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On the Aesthetics of Sustainable Buildings in Hot-Arid Climate, the case of two LEED buildings in Cairo, Egypt and Las Vegas, US.

Osama El-Saeed Mansour
Assistant professor, Faculty of Engineering, Ain Shams University
Cairo, Egypt
oeamanso@gmail.com

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Abstract. As building design strongly moves to the realm of sustainability, one can argue that the aesthetics of most of rated sustainable buildings to day disregard some of the inherited building features that were originally inspired and valued by local cultures. Althoughthe design intents of vernacular buildings in the pastwere mostly similar to the design intents of green building design today, the vernacular designs achieved these objectives while aesthetically conforming to the social and cultural needs, andmaking image of buildings an important part of the cultural identity of the place. This raises some questions:does the extensive use of sophisticated engineering systems and systematic rating tools in green buildings today negatively affect the aesthetics of these structures? This article analyzes the aesthetics of two LEED buildings located in different locations with different inherited architectural context while they share the same hot arid climate conditions, BWhaccording to Koppen climate classification. The interior and exterior images of the buildings were analyzed in light of the inherited gestalt image of buildings across different locations in hot-arid climate. The analysis shows an insight on the visual aesthetics of sustainable buildings today from environmental and cultural perspectives.

Keywords*:* Sustainable Building, Green Design, LEED, Aesthetics, Gestalt Image, Hot-Arid Climate.

Introduction

In his analysis of sources of design, Orrbelieved that the green building movement is based on ecological patterns and the design wisdom of the previous 3.8 billion years. In some ways it reflects the intent of the earliest designers to mirror a large reality, but it is now grounded in the modern scientific study of natural systems and process of nature transposed to the built environment(Orr, 2006). Although this is always an essential part of building design, the complexity of engineering systems and construction techniques today affected the image of the outcome. “Green building” is a term encompassing strategies, techniques, and construction products that are less resource-intensive or pollution-producing than regular construction (Hoffman & Henn, 2008), these objectives imposed a widely adopted quantitative approach for designing and rating such types of buildings. Meanwhile, a revolutionary advancementin computer applications was another root of change. An abrupt conversion is deemed necessarily to the approaches of design and construction of buildings at this point in history. With this reform in architectural engineering field, architects and engineers contest the new dominant quantitative approach for design, construction and building performance evaluation of green buildings.

“LEED” Leadership in Energy and Environmental Design is a predominant example. By 2010,LEED certified and registered projects exceed thirty four thousand buildings. LEED promotes five environmental categories to building design, construction, operation and maintenance (USGBC, 2009). These categories are named as sustainable site, water efficiency, energy and atmosphere, indoor environmental quality, and materials and resources. As in LEED, the application of most green building rating systems

starts with some design intents set in each credit under each category (USGBC, 2009). These design intents are mostly targeting quantitative measures, which can be achieved by building energy modeling, site and material selection.

While LEED is vastly adopted with using cutting-edge technology of construction materials and engineering systems, one asks: Dothe green rated buildings consider the inherited image of environmental buildings in its location? Do the visual aesthetics of green building play a social or cultural role in the sustainability ofa built environment?

Aesthetics of buildings

Aesthetics have long been considered in the design community as an undetermined research area, where most of the time it is approached by the abstract notion of beauty, or by its correlation to usability issues (Norman, 2004). The concept of aesthetics in industrial design is often related to the nice looking shape of a product, a trendy color scheme, or a pleasant surface texture. It is also commonly viewed as a way to express a socio-cultural message, e.g., a specific lifestyle, through the use of form and material (Muller, 1997). An aesthetic experience invigorates and vitalizes us and thus helps us achieve the ends we pursue (Ross & G. Wensveen, 2010).

