبة «الأفضل» فى شياخة قصر الدوبارة ٧٠ قسم قصر النيل بمحافظة القاهرة، بينما يأتى أعلى معدل للمواليد فى قرية النجاح ١٩١٫٣ قسم ومدينة بئر العبد بمحافظة شمال سيناء.

وأظهر التقرير أن نسبة قوة العمل ١٥ فأكثر كانت فى

الأبنية التعليمية تنتهك حقوق التلاميذ فوق أنقاض مدرسة «أبونشابة»

الدروس تحت الأشجار.. بلا مقاعد ولا دورات مياه

منذ أكثر من شهر انتظم التلاميذ فى مدارسهم فى كل أنحاء الجمهورية.. إلا تلاميذ مدرسة «أبونشابة» بمدينة السادات بعد أن ضاع حقهم فى «المواطنة» تحت أنقاض فصولهم.. فهم يعيشون الآن مأساة حقيقية قاسية.

المدرسة تحوى ٢٠ فصلاً لتلاميذ المرحلة الإعدادية و٢٤ فصلاً للابتدائية و٤ فصول لرياض الأطفال.. تستوعب أكثر من ٢٠٠٠ تلميذ وتلميذة بلا مقاعد ولا دورات مياه ولا حتى سبورات.. يقضون حاجتهم فوق الرمال.. يجلسون على أخشاب المقاول الذى يجرى أعمال الهدم والترميم.. ومئات منهم يتلقون حصصهم التعليمية تحت الأشجار فى الفناء.. وتهدد مخلفات البناء والبلاط حياتهم بصفة يومية.. ولا أحد للأسف يبالى أو يهتم.

.. رصدنا تلك الصورة على الطبيعة داخل مدرسة «أبونشابة» وهى تابعة لإدارة السادات التعليمية بمحافظة المنوفية.. ونقل تفاصيلها المأساوية إلى كل مسئول بوزارة التربية والتعليم..

لعلهم ينقذون تلاميذها قبل وقوع الكارثة.. ويعيدون حق مئات التلاميذ فى «المواطنة».

حصة تحت الشجرة

تلال من الرمال والزلط والطوب فى مدخل المدرسة احتاجت منا مجهوداً كبيراً لندخل إلى المدرسة التى تحول فناؤها إلى مخزن كبير للأبواب الخشبية القديمة المنزوعة من فصول المدرسة ومخلفات أعمال الترميمات والبناء فيها.

شاهدنا أعدادا كبيرة من التلاميذ الذين يجلسون فى الفناء تحت الشجرة يتلقون حصة اللغة العربية وهم فى الصف الرابع الابتدائى.. البنات والأولاد يجلسون جنباً إلى جنب على الرمال.. بينما يدور العمل على قدم وساق بدورات المياه وقد أكد لنا بعض المدرسين أن المقاول عندما علم بقدوم الصحافة جاء فى أول يوم بعد شهر كامل من توقف العمل.

بالوعات المدرسة مفتوحة.. والتلاميذ مهددون فى أى لحظة بالسقوط فيها خاصة أنها بلا أغطية.

عدد من المدرسين جلسوا وافترشوا أرضية المدرسة تحت ظل شجرة ومعهم مدير المدرسة لمتابعة العملية التعليمية وقمة المأساة أن حوش المدرسة الذى أصبح مكانا لالتقاء المدرسين والناظر وعمال الصيانة وبعض الطلبة هو نفس المكان الذى تستأذن فيه طالبة مدرستها لقضاء حاجتها أمام زملائها ولم تسلم من عيونهم أما المدرسات فيذهبن إلى المنازل المجاورة لقضاء حاجتهن.

وهو ما اشتكت منه التلميذات منى جمال وشيماء السيد وعهود أشرف واشتكين جميعاً من رؤية التلاميذ لهن وهن يقضين حاجتهن فى حوش المدرسة وقد أصيبت أعينهن بحساسية شديدة ولا يستطعن التنفس بسبب الغبار والهيو نتيجة أعمال الترميم.

