Ethics vs. aesthetics in sustainable architecture

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Abstract

In order to improve the environment all around the world, architects, engineers, urban developers, software developers, scientist, ecologists and other professionals have started to collaborate. But being tied to the necessity of designing sustainable buildings together with other professionals right from the design programing process, architects might have lost the freedom of creativity. An architect is obligated to think holistically in order to succeed and create an aesthetically pleasing surrounding together with the environmental features. As we embrace new trends in architecture, the research focuses on the relationship between sustainable architecture development and the freedom of creativity enjoyed by architects for centuries. The research delves into changes due to the rising importance of sustainability. What forms and functions are brought to the forefront or pushed into the background? Is contemporary architecture on the verge of a big change during which design and aesthetic form give way to environmental sustainability? The research presents several case studies together with interviews taken from the architects, developer or engineer of the building. The interview answers and existing researched material suggest arguments about similarities that each of the sustainable building has in regard to form, material, site, efficiency.
Keywords: sustainable, architecture, aesthetics, ethics, form, function, natural materials, freedom of architects.

1 Introduction

"Sustainable architecture isn't a prescription. It is an approach, an attitude. It should not really even have a label. It should just be architecture" (Maxman [1]).

Sustainable architecture, ecofriendly building, eco cities, eco houses, bioclimatic architecture, etc. are trending concepts. From the beginning of the

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planning process architects, urban planners and designers are increasingly considering how their work will address issues of sustainability and environmental protection, as well as global climate change. Designing and building according to the relatively new needs of environmental protection and sustainability has become a standard of our profession. Since functionality became crucial, style is not defined by architecture: new material is defined as a décor instead of ornament; historical forms are rarely considered, sometimes even destroyed; and concept statement and dialogue between environment and society is underlined.

Sustainable architectural development not only depends on the design process or on the architects, but requires collaboration between different professional fields due to its interdisciplinary nature. Hence, collaboration has become one of the main working principles of contemporary architecture. Especially critical is the need to create a web of professionals who ensure the correct and sustainable use of natural resources. To illustrate the critical importance of close collaboration between architects, designers and other professions, one can consider the early years of sustainable architectural development when products created by architects lacked elegance and attractiveness and yielded to the pragmatics of sustainability and environmental protection. Being tied to the necessity of designing sustainable products, architects lost some freedom of creativity, as they became less attentive to their designs' aesthetic qualities.

Gradually, architects, technical engineers, landscape developers, urban developers, scientist, ecologists and other professionals have started to work together for one reason – to save, protect and improve the environment. This means working with and not against nature, being aware of the human impact on nature and trying to reduce it as much as possible, considering prehistoric harmony seen between humans and nature and implementing these environmental elements in contemporary architecture.

The following research focuses on the relationship between sustainable architecture development and freedom of creativity enjoyed by architects for centuries, ethics vs. aesthetics of the profession. What particular changes, if any, have come about due to the rising importance of sustainability? The initial hypothesis indicates that sustainable architecture limited architects' creativity. The following work focuses on how this creativity was limited by a focus on environmental consciousness. What differences can be identified in terms of a) the form of buildings – aesthetics of buildings, b) sustainable features and c) the working process from design through the implementation process. The relationship between a building's formal characteristics – how it looks – and the building's sustainable features. Why are these elements significant and do they really matter?

1.1 Case studies

The most impressive and outstanding urban development in the 21st century will be the Masdar City Development. This project represents an excellent example of the importance of functionality with an emphasis on sustainability – a zero carbon, zero waste projects – which is still under construction and

development. In the development of Masdar City, the main goal was to develop a sustainable architecture prototype that could be easily placed in another part of the world.

The city takes into consideration the history of the United Arab Emirates. The streets, houses, and balconies are all derived from an understanding of the region. The orientation of the city, streets, and buildings is based on both sun and wind. The distance from one building to another is measured according to sun and shadow calculations. The aesthetics of the city is wonderfully aligned with the needs of the contemporary lifestyle. The technical part of the city and buildings are invisible to the general public. Solar panels are mounted on the roofs of the buildings. Wavy facades create a shadow for building owners and pedestrians. Traditional window ornament Mashrabiya is used for window and wall decoration. Islamic ornaments are used all over the city. As Foster mentions in his interview, Masdar City was developed after researching and learning from old historical principles, considering knowledge gathered throughout the centuries (Moore [2]). The forms have changed, but the concept for sustainability features, especially passive systems, has stayed the same.

