مفهوم البيئات المستدامة في دولة الامارات العربية المتحدة

The concept of Sustainable Environments in the UAE

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على مدى العقد الماضي، ونتيجة للنمو السريع في المجالات الاقتصادية والسكانية الذي ترافق مع نضوب موارد الطاقة مما أدى إلى آثار خطيرة على البيئة والإنسانية. هذا التطور مقرونا بوجود المنشآت النشطة، التي تتجاهل في بعض الاحيان تأثيرها السلبي على البيئة والأنشطة البشرية. لذلك، قد يستوجب وجود مبدأ الاستدامة من أجل الحد من هذا التأثير السلبي على البيئة والإنسانية.

في البلدان النامية، يبدو أن هناك فجوة كبيرة بين ممارسات البناء الحالية ومبدأ المستدام، التي تحتاج إلى المزيد من الاهتمام لتوضيح وتحديد المشاكل من أجل إيجاد الحلول المناسبة قبل أن تحصل مشاكل أكثر صعوبة وأكثر تكلفة. وتهدف هذه الدراسة إلى اختيار واحد من البلدان النامية وتحليل موقفها الحالي من حيث استدامة البناء من خلال جمع وتحليل البيانات عن ممارسات البناء. والغرض من هذه الدراسة هو تحديد وتسليط الضوء على المشاكل الرئيسية من أجل تقييم الوضع الحالي واقتراح الحلول الممكنة.

تم تصميم البحث من أجل جمع البيانات من الخبراء الذين يشاركون في مشاريع الإنشاءات مثل المهندسين المعماريين والمهندسين المدنيين والمهندسين الميكانيكيين والكهربائيين ومصممي الديكور الداخلي. فتم عمل استبيان تظهر فيه نقاط القوة والضعف من أجل توضيح الممارسات الحالية في مجال الاستدامة والأداء في المنشآت.

ونتيجة بينات البحث المستخلصة من الخبراء ادت لتسليط الضوء على مدى أهمية ملاءمة البناء في الإمارات العربية المتحدة و التعرف على مشاكلها، والحد من العقبات، ومحاولة لتحفيز الحلول والبدائل لتحسين الوضع الحالي، علاوة على ذلك للتأكد من أن التنفيذ سيكون تحقيق مبدئ الاستدامة في المستقبل

Abstract:

Over last decade, rapid growth in economic and population accompanied with depletion of the energy resources lead to serious impacts on environment and humanity. This development coupled with active constructions, which in some examples ignore the impact on the environment and human activities. Therefore, principle of sustainability has required in order to reducing this negative impact on the environment and the humanity.

In developing countries, it seems that there is a huge gap between the current construction practices and sustainable principle, which need more attention to clarify and define the problems in order to find suitable solutions before it comes more difficult and expensive.

The study aims to choose one of the developing countries and analyze its current standing in terms of building sustainability and performance through collecting and analyzing data on construction practices. The purpose of the study is to identify and highlight the main problems in order to evaluate the current situation and propose the possible solutions.

A survey have been designed in order to collect data from experts who are involved in constructions projects such as architects, civil engineers, mechanical engineers, electrical and interior designers. A questionnaire will show the strong and feeble points in order to clarify the current practices in terms of sustainability and performance in constructions.

The result of the data lead to highlight the significant important of suitability and buildings performance issues in U.A.E to recognize the problems, reduce the obstacles, and try to stimulated solutions and alternatives to improve the current situation, furthermore to be sure that sustainability implementation will be achieved in future .

١.Introduction

١,١ Background

The most significant event for humanity when the industrial revolution has been started in the ١٨th century in England and then it has passed to the other parts of the world. From England it was transfer to Belgium which become the first country in Europe transformed economically just like the great England ,Belgium industrial revolution concentrated in iron ,textiles and coal.After that, France had been involved in industrial power in ١٨٤٨,while Germany was achieved the industrail line after the nation unity .