الفصول بلا أرضيات والحوائط على الطوب الأحمر والمقاعد البالية أصبحت تحت سيطرة المقاول الذى

6.

بسبب تهالك المدارس الحديثة

محلى الشرقية يفتح النار على مسئولى هيئة الأبنية التعليمية ويتهم اللجان الخاصة بالتجاوز

وقال سعيد عبدالله السعدنى- عضو المجلس- ان للمستشار يحيى عبدالمجيد محافظ الشرقية كان قد وافق منذ فترة على إقامة مدرسة تعليم أساسى بقرية تل القاضى مركز ديرب نجم ولم يتم بناء المدرسة حتى الآن والقرية بها أكثر من سبعمائة طالب ابتدائى واعدادى وقد تم توزيع هؤلاء الطلبة على مدارس القرى المجاورة مما يعرضهم للخطر بسبب الحوادث على الطريق، خاصة الأطفال.

وقال محمد أحمد سعادة- عضو المجلس-إنه تم وضع أساسات خرسانية عبارة عن قواعد عادية مسلحة وأعمدة لعدد تسعة فصول بمدرسة الحرية ٢ بالصالحية القديمة وذلك برقم تعريفى ١٣٠٦٦٣٣ منذ أكثر من خمسة عشر عاماً ولم يستكمل بناؤها حتى الآن مما يعرض المبانى الموجودة للتلف وهو ما يمثل اهدارا للمال العام.

واستكمل عضو المجلس انه تم ضم جميع مدارس الصالحية القديمة الى مدينة الصالحية الجديدة والتى تتبع مركز الحسينية شعبياً مما يترتب عليه عدم تمكين الشعبيين بالصالحية القديمة من الطالبة بحقوقهم لانها تتبع فاقوس اداريا، ولان الجهاز التنفيذى بإدارة الصالحية الجديدة يتبع مركز الحسينية وليس فاقوس فإننا لا نستطيع ان نطالب بأى مطلب يخص العملية التعليمية رغم العجز الفادح فى العمالة والذى اعترف به مدير إدارة الصالحية عندما قال: نعم لدينا عجز صارخ بالعمالة بإدارة الصالحية الجديدة.

وتدخل سعيد عبدالله السعدنى- عضو المجلس- قائلاً انه تم تخصيص مساحة ثمانية قراريط عام ١٩٩٢م لبناء مدرسة اعدادية بقرية حصة الرهبان التابعة لمركز ديرب نجم ولم يتم بناء المدرسة حتى الآن والقرية فى حاجة ماسة لتلك المدرسة

وقال طارق مروان شبانة- عضو المجلس- انه تم إنشاء مدرسة منشأة قاسم مركز ديرب نجم وهى للتعليم الاساسى حيث يوجد مبنى قديم بالمدرسة وكثافة الفصول بها عالية جداً ولا يوجد قسم رياض أطفال رغم ورود ذلك فى خطة التطوير الخاصة بقرية العصايد وانتقل عضو المجلس الى كادر المعلمين قائلاً: تم صرف كادر المعلمين للوظائف الفنية وانتظار ووكلاء المدارس منذ عام وفوجئ بعض الوكلاء بالمدارس بقطع الكادر عنهم ومنهم فورى عطية عبدالعزيز وتوفيق السيد توفيق وكيلا لشئون المالية والمخزنية بمدرسة ديرب نجم الثانوية الصناعية وهما درجات فنية شملهما الكادر فى البند الأول بأحقية الصرف.

كما استعرضت اللجنة الطلب المقدم من الأهالى ومن مجلس أمناء مدرسة كفر حجى الابتدائية التابعة لمركز أولاد صقر والمزكى من مصباح المتولى عضو المجلس والذى جاء فيه أنه تم فتح جناح مكمل بالمدرسة مكون من أربعة طوابق ودورات مياه فى ٢٠٠٨/٢/٢٥ ويعد أن بدا العمل بالمدرسة تبين وجود مخالفات خطيرة وهى عبارة عن وجود ثقوب بخزانات المياه العلوية وتسرب المياه على سقف المدرسة وكذلك وجود أعطال بوصلات الكهرباء وهى غير سليمة، كما لم يتم

7.