In the case of architectural design, these underlying concepts may include branding, imageability, ideas about community, and the importance of technology. Visual and non-visual aesthetics are inherent or personally developed responses to natural and architectural forms that are perceptually pleasant or unpleasant. Visual and spatial pattern, the kinesthetic movement of the body, texture, color, sound, aroma, warmth, coolness (Doxtater, 2005). Aesthetic responses are formed on the basis of intrinsic elements of the stimulus, and they encompass strong attention and involvement(Bloch, 1995; Lewalski, 1988; Veryzer, 1995).

There are few forms in architecture to which people do not attach some meanings either by way of convention, use, purpose, or value (Hershberger, 1969). The transmission of meaning through the architectural medium is essential to both the use and enjoyment of architecture (Hershberger, 1969). However the meaning is always pending upon many factors and variables,the components of meaning can be described as cognitive, motivational and affective (O'Connor & Chamberlain, 2000).

Inthe cognitive component, people interpret their experiences in life and develop understanding and beliefs. The motivational component includes values and goals as well as behaviors. Value systems dictate, which goals people choose. The pursuit and attainment of chosen goals leads to a sense of purpose. The affective component comprises the feelings of satisfaction and fulfillment people get from their experiences or from the achievement of their goals. These structural components are interrelated and common to people's experience of meaning (O'Connor & Chamberlain, 2000).

From a different perspective, there are authorswho refer to aesthetics as a discipline of visual perception, focusing mainly on the visual or physical properties, and the visual Gestalt of an object. Aesthetics are related to qualities that appear in the physical form in which the content and services of the design are presented. Thus, aesthetics could be an important determinant of user satisfaction and system acceptability (Hartmann, 2006).

Little research has been devoted to the aesthetics of green buildings. However, none of these trials examined the aesthetics of green buildings in light of the inherited image ofenvironmental buildings. In this article, this relationship is deemed important for keepingthe local identity of the place and sustaining local cultures,it is also important for keeping the core value of sustainability, which needsmore attention to social and cultural dimensions. Obstacles faced by the green building movement are no longer primarily technological and economic. Instead, they are social and psychological (Hoffman & Henn, 2008).

A culture without the presence of its history is a culture without roots and, very possibly, without meaning. The study of vernacular touches the well-springs of inheritance and points in many ways to technologically undamaging, culturally acceptable and symbolically significant buildings in compatible landscape environments(Oliver, 2006). The author's central claim in this article is that building technology has taken the control of shaping green buildings and ignored the gestalt image of the environmentally designed buildings, which has been long attached to the architecture in a hot-arid climate. This might disconnect people from feeling the harmony with life in the desert.

Visual Gestalt

The operational principle of Gestalt psychology is that the brain is holistic, parallel, and analog, with self-organizing tendencies. The principle maintains that the human eye sees objects in their entirety before perceiving their individual parts, suggesting the whole is greater than the sum of its parts. Further, the whole is anticipated when the parts are not integrated or complete.

Gestaltism is often opposed to structuralism. The gestalt image in this study meant to focus on the holistic image of a building instead of going to the structure of the image as fully elaborated lines and curves.

A gestalt is more than a pattern. It rather expresses what is common in a collection of patterns, what characterizes them. It makes relating these patterns to each other according to similarity criteria possible. (Breidbach & Jost, 2006).

Hot-arid Climate

In Koppen climate classification, desert climate isBWh and BWk, sometimes also BWn, also known as an arid climate. There are usually two or three variations of a desert climate: a hot desert climate BWh, a cold desert climate BWk and, sometimes, a mild desert climate BWh/BWn. Furthermore, to delineate "hot desert climates" from "cold desert climates", there are three widely used isotherms: either a mean annual temperature of 18°C, or a mean temperature of 0°C or -3°C in the coldest month, so that a location with a BW type climate with the appropriate temperature above whichever isotherm is being used is classified as "hot arid" BWh, and a location with the appropriate temperature below the given isotherm is classified as "cold arid" BWk.

In this article the discussion is a about buildings in hot-arid climateBWh. Two case studies have been selected to demonstrate the argument, one in Cairo Egypt, and another in in Las Vegas US.