There are many evidence for existence of a new industrial revolution in the late ١٩th and ٢٠th centuries which known as “modern industry” . the second revolution has begun to exploit new energy sources,many natural materials and synthetic resources and products such as plastic. In addition, the improvements in machines and

computers have been lead to the automatic operation factories, which have been achieved in the second half of the ٢٠th century (Britannica online)

Major changes in economic have been occur which is associated with the development in non - industrial spheres. The developments are including, international trade, agricultural in order to provide food for non-agricultural population, society, political, cultural. Industrial factories drew many workers from their traditional communities (countryside) to increasing the centralized cities. This population displacement has coupled with the normal growth of population.

For first time, large number of people lived in crowded urban environment. Many researchers in Britain, Europe continental, and America are worried about the rapid growth of industrial city. In fact, these crowded cities are requiring new advances technological such as, electricity, roads, streetlights, paving, modern plumbing, transportation, constructions, and other infrastructures. Mega cities with more than million people are unknown before ١٨٠٠ when London achieved this level of population. Meanwhile the improvements and the affluence in these countries are creating the developed countries while the non –industrial countries remain as developing one. (Wheeler & Beatley ٢٠٠٩)

Overexploited for natural resources becomes as consequences of population booming and economic growth, in the same time the mega cities has suffered from pollution as impact of industrialization. When the cities have mega scale the construction industries have begun to take place and expand. In late twentieth century these cities experienced enormous problems due to public health, in other words, the balance between the natural environment and the human had been tripped too far in one direction.

Early twentieth century the deterioration of urban condition need to draw attention globally ,the professions of city planning, architects ,landscape designers, are worried about the expansion of the industrial cities. (Wheeler & Beatley ٢٠٠٩)

The rapid growth in economic and population associated with the sprawl of the cities and the affluence of the industrialization to distributed several kind of pollution such as air pollutions,water pollutions, in addition to the changing in climate, health problems,sick cities,depletion of the resources, natural hazardous.

In Stockholm ١٩٧١ U.N conference, a big question discussed, who was more important in industrial nations, is it the economic development, or environment protection? This was the time when environmental issues begun to explode in scene. The United Nation appoint the Brundtland commission in order to suggest and identify strategies for improving the human welfare without damaging the environment, the report published in ١٩٨٧ which was containing the sustainability definition that still used till now "The needs of present without compromising the ability of future generation to meet their own needs". In ١٩٩٢, these principles were backdrop in Rio Earth Summit, the major concern in economic and environmental issues was the sustainability in addition to other topics such as poverty, peace. These classic archives are very important to recognize the sustainability development in the world. (Blackburn ٢٠٠٧)

The Kyoto Protocol adopted in ١٩٩٧ and implemented in on February ٢٠٠٥, which address the global warming and stabilization of greenhouse gases as major issues by UNFCCC (United Nation Framework Convention on Climate Change). A consequence of these sustainability development, in November ٢٠٠٩ ١٨٧ states have signed and ratified the protocol including the United Arab Emirates which was ratify the protocol on ٢٦ January ٢٠٠٥.(Salama & Hana ٢٠١٠)

U.A.E one of the Gulf countries in the Middle East , having bordered with Arabian Gulf from the north, Saudi Arabia from the south and Oman from the east. U.A.E consist seven emirates, Abu Dhabi, Dubai, Sharjah, Ajman, Um Quwain, Ras Al khaimah, Fujairah ,all of them come together as one state in the second of December ١٩٧١. The federal capital of U.A.E is Abu Dhabi, which is the largest emirate while Ajman is the smallest one. U.A.E occupied total geographical area about ٨٣،٦٠٠ sq km which most of it covered by desert, mounting, and coral reefs.