8.


مليونا جنيه لإقامة أسوار
٣ مدارس بالوادى الجديد
وافق المهندس نبيل حلمى رئيس الهيئة العامة
للأبنية التعليمية على إنشاء أسوار جديدة بـ ٣
مدارس بالوادى الجديد.
صرح بذلك مصطفى عبد الفتاح مدير عام فرع
الوادى الجديد، وقال انه تقرر انشاء
مليار ونصف مليار جنيه لبناء مدارس جديدة بالفيوم
ادراج ١٠٠٠ مدرسة بخطة الجودة الشاملة
«عصارة» أسيوط سقطت من الذاكرة..
المدرسة آيلة للسقوط.. الأسمدة ناقصة.. مياه الشرب ملوثة
أسلاك الكهرباء العارية والبالوعات المفتوحة تقابل موقوته.. والمسئولون «طناش»
من المسئول عن بناء مدارس
فى منطقة مهددة بالانهيار؟!
نقص 1000 مقعد دراسى يعطل العملية التعليمية فى مدارس إدارة غرب الفيوم
طلاب «سوزان مبارك» عادوا إلى منازلهم لعدم وجود مقاعد
وتجديدات «الصنايع» تعطل الطلبة حتى نوفمبر القادم
جولة لوزير التعليم ومحافظ الجيزة فى أول أيام الدراسة بالفصل الثانى
د. الجمل: تنفيذ خطة بناء المدارس بنسبة ١٠٠٪
محافظ القليوبية يقرر وقف الدراسة فى مدرسة
بشبرا لتصدع مبانيها
كتب: محمد قاسم

بيانات إحصائية عن محافظة الجيزة
للعام الدراسي 2008/2007

اسم المؤشر	ما قبل الإبتدائى		الابتدائى		الاعدادى		ثانوى عام		ثانوى صناعى		ثانوى زراعى		ثانوى تجارى		الجملة		
	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	جملة
جملة الطلبة حكومى	8956	8128	343814	323277	137607	133981	33529	35614	20251	9354	2005	691	7577	11472	553739	522517	1076256
جملة الطلبة خاص	19417	17465	80894	73006	27096	22841	5647	5308	0	0	0	0	10443	13410	143497	132030	275527
جملة الطلبة	28373	25593	424708	396283	164703	156822	39176	40922	20251	9354	2005	691	18020	24882	697236	654547	1351783
عدد المدارس حكومى	144		678		369		106		33		6		20		1356		
عدد المدارس خاص	308		322		276		125		0		0		46		1077		
جملة عدد المدارس	452		1000		645		231		33		6		66		2433		
عدد المدرسين حكومى	30	739	6884	9737	5809	4777	3757	1843	1873	1002	161	141	689	701	19203	18940	38143
عدد المدرسين خاص	50	2056	1856	5363	1991	1443	890	469	0	0	0	0	157	44	4944	9375	14319
جملة عدد المدرسين	80	2795	8740	15100	7800	6220	4647	2312	1873	1002	161	141	846	745	24147	28315	52462
مدارس نظام اليوم الكامل حكومى	93		258		160		58		9		2		6		586		
مدارس نظام اليوم الكامل خاص	232		243		213		79		0		0		6		773		
جملة اليوم الكامل	325		501		373		137		9		2		12		1359		
مدارس فترة اولى صباحية حكومى	51		297		147		47		20		4		10		576		
مدارس فترة اولى صباحية خاص	76		79		63		29		0		0		1		248		
جملة فترة صباحية	127		376		210		76		20		4		11		824		
مدارس فترة مسائية ثانية حكومى	-		90		51		1		1		0		1		144		
مدارس فترة مسائية ثانية خاص	-		0		0		17		0		0		35		52		
جملة فترة مسائية ثانية	-		90		51		18		1		0		36		196		
مدارس تعمل على فترتين حكومى	-		33		11		0		3		0		4		51		
مدارس تعمل على فترتين خاص	-		0		0		0		0		0		3		3		
جملة مدارس تعمل على فترتين	-		33		11		0		3		0		7		54		
الفصل الواحد فتيات	87																
الفصل الواحد مشترك																	
مدارس التربية الخاصة	68	مدرسة	2854	تلميذة	498	مدرسين											

9.