The California Academy of Sciences Building, designed by Renzo Piano, provides a second example of environmental sustainability through its design and aesthetic form: "Museums are not usually transparent, they are opaque, and they are closed. They are like a kingdom of darkness, and you are trapped inside. You don't see where you are. But here we are in the middle of a beautiful Golden Gate Park" (Arcspace [3]). By creating the new Academy building Piano tried to represent the museum as something visually and functionally connected to nature. To add to the existing recreational zone without disturbing it, he employed sustainable design principles. Piano cut the vegetated site as if it was a carpet. He lifted it up and underneath it he created a building with green roof, integrated solar panels and skylines. The green infrastructure was not destroyed but preserved, just by being elevated. The idea for this project was developed and designed through collaboration between architects, biologists and engineers. Green roof, Photo Voltaic panels, rainwater usage, curtain glass walls for daylight and ventilation purposes, atrium, heat recovery system are the main principles of the sustainable design concept that Piano has developed in this museum. It is clear that the natural environment surrounding and sustainability problems dictate the form of the building. The integration of the building into the site is remarkable. Ecological and climate regulating novelties are extraordinary. The plasticity of the building, the green roof, and the scale all make it seem like a natural part of the landscape.

The Adam Joseph Lewis Center for Environmental Studies at Oberlin College in Ohio was designed by one of the pioneers of green architecture – William McDonough + Partners. The building is made of two structures: one structure consists of a two story high atrium, which serves as a lobby and connection point between the exterior and the interior spaces; the second structure consists of classrooms and offices for laboratories. The classrooms are located in the south part, which maximizes heat and daylight savings. The orientation of the building, energy efficient light fixtures, automatically opening clerestory

windows, photovoltaic panel usage, green plants arranged in the atrium, geothermal cooling and heating system, automatic regulator for heating and cooling all contribute to ideal "green" design. However, looking at the building, the perception that "green is ugly" comes to my mind. Looking at the form of the building, it is hard to visualize the freedom of an architect. The form is fully derived from the sustainable features – curved roof for better positioning photovoltaic panels and curtain glass wall, small windows on the south façade. It seems that each "green" design concept directed the form and material of the building. This gives a great example of how sustainability restricted architects about 10 years ago.

The Bank of America Building is a skyscraper. Located in New York City, between 42nd and 43rd Streets. Bank of America is 55-story building that attempts to engage principles of sustainable design in a big city. Designed by CookFox Architects, the building contains 2.1 million square feet and is entirely clad with a glass curtain wall, which also minimizes the energy that needs to be used to light the building. The building emphasizes daylight, fresh air and a central relation to the outdoors. The double envelope wall and low-E glass with heat reflecting ceramic frit minimize solar heat gain and also provide pleasant views from the building. The under floor air system delivers fresh air, which can be controlled individually. For ventilation purposes huge containers of water are stored in the basement. The water is cooled at night and is used during the day for air conditioning and ventilation. A co-generation system generates most of the heating energy for the building. Green roofs are used on different levels. Water recycling reduces consumption. Gray water recycling, a rainwater gathering system and waterless urinals reduce water consumption (Appel [4]).

The shape of the building, according to the architect, did not come about based on explicit considerations of sustainability. It was derived from the city and street structure. Since it is located in a big city where streets are narrow, the architects decided to help the street receive more sun: " If we had made the walls vertical, straight up, it would have blocked more sun light from the pedestrian level, so that was about opening up the ground plain to the sky. It was about multiple things. It solved more than one problem; it was not about performance issues…but we did think about urban fabric, in terms of sustainability, in terms of creating better environment. By sloping the walls, getting light down, freeing up the ground plan a little bit, in our minds contributed back to the fabric of the city" (Appel [5]). The building is one of the tallest sustainable buildings in New York City.