The unique location associated with natural resource such as Oil, rich natural gas, fishing, pearling to created the significant importance for U.A.E. since the discover of oil which exploited in ١٩٦٠, U.A.E became an open economy with high per capita income. It has transfer form an impoverish region of small desert to a modern state with high level of lifestyle. Further U.A.E becomes the center of business,

trading, banking, financial services, and tourism for the Gulf countries and for the entire world. (Carter,T. ٢٠٠٦)

In Europe, over ٤٠٪ of energy consumption has related to building industry, ٥٠٪ of natural resources have used as a materials related to constructions sector, ٥٠٪ of national waste produced by building field. In fact, these percentages are even higher in U.A.E in way that it should be attract more attention from the government. In order to align the construction sector with sustainability development approach, the major attention should direct towards establishing a new regulation in addition to sustainable guideline (AboulNaga & Elshehtawy ٢٠٠١)

١,٢ Aim of the study

The study aims to examining the current practices and their impact on the environment, in addition to the significant challenges that may face these practices in construction sector in terms of building performance. The study will investigate the level of sustainable implementation in U.A.E especially in Dubai, Abu Dhabi, Sharjah, and Ajman, which witnessed huge constructions projects. This data will help to assess the buildings performance in U.A.E and highlighted the main obstacles to achieve sustainability.

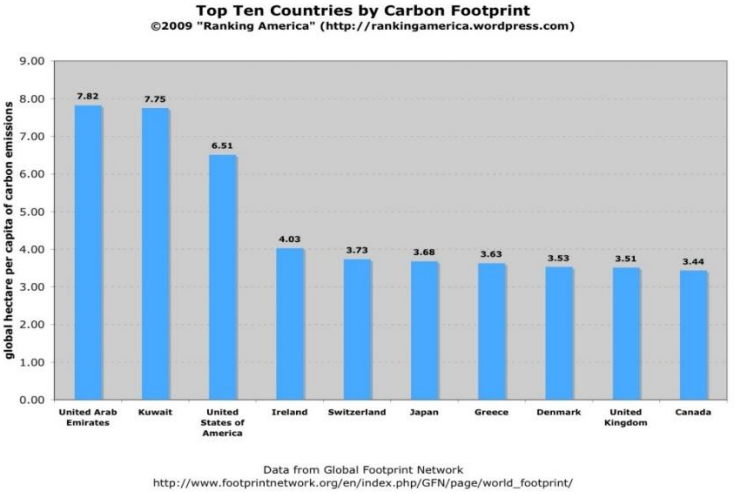
١,٣ Motivation

U.A.E is a developing country that represents a motivating case study because of the rapid growth in economic and the booming in construction projects. In addition, U.A.E has listed as the largest ecological footprint according to LIVING PLANT REPORT ٢٠٠٨, which gives the U.A.E the higher rate for Carbon footprint (Carbon emission) globally as shown in figure ١,٣,١

In country like U.A.E, it will be a major challenge to recognize the current practices because U.A.E has achieved a huge improvement in all aspects of life, including finance, aviation, port facilities, tourism, telecommunication, this development normally will associated with explosion in building constructions . The constructions industry is the major support for the economic growth in U.A.E, which has witness many mega construction projects. These practices will need more attention to directed towards establishing sustainable guideline and new regulation for practitioners.

Figure ١,٣,١ shows the U.A.E as the biggest footprint in the world

٢. Methodology



In order to evaluate the sustainability practices in U.A.E, a survey structured to look in the following key area:

- The level of sustainable implementation in current practices in constructions sectors.
- The challenges that facing the sustainability achievement in construction industry.

The questionnaire distributed to a ٤٠ random samples of practitioners including , architects,engineers,projects managers, health and safety environment,finance and other professionals. A total of ٢٥ response were received which presents around ٦٣٪ while the rest have been neglected. In fact ٤ of the response is uncompleted which could not be under consideration .However the ٢١ responds were not satisfied to the researcher but it were enough to provide outline for investigate the data.In fact the research should depend on the reality not on the assumption.

The survey contains three major sections, the first one investigated information about the participants while the second sector including questions that addressing the level of the involvement in sustainability practices and the sustainable awareness of the practitioners. The third section highlighted the major challenges that facing the sustainability achievement.