Enviro-cultural dimensions andbuilding aesthetics inhot-arid climate

The relationship between environmentally designed buildings andcultural values of laypeoplehave been long thought as sustainable and strong in hot arid climate. By different civilizations and cultures lived in hot arid climate for hundreds of years, a featured gestalt image has been formed for the architecture to be an organic part of the desert. Examplesof such gestalt image will be analyzed in the next few paragraphs. Theimage of architecture in this analysis is linked to the cultures established in each location; thesecultures are the Mesopotamia, the North African, and North American Southwest. The classification is based on Oliver's global culture classification (Oliver, 2006). The examples taken from these cultures are buildings in Yazd Iran, Fatimid Cairo Egypt, Nubian architecture North Africa, Siwa Oasis and Ghadames in Sahara Desert North Africa, in addition to a single trial in hot arid climate of Southwest United Statesdone by Frank Lloyd wright atTaliesin west Phoenix Arizona.

Unlike Rapoport vision about house form and culture (Rapoport, 1969), a holistic analysis of images of each example shows that the image of architecture resulted from the same environmental factors but different cultural influences deemed to share some characteristics when it is read and analyzed by considering the intrinsic meaning of Panofsky (Panofsky, 1970) and possibly Kress and Leeuwen grammar of visual design (Kress & Van Leeuwen, 2006).

Desert architecture in Yazd Iran

Older than the examples of North Africa and North America, Yazd in Iran is an example for the architecture with a distinguished gestalt image in the desert.The holistic appearance of Yazd architecture was created to match the environmental and cultural dimensions at that time. At Yazd, which considered a great example for a green or sustainable pattern in hot arid climate in the history, they used kanat or channel filled with water under buildings to cool the air coming from the wind catchers above the buildings. These wind catchers played a significant role in forming the aesthetics of most of Yazd buildings, which became a distinguishable feature for buildings in hot-arid climatefor long time. Yazd is also one of the largest cities built entirely out of adobe walls with the least amount of fenestration on perimeter walls.

Fig. 1. A building façade in Yazd Iran [www.panoramio.com].

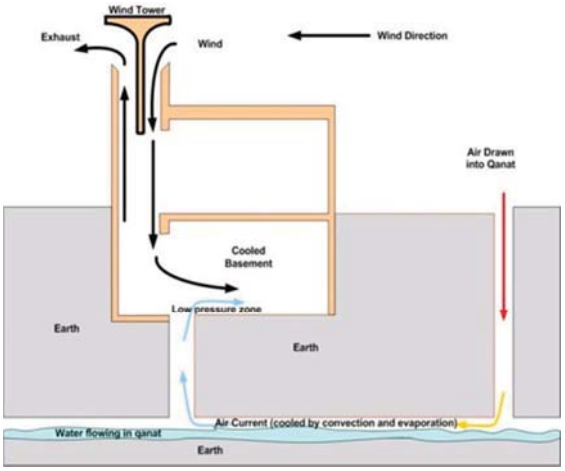

Fig. 2. Sketch shows the traditional cooling system in Yazd [www.sustainabilitytelevision.com].

The gestalt image of buildings in Yazd includes the feeling of heavy mass architecture that matches with the desert in colors and textures.Small amount of fenestrations in each building were created as mean of protection from the harsh climate conditions. Also building configurations match with the social and cultural dimensions of people who gathers and celebrate a distinguished type of social interaction.

Fatimid Cairo architecture

In Fatimid Cairo during the tenth and eleventh centuries, the design of buildings' envelope was a unique example for considering the environmental and Cultural dimensions. The available local materials with the adobe construction technology using brick, stone and wood have been potentially used in building envelope construction. The formation of this blend respected the existed culture when produced a holistic image,which possibly stayed in people's minds for centuries. At this time the privacy was valued as one of the main functions of buildings, the designers tailored the shading devices and the fenestration to protect the internal spaces from the heat of the sun, giving the privacy to building occupants by preventing the passersby in the street from seeing the occupants inside the building, and at the same time giving the chance to building occupants to see the street through the shading devices.