Created by ShoP Architects with Hunt Construction Group collaboration, Barclay Center Stadium (Arena) is the next innovative building that I will introduce. It is located in one of the important hub places of Brooklyn. Building materials were extracted, harvested and manufactured 500 miles away and brought to the site where they were assembled later. As Christopher Sharpless explained in the interview, ShoP Architects' concept is to use optimized materials, innovative technologies and consider the surroundings. Developed by ShoP Construction computer numerical controlled (CNC) files were given to a façade fabricator, who developed 12,000 preweathered steel panels and the

curtain wall enclosure used for the façade (Sharpless [6]). Thermal envelopes, high efficiency glazing, a high performance HVAC system, reduced interior lighting system, a storm water collection system, waterless urinals, low flow lavatory and kitchen sinks, a roof surface, and recyclable material help the building to be energy efficient. Albedo surface on the roof reduce heat released from the roof of the arena. Using an innovative approach and optimized? Materials for the building envelope marked a remarkable point in sustainable architecture development. "We look at it this way: if it makes sense, that's where it needs to be. It's all about optimization; at the end of the day we believe that if it performs really well it is going to be beautiful" (Sharpless [6]). Standing in front of the entrance and looking up at huge cantilevers and spirals with electrical signboards is rather impressive I have chosen this building because though it does not have typical features, its form and material usage is innovative. This saves the environment and proves that sustainable architecture can be designed out of the box. Developing an original approach to the design and creating something unique that could help not only one building but also the surroundings is important.

"Using orientation correctly *is a free* lunch…" [8] said Ana Serra, a Buro Happold engineer. Net Zero building, Hawaii Preparatory Academy is located on the Kamuela Island. "Tropical 3 Pitch Roof" (Buro Happold [9]) was derived from the island climate, in particular directed by prevailing winds and the relief. "The form of a building is crucial to its environmental performance, as are its orientations and materials" (Hagan [10]). The prevailing wind and hilly site encouraged? Architects and engineers to create a terrace type building with three separate roofs, which are also used for ventilation. "Sometimes it is hard to create fully passive building, because of the comfort level you need to provide, type of equipment used in the building, sort of automated systems that needs to be incorporated which require tighter control of environmental conditions. Because of this we always start with passive and understanding the needs" (Serra [8]).

The building is fully naturally ventilated by automatically opening windows. Each space is separated by small amounts of elevation. Three different types of solar panels are placed on the roof. CO_2 sensors are located in all areas. All the rainwater is collected and stored in tanks, which later is used for radiate cooling system. The level of the water in the tank is continuously monitored, since it is extremely important to use recourses as efficiently as possible. Increases productivity and saves electricity and water. The duel flush toilets are used throughout the building. The roof is insulated with natural material, like soy. Natural wooden materials are also used in the building. The portable walls divide the spaces to arrange spaces as needed. Polycarbonate skylights, wooden sunscreens and interior roller shades control natural daylight.

The last building that I would like to introduce is Cleveland Metropark, Storm Water Management Office Building. The building has no green roof, no solar panels on the roof, and no curtain walls. The building is a typical one level building, with regular windows, and a double sloped roof. However, if one looks carefully and examines the building, it has great sustainable features. Every drop

of the water is reused. Sensors regulate thermal comfort. The exterior and interior of the building is made from natural and local materials. As Chuck Miller explained in the interview: "You need to have four virtues in the new architecture: durability, flexibility, affordability and beauty, which people forget about. Someone in 20 years has to love and take care of the building. It has to last – traditions, cultural traditions, what people love in that culture" (Miller [11]). The building is not extraordinary, but it is very functional and flexible to the surrounding. As Miller mentioned in the interview, it is very important for architects to consider materials that can be found in the same region. "In vernacular architecture, a lot of design was done based on the materials that were available, local climate conditions and sun orientation. They based their architecture on what they knew, have experienced, what climate existed; it was just common sense architecture" (Miller [11]). Looking at this building one thought definitely comes to my mind: "if we build in the desert, let the house know the desert and the desert be proud of the house by making the house an extension of the desert" (McLennan [12]).

1.2 Discussion: But what is happening with the aesthetics of buildings? What is the relationship between a building's formal and sustainable characteristics?