٢,١ Participant profile:

This part of the survey focuses on the gender ,the job classification,company type. In addition the period time and the location of the experiences in U.A.E in order to comparing between the level of sustainability implementation from emirate to another. Meanwhile the participant's nationality and company's profile as (international or local) can comparing the variety of the sustainability knowledge

٢,٢. current practices:

This section designed to achieve full concept about the current practices of construction in order address the awareness of the participants and the level of sustainability update in the context of United Arab Emirates. It contains ٢٠ questions with multiple choices ranging from always (which mean maximum score) till I don't know (which mean lack of awareness)

The table below shows the scoring system from ٥- ١ to give the participant answers levels of score for example the choose of always scored ٥ which is the maximum for measuring the sustainability levels while "don't know scored ٠ which means breakdown in understanding and knowledge about sustainability.

Always	Almost Always	Somtimes	Almost Never	Never	Don't know
٥	٤	٣	٢	١	٠

Table ٢,٢,١ explain the scoring system

In order to evaluate the Sustainability achievement The questions covered the following key area :

- The integrated design
- The flexibility in design

- Passive design
- The use of renewable energy,
- The building lifespan,
- The used of local materials
- The awareness and knowledge of sustainability

٢,٣ Challegnes

The last section of the survey highlighted the challenges which facing the sustainability in U.A.E context, it contains ١٠ statements with multiple choices ranging from (strongly agree, moderate agree,undecided,moderately disagree, strongly disagree and don't know).The choices of strongly agree scored ٥ while don't know scored ٠ which measuring the misunderstanding and lack of awareness about the questionnaire

To identify the challenges this section covered the following aspects:

- The lack of knowledge about sustainability principles
- The comparison between performance and the rapid benefit of the building.
- The lack of professionals and skilled workers.
- The lack of education in the public sector and the academic institutions.
- The absents of recycling and reused principles.

When the results are classified and then it analysed according to the main aspects which are the professionals background and experiences, the current practices according to building efficiency,design integration and sustainability awareness of staff and public. The challenges analysed in term of building performance and lifestyle .Once these analysis complete , obstacles becomes very clear and increase the level fo ability to achieve solutions.

٣. Results and Discussion

As mentioned before, ٢١ response considered which represents ٥٢٪ of total number survey's distribution. Number of respondents are not satisfying but the percentage provide outline for the main purpose of the study.

٣,١ Participant profile:

The result from this section including the number of male and female, as shown in figure ٣,١.١ that the ٨٦٪ of the participants from male while the rest from female. Its very clear that the sector of construction running by the male decisions.

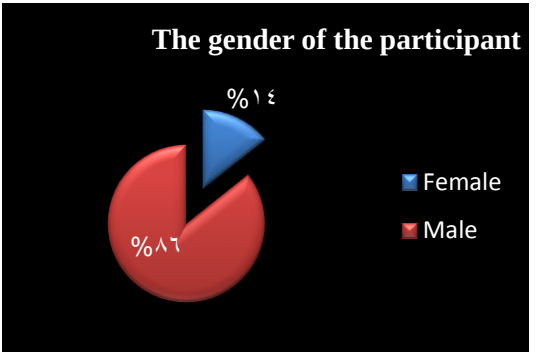
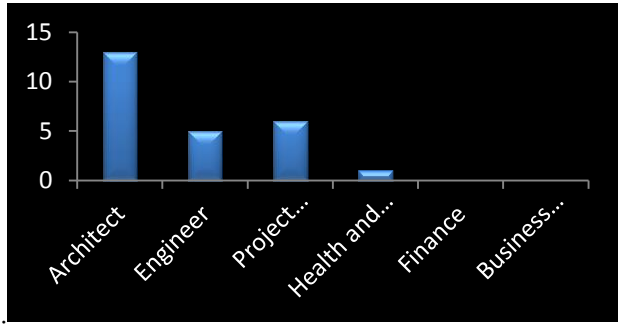