Fig. 3. The internal open court of a Fatimid Cairo house [www.panoramio.com].

Fig. 4. Building envelope of Wekalat Al-Ghory, a business trade building in Fatimid Cairo [www.panoramio.com].

The use of the adobe walls and available local materials gave the building natural colors that match with the desert milieu, this theme extends to giving an impression of the robustness and strength of protecting people from the harshness of the desert environment, especially when the wind comes loaded with sand from the desert.Not only building envelope that considered the sociocultural dimension of the laypeople but also building configuration; most of buildings at this time included an internal court yard that gave a chance to building occupants to socialize in outdoor environment and having their needs from privacy at the same time. That madethese structures with the way were designed remained for centuries; it satisfied the users and the community while were environmentally responsive for long time.

Desert architecture in North Africa

The historical vernacular architecture in the desert of North Africa is another great example for what happened in Fatimid Architecture of Egypt and Yazd architecture of Iran. This architecture ever considered the social and culture factors of people in its details as well as its holistic image. The Bedouin people who inhabited this architecture were living a life full of spiritual dimensions while they were producing local artifacts from local materials such palm trees and leather. They used the same motifs of their artifacts in their building facades. Some social values like privacy are also expressed in their heavy solid buildings that looked like forts against the harsh desert environment, which continuously comes with strong wind loaded by sand to swipe their buildings.

Fig. 5. A building envelope in Ghadames, Libya [www.panoramio.com]

The gestalt image of the desert architecture in North Africa includedthick walls with little amount of fenestration and connected urban fabric, this also express the spirit of the connectedness of the tripe members as one body against the strangers who might threat the community.

In Nubba in southern Egypt, culture is almost the same as North African desert communities, however the Nubian people are characterized by their ceremonial and artistic activities like painting, dancing and poetry. These activities have been reflected on the image of their buildings in terms of colors of their houses and some design elements such domes and vaults that featured their buildings till today.

Fig. 6. A Nubian House[www.panoramio.com].

In Siwa Oasis at the western desert of Egypt, and since ancient Egyptians, people developed certain building techniques using rammed earth walls, palm and olive trees for roofing system. The image of the siwan architecture shared the same implications of hot-arid climate buildings over history; thick walls, rough texture with colors of the desert, and the compacted urban fabric to express the unity of the community and means of defense. The consideration of sociocultural dimensions in the aesthetics of the architectural design was ever existed while sharing the same features in the architecture of hot-arid climate.

Fig. 7. Internal court of Shali Motel in Siwa, a new revivalism of the traditional architecture [By author].

Fig. 8. A photo for a new building façade in Siwa, a renewal to the old traditional style in Siwa [By author].

A trial in North America

Taliesin West is a great example for its harmony with the ambient environment. In Taliesin west at Phoenix Arizona, Frank Lloyd Wright used the same approach which has been commonly usedacross different hot arid climate regions,he used rammed earth heavy building envelope with little amount of fenestration expressing an exceptional harmony with Arizona desert.

The analysis shown in table 1 sorts the common features inherited in the image of environmentally designed buildings in hot-arid climate, the main features are adobe and rammed earth walls, little amount of fenestration on perimeter walls, building colors match with ambient environment, and the overall gestalt image of the building expresses a heavy mass construction.

Fig. 10.A photo for building façade of Taliesin West in Phoenix Arizona [By author].