1.2.1 Orientation and geometry

Looking at each of the building, we clearly see that there are no similarities in the geometry. Each form was created by the architect and engineers based on the needs and surroundings, where geometry was derived from the sustainability characteristics. But if the form was dictated from the sustainable characteristics, does not it mean that architect was restricted, in other words put in frames?

Let's consider orientation of the buildings – each building is oriented based on the surrounding area and climate. Each architect considered the solar path and thermal radiation, east–west orientation, south façade, natural ventilation options, shading systems, and wind. Based on and considering these materials they create the adequate form.

Masdar City used traditional knowledge and created buildings based on experience. Narrow streets, wind towers, buildings were planned considering the climate conditions. Buildings were positioned based on wind and sun orientation. Environmental issues were brought forefront, which restricted an architect. The architect that designed the California Academy of Science tried to lessen the harm the building would do to the environment. The building is hard to separate from the surroundings from a distance. Using curtain glass wall and green roof the building is blended in the natural environment. Barclay Center is located in an urban environment, which itself determined the orientation of the building. Extremely industrial surroundings suit the harsh and rusted form of the arena. Coming out of the subway station, looking up and seeing the canopy coming out of the building is very impressive. The building geometry is very aggressive and strong, but has no visible sustainable characteristics. Only the material and part of the glazed glass is noticeable. On the one hand, it is wonderful that the sustainable features are so well blended in the design that they

are hard to see, but on the other hand, how sustainable is the building in comparison with already discussed buildings? The remarkable part in this building is innovative approach of an architect, not restricting but bringing creativity while protecting the environment. Barclay Center never brought feeling of caring, thinking and loving the environment although it is certified as sustainable building. It obviously shows architects freedom and thinking out of the box attitude. The orientation and geometry of Hawaii Preparatory Academy was clearly derived based on climate. Prevailing wind directed architects to design the building with three different roofs, each of them serving as ventilation purpose as well. The building shape and form is very pleasant and brings impression from just looking at it, that it would not damage the environment. Great example of sustainable building orientation and geometry will be Oberlin College building. The south façade is used for classrooms. The windows are relatively small and shaded. But the form of a building has nothing extraordinary – curved roof for photovoltaic panels, curtain glass wall for daylight, and plants in the building. The Cleveland Metropark building is less aggressive regarding the visibility of clear, dominant sustainable features. It is oriented "classically" as a green building. While discussing the geometry of the building it is also important to bring up importance of the façade and used material, since it plays big part in the architectural aesthetics.

1.2.2 Façade

California Academy of Science curtain glass walls links the structure with its natural surroundings and created daylight, which reduces the energy costs. The Bank of America form is quite unoriginal, compared to other buildings, but serves as a great example for an effective use of solar radiation. By tilting the façade appropriately, the building decreases its energy consumption by 50%. Clear glassing is one of the important features of the building. It interrupts and does not change the color of the outside view. Fritted curtain walls and double envelope keeps unwanted solar heat enter the building. Hawaii preparatory academy also uses curtain glass walls from one side of the building. Barclay Center partly uses curtain glass wall. Important is to mention that each of these building, expat Bank of America uses shading systems around the facades. Bank of America cannot use the system, since the wind pressure and maintenance of the building become problematic. Even though for daylight and heating and ventilation purposes each building uses the same methods, I can't state that facade of the buildings are the same. But again it is obvious that each architect thought about façade material to maximize the daylight usage, cooling, heating and ventilation systems. He/she tried to adapt the building to its surrounded environment and natural recourses.

1.2.3 Planning

Third feature that I always pay attention to and compare is the floor plan of the buildings. Especially I would like to point out an Atrium. An Atrium helps to ventilate and bring natural daylight in different spaces. Besides the environmental function atrium provides social and organizational space. Kenneth Frampton's description comes to my mind where he mentions that

sustainable buildings have to consider certain regions, orientations, and thermal mass implementation by manipulations of vents, shutters, and sliding screens to be able to maintain optimal conditions inside the buildings (Frampton [13]). Oberlin College building and California Academy of Science has an atrium, which helps to ventilate and save energy in the building. Hawaii Preparatory Academy and Cleveland Metropark building use small partitions to separate spaces. The partitions can be taken out and use as one big space. Again here architect considered ventilation and delighting issues. Bank of America even though does not use atrium for ventilation, uses double envelope system. Comparing each of the architectural forms represented in the paper one could see the links in planning. Again some restrictions are made based on the sustainable concepts.