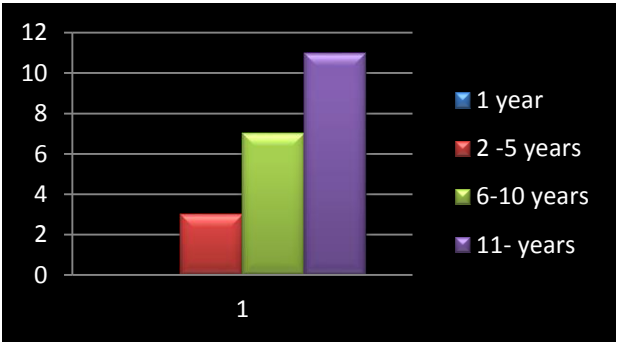
Figure ٣,١.١ shows the percentate of male and female of the participant profile and shows the majority of experiences location

Building have a direct impact on the environment through the construction process or during the used period. Its absolutely that environmental issues are tackled right from the design. (AboulNaga & Elshehtawy ٢٠٠١).

Most of participants are architects ٦٢٪ while the less one is the health and safety environment which presents ٤٪ from the total as shown in figure ٣.١.٢, Its absolutely clear that the professionals who support the environmental issues are very limited in spite of the architects have big part of the responsibilty to achieved sustainability in design phase but it is vitally important to linked and integrated between all the staff of the construction projects.



Figue ٣.١.٢ shows the domination of the architects for the participants.



The information about experiences gives indication about the period of time that participant spend it in construction sector in U.A.E, as clear from the figure ٣,٣ that most participant have more than ١٠ years in U.A.E which represents ٥٣٪ of the total. While the range from ٢-٥ years have the less percentage ١٤%, it is very clear the last ١٠ years witnessed the rapid growth in construction, which attracted many people to have their opportunity to have jobs in U.A.E while the financial crises in ٢٠٠٨ affect the rate of constructions, which reduce the number of labor. This will have disadvantages that the level of experience construction sector has been improved during the last ١٠ years. In the other hand the mix of nationality have advantage and disadvantage because it could be strong point as a background experiences and feeble point because sometime this background not matching the U.A.E climate and culture. As shown in figure ٣.١.٤ that the major nationality in construction field is the Middle east ٣٨٪ from the total, which including Iraq,Egypt,Lebanon,Syria, Jordan and others.

Figure ٣,١,٣ shows the experiences period in U.A.E

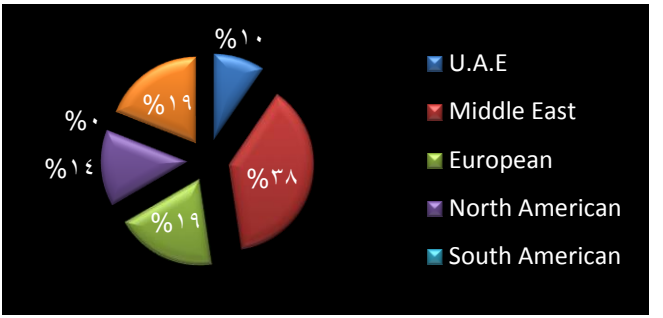


Figure ٣.١.٤ shows the mix of nationality in construction sector in U.A.E

In fact, this variety in nationality provide the construction sector with different background this becomes as disadvantage especially in terms of design rhythm which sometimes directed away form the local climate and the culture value .while it becomes an advantage when it provide the city with unique design such as the tallest building in the world (Burj khalifa) or (Burj Al Arab) which is the most luxury hotel in the world ,these icon buidings attracted the toursim and placed U.A.E as one of the most important architectural city in the world.

As shows in figure ٣,٥ its clear that majority of experiences are located in Dubai ٥٧٪ and then Abu Dhabi ٢٩٪ , Ajman ١٤٪ while the other emirates totally neglected, this represents an evidance that the constuction in Abu Dhabi deliberate and planned with slowly rythem than Dubai.