Location of the example	Culture classification according to Oliver's classification	Walls	Colors	Fenestration	Shading Devices	Gestalt Image – heavy mass or light construction
Nubba, Southern Egypt	Nubian culture – North Africa	Rammed earth and adobe walls	Colorful image expresses the ceremonial and artistic life of Nubian people	Little amount of fenestrations on the external walls while most of the openings are on the internal court	Wooden strips on the windows	Heavy mass architecture distinguished by the domes and vaults above the buildings and the colorful facades
Siwa, Egypt	North African	Rammed earth	Colors of the desert	Little amount of external fenestrations	Wooden strips on the windows	Heavy mass architecture distinguished by the rough texture of the rammed earth walls and using of palm and olive trees in the roofing
Yazd	Mesopotamian culture	Adobe walls	Colors of the desert	Little amount of external fenestrations	Wooden strips on the windows	Heavy mass architecture
Ghadames	North African	Rammed earth	Colors of the desert	Little amount of external fenestrations	Wooden strips on the windows	Heavy mass architecture

Table 1. Analysis of the inherited common visual features of environmentally designed buildings in hot-arid climate

Method

Most building aesthetics studies depend on users' responses, this approach has been used in numerous studies by performing building Post Occupancy Evaluations. Post Occupancy Evaluation is the process of systematically comparing actual building performance, i.e., performance measures, with explicitly stated performance criteria (Preiser, 1995). In the current study the objective is different from the conventional Post Occupancy Evaluations, and The goal is to compare the image of sustainable rated buildings with the inherited gestalt image of environmental buildings that has been culturally accepted for long period of time in the region of each case study.

A holistic analytical approach has been used to analyze the design intents, and also to compare each case study with the gestalt image of buildings that has been established over hundreds of years in hot-arid climate. This approach is similar to Rapoport study of house form and culture (Rapoport, 1969) and Oliver in his analysis of vernacular buildings (Oliver, 2006). In Egypt's case study, the design intents were collected from the designers and building engineering consultants. In the second case, the office building in Las Vegas, the design intents have been collected from a group of curators in the building, who are knowledgeable about the design intents from meetings with the designers and who use the building as a tool to teach people how sustainability works in a building in Mojave desert.

The study started with walkthroughs in the Springs Preserve project with two of the curators while asking them some general open-ended questions. These questions focused on the role of building aesthetics as part of the exhibit, what are some of the comments made by visitors on the design of the building after they learn that it is a LEED building, how far the exterior look of the building succeed to deliver a message about sustainability. The answers of these questions were analyzed in light of building pictures. The same approach has been taken in Cairo building, however because the author is the LEED consultant of the project, the feedback was directly taken from the designers and people worked in the project in addition to some of the occupants. Thorough

reviews for Projects' scorecards were also very helpful to identify the critical features that formed the image of the new buildings.

The case studies

Rational behind selecting these two buildings

As main purpose of this paper is to analyze the aesthetics of green rated buildings in light of the gestalt image of local conventional environmental buildings. The selection of the two buildings was based on finding a good demonstration for the research problem. In Egypt, although design of environmentally responsive buildings have long been thought as one of the main characteristics of the local traditional architecture, the green rated buildings are fairly new to the country. The building shown in this study is one of a few new constructions that are targeting LEED certification, so that the study of this building deemed to elaborate the relationship between the image of green rated building and the inherited gestalt image of environmental building in old region like Cairo Egypt.

Springs Preserve project in Las Vegas has been designed and built as interpretive center, which intends to show passers by and visitors how sustainability works in green buildings through design and operation; this believed as a unique opportunity to see what designers do when they think about the aesthetics of a sustainable building as a teaching tool in hot-arid climate.

A LEED building in Cairo, Egypt

The first case is a newly built LEED office building in Cairo, Egypt. This building is a medium rise office facility of six floor height.

Fig. 11. An external perspective for a newly built LEED building at Cairo Egypt [By the designer].

The building envelope consists of three curtain wall facades, north, east and west, as shown in Fig. 11 while the southern façade is a conventional brick wall with small windows in addition to a skylight on the top of the building. The building was designed as a twentieth century modern architectural style, without any architectural design elements rooted to the history of environmental building design and construction in Egypt or even to the architecture of hot-arid climate. In addittion building interior design completes the picture of a real modern design with colors, lighting designs, and material selections.Architect was more comfortable with using the latest available technology of environmental control systems as well as construction materials, however the image of the project carries no semiotics to the environmental or cultural dimensions in the place or not. This can be considered one of the influences of the globalization on local cultural products such as architectural design.