المؤشرات الخاصة بمحافظة الجيزة
للعام الدراسي 2008/2007

اسم المؤشر	ما قبل الإبتدائى		الإبتدائى		الإعدادى		ثانوى عام		ثانوى صناعى		ثانوى زراعى		ثانوى تجارى		الاسبيعاب
	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	بنين	بنات	جملة
الاسبيعاب	-	-	110	113	بحسب الاسبيعاب للصف الأول الإبتدائى فقط (بدون الأزهر)										11
نسبة النمات للجملة (حكومى)	-	47	-	49	-	49	-	61	-	40	-	13	-	67	
نسبة النمات للجملة (خاص)	-	47	-	47	-	46	-	48	-	0	-	0	-	56	
نسبة النمات للجملة (جملة)	-	47	-	48	-	49	-	52	-	32	-	26	-	58	
نسبة التقد الاجمالى	56	53	105	105	81	83	57	58	التقد الثانوى يشمل ثانوى عام وما فى مستواه						
الفجوة	3		0		-2		-1		الفجوة الثانوى يشمل ثانوى عام وما فى مستواه						
التسرب	-	-	2	1	6	6	بحسب التسرب لمرحلة التعليم الأساسي فقط								
متوسط كثافة الفصل (حكومى)	36		55		49		40		33		35		36		
متوسط كثافة الفصل (خاص)	28		32		30		24		0		0		41		
متوسط كثافة الفصل (جملة)	30		49		44		37		33		35		39		
نصيب المدرس من التلاميذ	19		34		23		12		10		9		27		
نسبة المدرسين المربوبين لإجمالى هيئات التدريس	53		72		59		59		74		51		35		

10.

Appendix .

11.


العنوان: تقييم المدرسه الحكومية
امبابه
السعديه
السؤال الأول: هل تشعر بانتمائك وفخرك بالمدرسة؟
نعم
لا
السؤال الثاني: هل موقع المدرسة يؤثر على مستخدميها من الداخل؟
نعم
لا
السؤال الثالث: هل المساحات المفتوحه مستغله جيدا داخل المدرسه؟
نعم
لا
السؤال الرابع: هل أماكن الفصول والمعامل والمكتبه والمساحات المفتوحه ومسارات الحركه بينهم جيده؟
نعم
لا
السؤال الخامس: هل شكل المبنى الخارجي يعجبك؟
نعم
لا
السؤال السادس: هل مساحات الفصول وتشطيبها مناسب؟
نعم
لا
السؤال السابع: هل التهويه والاضاءه داخل المدرسه جيده؟
نعم
لا
السؤال الثامن: هل تشعر أن المدرسه تهيء لك بيئه آمنه ومرحبه؟
نعم
لا
السؤال التاسع: هل يمكن استخدام فراغات المدرسه في عدة وظائف؟
نعم
لا
السؤال العاشر: هل تشعر أن تصميم المدرسه ناجح؟ ما هو رأيك لتطوير المدرسه الحكوميه لتكون مدرسه مستدامه و تستفيد من الموارد الطبيعيه والبشريه
نعم
لا

Appendix .