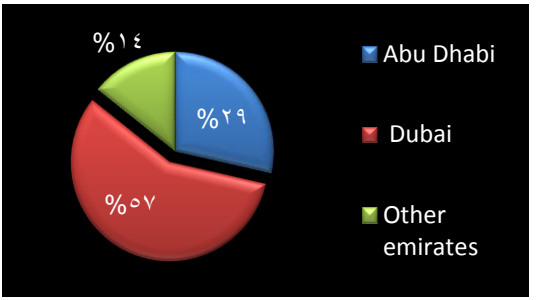


Figure ٣.١.٥ shows the experiences locations in U.A.E

٣,٢ Current Construction practices

As known that the projects going through stages to be ready for occupants, these stages classified to three major area :design phase, construction phase and occupancy evaluation. Each one of these stages should integrated with the two others in order to achieved the building performance and sustainability. Sustainability achievement required to involved with,Ecologists (concern about preserving the natural system) ,Economists (which deal with the growth efficiency and the uses of resources),Sociologists (which focuses on human needs and culture identify) (Wright.R٢٠٠٨)

Totally ٦٥٪ of the question in this section investigate about the desing phase in order to highlight the significant important of the sustainability to be achieved from the begining of the project. One of the general question about the ability to achieved sustainability in design have ٤٨٪ of the answers are(sometime)which mean that the principle of the sustainability may consider or not while the ٢٠٪ of the answers are (almost never) that gives full image about the current practices in U.A.E in term of sustainability.

However the site assessment befor the design is a major step wheather through the softwar evaluation analysis,the answar of this question ٥٢% (somtime) while the ٣٣% of the answers (almost alwayas). Its very clear from these prcentages that site evaluation not basic requirment in current pracitces while in fact it should be.

As the building the main consumption of energy through operating of cooling,heating and lighting , the question about the used of renewable energy such as solar panel, photovoltaic,wind turbine..) ٤٧٪ of the total answers are (sometime) while the ٢٩٪ of the answers are (never) and ١٩٪ (almost never) this result analysis as it begun to take place in the current practices but not widely because of the absence of motivation and encouragement from the government.

In spite of the lack of energy in some of the emirates such as Ajman and Sharjah which both of them suffering from this problem but still no forced regulations to use alternative renewable energy in order to find solution.

Hence, the building consumes energy resources, materials, so the design and the constructed should increase operating efficiency, durability and reduce the energy resources(AboulNaga & Elshehtawy ٢٠٠١). The durability means the increase of

the lifespan and evaluated the cost of maintenances during the design phase,the question about the consideration of lifespan for the building,٣٨٪ of the total answers are (almost always) while ٢٠٪ are (always) and ٩٪ (sometimes) ,that gives indication that the durability of the buildings considered in current practices in U.A.E which provide opportunity to reduce the energy and materials used to achieved sustainability .Meanwhile the question about evaluated the cost of maintenances during the design phase, the answers coming ٥٣٪ (almost always) and ٢٤٪ (always) this situation gives an evidence that maintenance of the building consider in current practices in U.A.E .

The culture value one of the important componants of sustainability as it means the rspect of human needs and requirment and the cultural background,as the question about the considered of local cultur value in project design .The answers are ٣٥٪ (sometimes) while ٢٩٪ (almost always) and ١٩٪ (always) these data give evidence that not all the time the culture value considered in current practices because many of the architect and designers belong to another societies and different background. This is exactly what cause the loss of identity.

During the last years U.A.E witnessed an improvement of awareness of sustainability which still need further enhancement in order creat sustainable culture .the main part of the lifestyle depend on culture knowledge and education. The question about the ability of provide funding in order to support researches on environment and sustainability issues,the answers are ٤٪ (always), ٩٪ (almost always), ٢٩٪ (sometimes) and ٣٤٪ (never), its very clear that the funding of researches very limited and unregulated by the gevernment. other question about the education is about the offering of sustainability training or courses for employees of the companies,the answers are ٢٣٪ (sometime) ,٢٨٪ (almost never) and ٣٤٪ (never) these data shows the lack of sustainability knowledge in the professionals field but many organization and academic institutions begun to manage courses and conferences such as Ajman Univesity in order to improve the professionals awareness.