Fig. 12. An interior perspective shows the design theme of the New Cairo City building [the designer].

This building is registered at US. Green Building Council while targeted LEED Silver certification. Technically, the design team has set a strict basis of design to save energy by 32 percent better than similar buildings in Cairo. Moreover, it saves water by 42 percent and using construction materials that includes over 20 percent of recycled materials

A LEED building at Springs Preserve center, Las Vegas, US

After a quick look at LEED case studies on US. Green Building Council website one can argue that most of new green certified buildings in hot arid climate in North America are doing the same as Egypt's shown building, they use the cutting edge technology in order to save as much energy as they can without paying attention to the inherited image of successful environmental buildings in the past. However, Springs Preserve in Las Vegas at the heart of Mojave Desert is different, being an interpretive center for sustainable living in the desert set additional objectives for the designers, one of the main functions of the building is to convey certain message about sustainability to laypeople. The case shown in this article is the administrative building of the Springs Preserve. The whole project is LEED Platinum, the highest certification level on LEED certification scale.

Fig. 13. Wind catcher and water harvesting system on the façade of Springs Preserve administrative building [by author].

The architects employed some traditional building elements, which were commonly used in environmental building design for long time in hot-arid climate as communicative forms to transmit their message to laypeople. Although these elements were not used in the Mojave Desert or even North America at all, the designers believed that it is good to have them in the project.

Fig. 14. A photo for the southern façade of the administrative building at Springs Preserve [by author].

At the heart of Mohave Dessert, Springs Preserve has been designed and built to send a message to the world, teaching them how sustainable construction should be in the hot arid climate. Saving energy, water and natural resources

symbolized the scarce of them in the desert. The building itself is undoubtedly a geek saver. It uses the cutting edge technology of the time when it is built, and at the same time it explicitly dressed some ever known and used traditional building technologies such thermal mass, straw bale walls, and wind catchers for the evaporative cooling system. The interior design image expresses the nature of the materials used in the building like wood and rammed earth walls with desert colors Fig. 15. The form of this project deemed to be a good example of sustainable building design in hot-arid climate from designers and occupants' point of view.

Fig. 15. A photo for the interior design of the office space at Springs Preserve [by author].

Result

Although Springs Preserve is located in a fairly new city, which merely include modern and after modern architecture trends, when the designers intended to show people how sustainability works in a building in hot-arid climate, they accommodated some traditional inherited environmental building design elements they believed they were successful solutions in same climate conditions allover the world, however this is totally in contrast with the current thematic styles used in Las Vegas buildings. This quixoticacceptance of such contrast might lay in people's perception of and sympathy to the inherited image of environmental buildings in hot-arid climate; it is the layers of meanings that have been accumulated over several thousands of years.

In Cairo case and similar to most of current green rated buildings, the designers didn't pay attention to any local inherited environmental design elements while they design a building in a city of more than a thousand of years of history and loaded with many different architectural styles that shared lots of hot arid climate building features. This might be a result of excluding building design from being a teaching tool to express sustainability to laypeople.

This comparison between a sustainable design which did consider the image of the building as a teaching tool for sustainability and a building that didn't, might shed the light on the importance of the image as well as the overall aesthetics of green buildings as a possible key factor in sustaining the cultural identity of the place and also the possibility of using it as a visual medium to teach people how sustainability works in the built environment.

Conclusion

In this article I have made a start with exploring the aesthetics of sustainable building design in light of the inherited gestalt image of environmental building designs in hot-arid climate. Environmental buildings in this climate have built a certain gestalt image over thousands of years. This image made buildings blend with the harsh Environment of the desert by similar textures and colors. The present work reviewed the inherited gestalt image of environmental buildings in a hot-arid climate versus the gestalt image of two newly built LEED projects in Cairo, Egypt and Las Vegas, US.