نتيجة استقصاء لطلبة مدرسة امبابه والسعيديه عن رأيهم في المدرسه

السؤال الاول:هل تشعر بانتمائك وفخرك بالمدرسة؟
1. نعم (31.25%)
2. لا (68.75%)
السؤال الثاني:هل موقع المدرسة يؤثر على مستخدميها من الداخل؟
1. نعم (75.00%)
2. لا (25.00%)
السؤال الثالث:هل المساحات المفتوحه مستغله جيدا داخل المدرسه؟
1. نعم (25.00%)
2. لا (75.00%)
السؤال الرابع:هل أماكن الفصول والمعامل والمكتبه والمساحات المفتوحه ومسارات الحركه بينهم جيده؟
1. نعم (31.25%)
2. لا (68.75%)
السؤال الخامس:هل شكل المبنى الخارجي يعجبك؟
1. نعم (25.00%)
2. لا (75.00%)
السؤال السادس:هل مساحات الفصول وتشطيبها مناسب؟
1. نعم (25.00%)
2. لا (75.00%)
السؤال السابع:هل التهويه والاضاءه داخل المدرسه جيده؟
1. نعم (18.75%)
2. لا (81.25%)
السؤال الثامن:هل تشعر أن المدرسه تهيء لك بيئه آمنه ومرحبه؟
1. نعم (31.25%)
2. لا (68.75%)
السؤال التاسع:هل يمكن استخدام فراغات المدرسه في عدة وظائف؟
1. نعم (37.50%)
2. لا (62.50%)
السؤال العاشر:هل تشعر أن تصميم المدرسه ناجح؟ ما هو رأيك لتطوير المدرسه الحكوميه لتكون مدرسه مستدامه و تستفيد من الموارد الطبيعيه والبشريه
1. نعم (25.00%)
2. لا (75.00%)

12.

دراسة لتحويل المدارس الثانوي إلى مدارس مستدامه

محمد أسامه محمد رسمي

رساله مقدمه إلى
كلية الهندسه – جامعة القاهره
للحصول على درجة الماجستير
في الدرسات المعماريه التصميميه

كلية الهندسه – جامعة القاهره

الجيزه – جمهورية مصر العربيه

2011

دراسة لتحويل المدارس الثانوي إلى مدارس مستدامه

محمد أسامه محمد رسمي

رساله مقدمه إلى
كلية الهندسه – جامعة القاهره
للحصول على درجة الماجستير
في الدرسات المعماريه التصميميه

إشراف

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أستاذة العماره
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كلية الهندسه – جامعة القاهره

الجيزه – جمهورية مصر العربيه

2011

دراسة لتحويل المدارس الثانوي إلى مدارس مستدامه

Transformation of Traditional Secondary Schools to Sustainable Educational Building

م/ محمد أسامه محمد رسمي

دراسه مقدمه

لكلية الهندسه – جامعة القاهره

للحصول على درجة الماجستير

في التصميم المعماري

لجنة الاشراف و الممتحنين

أ.د. محمد مدحت حسن دره	**مشرف رئيسي**
أ.د. زينب يوسف شفيق	**مشرف**
أ.د. خالد محمد راغب دويدار	**ممتحن**
أ.د. رويدا محمد رضا كامل	**ممتحن**

مهنـــــــــــدس: محمد أسامه محمد رسمي

تاريـخ الميـــلاد: 12/4/1980

الجنسيـــــــــة: مصري

تاريخ التسجيل: 1/ 10 /2003

تـــاريخ المنـــح: / /

القســـــــــــم: الهندسة المعمارية

الدرجـــــــــة: ماجستير

المشرفون : أ.د. محمد مدحت حسن درة أستاذ العمارهبجامعة القاهره

أ.د. زينب يوسف شفيق أستاذ العماره بجامعة القاهره

الممتحنـــــون : أ.د.خالد محمد راغب دويدار أستاذ العماره بجامعة عين شمس

أ.د. روايدا رضا كامل أستاذ العماره بجامعة القاهره

أ.د. محمد مدحت حسن درة أستاذ العماره بجامعة القاهره

أ.د. زينب يوسف شفيق أستاذ العماره بجامعة القاهره

عنـــوان الرسالـة : **دراسة لتحويل المدارس الثانوي إلى مدارس مستدامه**

الكلمات الدالة : **الأستدامه في المدارس الثانوي**

ملخـــص البحـــث :