٣,٣ The challenges

The result of the challenges ranging between (strongly agree) and (moderately agree) .٦٢٪ fo the total choices are (sotrongly agree) that in developing countries the lack of sustainability knowledge lead to the absence of sustainable design.٤٩٪ of the total participants (strongly agree) that the intial cost of sustainability might turn people away form it without consider the saving during the project's operating, while ٣٨٪ (moderately agree)

Meanwhile,٣٤٪ of the total choices (strongly agree) with the lack of skilled professionals lead to reduce the sustainability practices while ٢٤٪ (moderately agree). ٩٪ (strongly agree) about the rapid rhythem of constructions in U.A.E minimize the ability of evaluated the building performance .٢٤٪ (strongly agree) and ٢٣٪ (strongly disagree) that the lifestyle of U.A.E limited the ability of used recycling or reused materials. ٢٠٪ (strongly agree) ٤٣٪ (moderately agree) about the prefering the profit from the building rather that the building performance. ٤٨٪ (strongly agree) and ٤٢٪ (moderately agree) about the significant important of public involvement in sustainable projects in order to create sense of responsibility towards their environment. ٢٠٪ (strongly agree) and ٤٣٪ (moderately agree) about the lack of local manufacturing materials in the market reduce the used of materials that suitable for U.A.E climate. ٢٩٪ (strongly agree) while ٣٨٪ (moderately agree) about the missing data from the monitoring and reporting for occupied buildings lead to absence of rating system for constructions in U.A.E .

According to the result above, it's very clear that most of the participants recognize the challenges and considered the constraints which facing the sustainability achievement. This awareness about the o obstacles can be accounted as advantage because the first step in finding solutions is to recognize the problems first.

It seems that the next period of time will witness many improvement in adopting sustainability as a consequences of the knowledge improvements.

٣,٤ The impact on the sutainability and performance of building

The efficient design is the main component to measure sustainability , while energy used,population growth,resources efficiency and the waste are the others components. The improved in building performance leads automatically to achieved

sustainability . The failure in building performance will lead to change the direction away from the sustainability achievement.

One of the important factor to increase the ability of improving building performance is the site analysis whether by software analysis or by simulation methods to recognize the best orientation and how can be used to reduce energy or harness the site conditions to provid energy for instance the use of solar panels or photovoltaic in order to reduce energy consumption .It shows from the survey that ٥٢% of the vote going to sometime while ٥% choose never and ٣٣٪ choose almost always as shown in figure ٣,٤,١, normally this will effect the building performance in terms of ignore the indoor air quality which depend on natural ventilation. In the other hand it affects the achievement of sustainability by incresing the energy consumption and used of electricity though the cooling system.

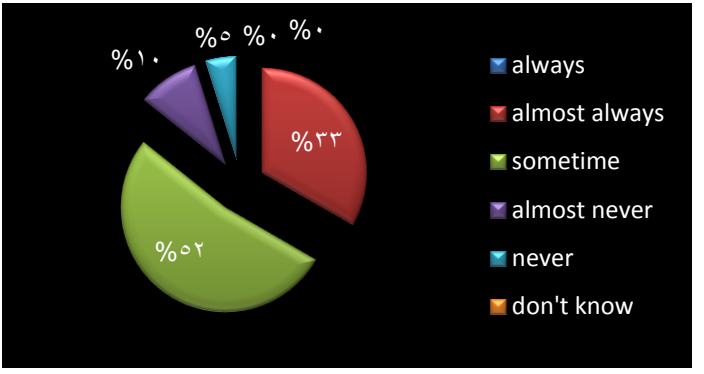
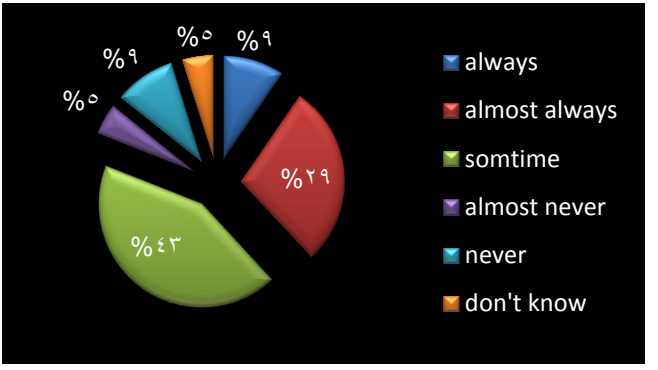