The author argues that inherited gestalt image can be employed in green buildings in such a way to help in supporting local cultures as part of social and cultural sustainability. Although aesthetics is a philosophical idea that changes in time according to the evolution of civilization, a deep understanding of a project ambient environment and the socio-cultural dimensions of prospective occupants would help in building sustainable aesthetics that can evolve with retaining some dimensions from the past and blending them with the contemporary available solutions.

This article agrees with Peter Einsman opinion in 2009 interview, that "Designers care about image, and the green movement, like it or not, has no reputation, for being all substance and no style".

And Hosey statement that the ugly truth about sustainable design is that much of it is ugly (Hosey, 2012). The article also agrees with Hoffman &Henn that Obstacles faced by the green building movement are no longer primarily technological and economic. Instead, they are social and psychological (Hoffman & Henn, 2008) and Hartmann that aesthetics could be an important determinant of user satisfaction and system acceptability (Hartmann, 2006).

The author's central claim in this article is that building technology has taken the control of shaping green buildings and ignored the gestalt image of the environmentally designed buildings, which has been long attached to the architecture in hot-arid climate. This might disconnect people from feeling the harmony with life in the desert. Also aesthetics should be an important category in green building rating systems in order to help with developing a belief system about sustainability while sustaining the cultural identity of the place.

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عن جماليات البناء المستدام في المناخ الحار القاحل
حالة مبنيين في القاهرة بمصر ولاس فيجاس بالولايات المتحدة الأمريكية

أسامه السعيد منصور

مدرس العمارة– كليه الهندسة جامعة عين شمس
oeamanso@gmail.com

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الملخص: يتجه تصميم المباني في كافة أنحاء العالم نحو البناء المستدام و التصاميم الخضراء . بالنظر إلي المباني ذات الأداء المتميز في المناخ الحار القاحل بعد تقييمها من أنظمة تقييم البناء المستدام مثل نظام الرياده في الطاقه و التصميم البيئي (ليد) يلاحظ أن معظم هذه المباني تفتقد الكثير من الجماليات التي اعتاد عليها الناس والتي قد شكلت صوره ذهنيه للمباني في المناخ الصحراوي عبر مئات السنين . فبالرغم من أن أهداف العماره الخضراء تتشابه إلي حد كبير مع أهداف العماره البيئيه التقليديه في المناطق الصحراويه إلا أن العماره التقليديه في المناطق الصحراويه تبدو أكثر نجاحا في التوافق من ناحية الشكل مع البيئة المحيطه و الأبعاد الاجتماعيه و الثقافيه للناس – و هذا جعل صوره المبني في البيئة الصحراويه جزء لا يتجزأ من الشخصيه الثقافيه للمكان في المناخ الحار القاحل مم يثير العديد من التساؤلات – هل الاستخدام المفرط للأنظمه الهندسيه و أدوات التقييم الكميه أثر سلبيا على جماليات هذه المباني و علي توافقها مع البيئه المحيطه؟ هذه الورقه البحثيه تقوم بتحليل الشكل المعماري لمبنيين معتمدين بنظام ليد يقعان في موقعين مختلفين من حيث الموروث العمراني و لكنهم يتماثلان في موقعهم من حيث المناخ الحار القاحل طبقا لتصنيف كوبن للمناخ - يقع أحد المباني في مدينة القاهره بمصر و المبنى الآخر في مدينة لاس فيجاس بالولايات المتحده الأمريكيه – تم تحليل الشكل المعماري و ما يتبعه من جماليات ترتبط بالشخصيه الثقافيه للمكان لكل من المبنيين في ضوء الصوره الجشطالتيه للمباني في المناخ الصحراوي و التي تشكلت و تكررت في مناطق مختلفه من العالم عبر مئات السنين – يبرز هذا التحليل رؤيه جديده لجماليات البناء المستدام من خلال منظور ثقافي بيئي.

الكلمات المفتاحية : البناء المستدام ، التصميم الأخضر ، ليد ، الجماليات ، الصورة الجشطالتيه، المناخ الصحراوي.