يعتبر التعليم هو مقياس الحضاره و التقدم للأمم و لقد كانت مصر في الفترة الاخيره تعاني من مشكلات كثيره في مجال التعليم مما جعل تطوير تصميم المباني التعليميه من أول الاهتمامات التي يجب علينا دراستها و حل مشكلاتها لنبدأ التطوير و لنبدأ أولى خطوات النهضه التعليميه. و من خلال الدراسه للمباني العالميه وجد أن المدارس المستدامه هي أنجح نموذج لتطوير المباني التعليميه و هي النموذج العالمي لتطوير المدارس و المجتمع معا و هي ما نحتاجه في مصر تطوير المدارس و تفعيلها مع المجتمع لتؤثر على الطالب و المجتمع من حوله لتبدأ أولى خطوات التقدم و الحضاره.

المدارس المستدامه :إختلفت الاراء حول المدارس المستدامه في العالم هل هي المدرسه الخضراء ام هي المبني التعليمي الذي يخدم المجتمع أم هي المدرسه التي تعمل بكفاءه أم هي المدرسه الموفره للطاقه ولكنها مدارس تحترم المستقبل وتساعد على التقدم و الحضاره للعالم دون إخلال بالتوازون البيئي بعد تشغيل المبنى.

و من خلال الدراسه تمت دراسة المدارس المستدامه العالميه و تطبيقاتها من خلال CABE &LEED

و كيفية إنعكاس ذلك على المدارس في مصر و لقد تمت دراسه تغيير مدرستي السعيديه و إمبابه الثانويه لجعلهم مدارس مستدامه لتلائم موقعهم الحالي و جعلهم يتفاعلوا مع المجتمع وذلك لتطوير العمليه التعليميه و النهوض بالمجتمع المصري من خلال تفعيل المدرسه مع المنطقه حيث يتم تصميم مكتبه مركزيه و قاعات إجتماعات و معامل كمبيوتر و ملاعب يمكن إستغلالها أثناء و بعد ساعات المدرسه مما يوفر الأنشطه للمجتمع و الطلاب ويساعد على تنمية المجتمع.

بسم الله الرحمن الرحيم

توكلت على الله

و به نستعين

لا إله إلا أنت سبحانك إني كنت من الظالمين

الباحث

محمد أسامه رسمي

مهندس معماري بشركة دار الهندسه

خريج كلية الهندسه

جامعة القاهره- ٢٠٠٣

دراسه لتحويل المدارس الثانوي إلى مدارس مستدامه

الباب الأول :المشكله البحثيه

يعتبر التعليم هو مقياس الحضاره و التقدم للأمم و كلما كانت الشعوب متعلمه كلما زاد تقدم الحضاره و الأقتصاد لتلك الأمه ، لذلك تطوير التعليم هو تطوير للحضاره و بداية التقدم ، و لقد كانت مصر في الفترة الاخيره تعاني من مشكلات كثيره في مجال التعليم وعدم جودة العمليه التعليميه وقلة خبرة الخريجين وعدم كفاءتهم لسوق العمل و أنتشار البطالة و الاميه و الكثير من المشكلات ، أدت لتأخر مصر عن الركب العالمي و التقدم الحضاري ، مما جعل تطوير العمليه التعليميه من أول الاهتمامات التي يجب علينا دراستها و حل مشكلاتها لنبدأ التطوير و لنبدأ أولى خطوات النهضه التعليميه. و من أكبر المشكلات للعمليه التعليميه هي المبنى التعليمي الذي يعتبر من أهم الأشياء التي تحتاج إلى تطوير و معالجات تساعد على تشغيله بكفاءه و إيجابيه لتطوير العمليه التعليميه.

و لقد تمت دراسة المباني التعليميه في مصر و كانت المباني الصالحه للعمليه التعليميه حوالي ٣٥% فقط من جملة المباني الدرسيه الحكوميه بينما ٨١% من المباني التعليميه الخاصه صالحه للعمليه التعليميه.