Figure ٣,٤,١ shows the percentage of site assessment

The best way to improve building performance is the used of integrated desing which means the inclusiveness efficiency, the integrated should be considerd in deign phase and implemented in constructions period and monitoring in operation time in order to achieve high level of efficiency. Meanwhile this integration include all the professionals who involved in desing, constructed,and operating the building .one of result analysis shows that the respond about the used of integrated desing in order to improve the building performance is ٤٣٪ of participants choose sometime while ٩٪ choose never and between them ٢٩٪ almost always. This result shows that the integration in desing not all the time part of the project proccessing,

for example if the design not consider the local climate, this will lead to reduce the mechanical system efficiency by over exceed the used of cooling system the energy consumption increased also. All these impacts related to each other ,as consequences the absence of integration design affect the building performance which impact the level of sustainability achievement.



.Figure ٣,٤,٢ shows the percentage of achieve integrated design

٤. Conclusion and recommendation

٤,١ Conclusion

Its definitely clear from the data collected and the result analysis that the current practices lacks of sustainability achievement associated with the financial crisis which lead to limit the abilitiy to improve level of building performance .On the other hand the positive side is the growing awareness of sustainability which absolutely lead to improve the future of sustainability achievement .In fact Emirates Green Building Council (EGBC) associated with Emirates Environment Group (EEG)are guiding the construction sector towards the sustainability achievement. EGBC was establish in July ٢٠٠٦ and become a member of the World Green Building Council in the same year , meanwhile U.A.E becomes the ٨ th country in the world to establish such a council.

The study conclude that the lack of professionals which lead to weaken the level of building performance especially during the desing phase.

One of the important conclusion that the architects are leading the constructions sector through the desing or the constructed period, usually the architect have low

awareness about the mechanisms and systems which reduce the ability of improve the performance of the building (as shows in figure ٣,١,٢)

٤,٢ Recommendation

As a result of the conclusion the main recommendation is to increase the awareness of sustainability in constructions sector and the academic field through course and conferences in order to be sure that the new generation of architects and engineers have background to support their practices.

The other major recommendation is to increase the regulations and managing the constructions sector. The aim of the regulations not only to manage the proccess of the buildings but to encourage the developer to utilize environmentally friendly technologies which protect the environment. Furthermore, using the motivation system to push the developer to find alternative of energy such as using solar panels. The principle of using the ٢ R which mean Recycled and Reused in order to be part of the lifestyle and culture knowledge.

Many project designed in U.A.E to be as guide for sustainability as Masdar City which created with limited Carbon emission which could be sample to educated the public and academic institution

Create organization such as Estidama that offer education and exam to authorize professionals staff in order to increas the awareness and regulate the construction sector. In addition the building rating system is very important to collect data from the occupied building by reporting and monitoring the building performance. This will create competition between the professionals to achieved the sustainability.

The government should support researches about sustainability and environmental issues which lead to improve the academic and construction fields. In addition to involve the public in sustainability activities to creat their responsibility about the enviornment

There are many advantages not mentioned, the major one is construction sector measures the level of country development and economic improvement .but it should be controle by regulation and organization.

Limitation

First limitation is the period of time very limited especially for the survey ,this study need to extend in order to increas the flow up of participants respond

The other limitation is unavailability of the data about sustainability in U.A.E because the lack of researches and limited data in the BUID library . Finally I hope that the study provide an academic research which could be completed to be as ar references to other researchers and students.

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