Another question that comes to mind is the working process of an architect.

1.2.4 Has the working process changed for architects? How is it possible to create an environmentally clean building without consultants and collaborators?

During the 70s architects and engineers started using new technologies into their projects. Some incorporated natural materials, some used alternative energy sources, and some used wind turbines and solar panels. But all this looked "ugly" in the mind of the public. The general response was that, "green was no longer cool" (McLennan [12]). This perception that sustainable buildings are ugly became typical. These types of buildings were not popular, but architects still insisted in designing them. As Jason McLennan describes, this part of the development was similar to a child starting to walk.

One of the reasons this happened was the sustainable design working process. The process was not synchronized with engineers and different professionals. There were not other professionals involved in the design process from the beginning. Scientist who worked on material technologies, computer graphics artists who worked on software developments and engineers all worked separately. During the sustainable development process, about 10 years ago, architectural studios started to collaborate and address each task in a holistic way. At ShoP Architects people come from very different backgrounds like political science, biology, science, and philosophy. "We think as a think tank. Building as a civic gesture, its existing story" (Sharpless [6]). As Ana Serra mentioned in her interview, the collaboration process was a significant change in the design process. "The whole thing that the sustainable design brought about is the integrated design process" (Serra [8]). Without having an engineer on board right from the beginning of design process, it is impossible to plan a good sustainable building. While working on the rainwater problems, or conceptual massing and siting of the building, understanding each sustainable feature needs to be developed, integration process is need. Different parties and expertise leaders need to sit down together and discuss; otherwise the project will be in the air. As Serge Appel, lead architect of Bank of America Building, One Bryant Park, CookFox Architects, mentioned 10 years ago the sustainable problems were more as an add on process, more about technology, cogeneration plan. This

all had nothing do to with the building or site of the building. "Now when we look at the building much more location of the building, shapes of the building, esthetics of the building, how they contribute to the sustainability, it is broader than just the technology going in; this is all going to be called 'Biophilya'. For this architecture firm how we incorporate nature into the building is our next challenge. We know how to incorporate technology into the buildings" (Appel [5]). Finding the way to shape the buildings to create better, more sustainable buildings is harder. It is hard to integrate nature directly into the structure. All of our CookFox developments have plantings integrated into the structure. It is not about making the buildings look green – growing vegetables, but that they provide spaces for humans to interact with nature. Have a direct connection to the outdoor environment, not about the appearance of green; it's about the actual physical and emotional connection to an actual building. "We work more closely with landscape architects; Plumbing – heavy drain, heavy rain; Building maintenance becomes very complicated; cleaning the glass buildings; integrated terraces; Structure; ice and snow; structure becomes very important;" (Appel [5]).

1.3 Conclusion

The sustainable architecture development became a process that includes collaboration between different disciplines, which itself became a holistic approach. The architects themselves alone are no longer able to design the building. The engineers, developers and physicist, chemists, ecologist, software engineers, sociologists and other professionals work together to succeed. Sustainable design became an ordinary issue. The only difference is that it involved more people and cooperation. These collaborations retrained architects and forced them to work out of the box and push forward their ideas. Only after great collaboration process and thinking holistically architect will be able to create aesthetically pleasing building. Discussing each building's architectural form we come to the point that sustainable features restricts architect in regards to consider the issues such as daylight and shading, ventilating and cooling, heating, planning. But architects only think about sustainable features and create purely technical buildings, aesthetically unpleasant, general public will reject it and push back environmental principles. The notion that "green is ugly" will come back. "It is about understanding the unfolding and dynamic interplay between nature and culture and treating design as if it is process of participating in and reconciling these processes as they flower into forms that best benefit people and planet" (Robert [14]). Based on the comparison we can clearly see that the architectural form is constituted by the principles of environmental performance – sun, heat, light, air, and water. Definitely sustainable characteristics put architects in restrains. But each architect can be creative and develop the form that is both, aesthetically pleasing and comforts the environment. The only challenge is to think out of the box.

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