و من خلال الدراسه للمباني العالميه وجد أن المدارس المستدامه هي أنجح نموذج لتطوير المباني التعليميه و هي النموذج العالمي لتطوير المدارس و المجتمع معا و هي ما نحتاجه في مصر تطوير المدارس و تفعيلها مع المجتمع لتؤثر على الطالب و المجتمع من حوله لتبدأ أولى خطوات التقدم و الحضاره.

الباب الثاني: المدارس المستدامه

أختلفت الاراء حول المدارس المستدامه في العالم هل هي المدرسه الخضراء ام هي المبني التعليمي الذي يخدم المجتمع أم هي المدرسه التي تعمل بكفاءه أم هي الدرسه الموفره للطاقه و كانت إجتماعات و مؤتمرات في جميع أنحاء العالم لتعريف الأستدامه ولكن الجميع أتفق على أنها مباني تحترم المستقبل وتساعد على التقدم

و الحضاره للعالم دون إخلال بالتوازون البيئي بعد تشغيل المبنى. و من خلال الدراسه تمت دراسة المدارس المستدامه و معرفة تأثير تطبيق الأستدامه على كل نقطه من نقاط الأستدامه وهي :

٢-١ الأستدامه التصميميه: و هي من خلال معرفة كيفية تشغيل المبنى من خلال العلاقات التصميميه و المسارات و الفراغات التعليمه وكيفية تشغيل المدرسه بكفاءه للطلاب و المدرسين من خلال الفصول و المعامل و الأنشطه.

٢-٢الأستدامه في الطاقه: و هي كيفية إستخدام الموارد الطبيعيه من شمس و رياح في توليد كهرباء و تسخين مياه للمدرسه ، و المعالجات البيئيه للمدرسه عندما تكون في فصل الصيف أو الشتاء ، و لقد بدأت ظهور المدارس الموفره للطاقه و التي مثلما تستهلك طاقة المدرسه فهي تنتج هذه الطاقه فتكون بذلك مدرسه محصله الطاقه فيها صفر.

و إن مصر لديها موارد طاقه متعدده من شمس و هوارء و رياح كل ذلك يساعد على توفير الطاقه في المدارس المصريه و إنتاج طاقه نظيفه للمدرسه و للأماكن المحيطه.

٢-٣الأستدامه في المجتمع: من خلال تشغيل المدرسه في الأوقات بعد الدراسه أو في الاجازات من خلال جعل مطعم المدرسه يعمل ليلا للمجتمع و المعامل الكمبيوتر و المكتبه تعمل للمجتمع من خلال دورات تدريبيه و خلافه ، و ايضا يمكن للمدرسه ان تعمل كمتحف لتعليم الطلاب أو بها فرغات تساعد على تطوير العلاقات الأجتماعيه بين الطلاب.

٢-٤الأستدامه في المواد: من خلال إعادة إستخدام المواد التي لا نحتاجها مره أخري و أيضا توفير مواد البناء و إستخدام المواد الطبيعيه المحيطه بالمدرسه.

٢ -٥إدارة المياه: و هي كيفية توفير مياه المبنى و إعادة تشغيل المياه الضائعه من حمامات السباحه و مياة الأمطار في ري الزرع و الملاعب ، وكيفية الاستفادة من مياه البحار. وذلك سهل تطبيقه في مصر في الأماكن الساحيليه مثل الأسكندريه و المدن الساحيليه المصريه.

الباب الثالث: معاملات تطبيق التصميم المستدام في المدارس

ولقد تم في البحث دراسة تطبيق الاستدامه من خلال دراسات تمت في إنجلترا من جماعة التصميم و التخطيط CABE و من خلال تطبيقاتهم لمباني تعليميه متعدده و لقد تمت قياسات المباني التعليميه على ١٠ نقاط عند تطبيقها تجعل المدرسه مستدامه و تعمل بكفاءه تصميميه في جميع الأتجاهات. ومن خلال الدراسه تمت تطبيق هذه النقاط لمعرفة كيفية تطبيقها على مدارس قديمه و كيفية تطويرها و LEED مدارس جديده بنيت من الأساس مستدامه.

و يتم تطبيق الأستدامه في الولايات المتحده الأمريكيه من خلال قياس ال LEEDو ذلك من خلال محاولة تحقيق عدد من النقاط يجعل المدرسه مستدامه.

الباب الرابع: دراسة الحاله لنماذج مدارس مستدامه عالميه

من خلال الدراسه تم تحليل ثلاث نماذج لمدارس عالميه واحده تم تطبيقها عن طريق CABE و المدرستين الأخرتين هما مدارس مستدامه بالولايات المتحده الأمريكيه و هما مدارس حاصله على الLEED و لقد تم تطبيق ال١٠ نقاط منCABE لمعرفة كيفية تطبيق الأستدامه وللأستفاده من نقاط نجاح المدرسه عند تصميم مدارس جديده و كيفية التفكير في التصميم المبدئي للمدارس المستدامه.

الباب الخامس: تطبيق الأستدامه على المدارس الثانوي في مصر

إن المدارس المستدامه ليست بجديده في مصر فالمباني الفرعونيه و المساجد الاسلاميه كانت مدارس مستدامه تساعد في المجتمع و تقوم بدورها التعليمي و لكننا في العصر الحديث نحتاج لتطبيق الأستدامه على حسب متطلبات العصر و تطبيقها بما يلائم الوقت الحالي و المستقبل.

و لقد تمت دراسه تغيير مدرستي السعيديه و إمبابه الثانويه لجعلهم مدارس مستدامه لتلائم موقعهم الحالي و جعلهم يتفاعلوا مع المجتمع.

مدرسة السعيديه : تمت دراسة إدخال الجانيب الأستثماري للمدرسه لجاب موارد دخل تساعد على تطوير العمليه التعليميه و المعامل و ذلك منخلال حل مشكلات الموقع و توفير خدمات له تساعد على تغيير و تطوير المجتمع، مثل توفير معارض و مكتبه و ساحه ثقافيه لجذب الطلاب المحيطين من الجامعات المختلفه للقراءه و الجلوس في مكان هادىء و ثقافي يساعد على القراءه و الاطلاع مما يكون موقع جيد يحفز على زيادة الأطلاع و الثقافه ، و أستخدام معامل الكمبيوتر و المعارض في أوقات غير الدراسه للطلاب الجامعيين و المجتمع لأخذ الدورات التدريبيه و إستخدام الملاعب في غير وقت الدراسه.

و تمت تطبيق ١٠نقاط CABEعلى المدرسه مما جعلنا من خلال الدراسه أن يكون المباني مرتبطه كلها بمسارات داخليه و توفير أماكن للتعليم المفتوح.

مدرسة إمبابه: تم تطبيق فيها إضافة لما سبق مركز حرفي و قاعات ندوات ثقافيه و مكتبه مركزيه لسكان المنطقه مما يساعدهم على وجود فرص عمل بدلا من تضييع الأوقات فيما لايفيد ومحو أمية الكثير من السكان.

و أيضا تمت أضافة ملاعب كثيره مخططه للمدرسه نظرا لعدم توافر أنديه رياضيه و يوجد مركز شباب واحد فقط و لذلك كانت الساحات المركزيه الملاعب بديل جيد لممارسة المجتمع الرياضه داخل المدرسه.

و بذلك يمكننا تطبيق المدارس المستدامه في مصر و تشغيلها بما يخدم المجتمع مما يخلق بيئه حضاريه تساعد على إعادة التنميه و الحضارة المصريه لسابق عهدها.

الباب السادس: الخلاصه و التوصيات

من خلال البحث تمت دارسة المدارس المستدامه و كيفية تطبيقها في العالم و كيفية الأستفاده من ذلك لتطبيق هذه النماذج في مصر و يمكننا تطبيق ذلك معماريا وهندسيا بعد دراسة الموارد المحيطه و كيفية أستغلالها و إدارة ذلك لصالح المدرسه و المجتمع و سكان المنطقه، لتكون بذلك مدارس مستدامه.