Journal of Art, Architecture and Built Environment (JAABE)

Volume No.1 Issue No. 1 Spring 2018
ISSN: 2617-2690 (Print) 2617-2704 (Online)
Journal DOI: https://doi.org/10.32350/jaabe
Issue DOI: https://doi.org/10.32350/jaabe/11
Homepage: https://sap.umt.edu.pk/jaabe/Home.aspx

Journal QR Code:

Article: **Green Buildings as solution for Sustainable Housing: Role of Private Housing Schemes, Lahore, Pakistan**

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Online Published: April 2018

Article DOI: https://doi.org/10.32350/jaabe/11/05

Article QR Code:

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To cite this article: Baig, A. (2018). Green buildings as solution for sustainable housing: Role of private housing schemes, Lahore, Pakistan. *Journal of Art, Architecture and Built Environment, 1*(1), 85–99.
Crossref

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
10	09	05

A publication of the
School of Architecture and Planning, University of Management and Technology, Lahore, Pakistan

Green Buildings as solution for Sustainable Housing: Role of Private Housing Schemes, Lahore, Pakistan

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Abstract

Housing is a basic need of every human being. Apart from the financial and social problems faced by our nation, we encounter energy crisis, climatic changes and their impacts on a daily basis. There is an urgent need of efficient green houses for our nation to continue living in a healthy environment. This need is reflected by the congestion of our cities, increasing population and energy demand. Pakistan is one of the countries with highest energy consumption at domestic level. Sustainable urban communities are based on an approach that links economic, social and environmental issues and solutions. They are designed to be socially and economically viable, environmentally sustainable and equitable places. Rapid urbanization demands a lot of housing stocks in urban areas. This paper examines sustainable development in the housing sector of Pakistan towards green building specifically focusing on the private housing scheme developers. Their lack of vision regarding green building adaptation is perplexing. Grand Avenue Housing Scheme, Lahore has been selected as the case study area to highlight the importance of green building. Primary and secondary data has been collected from this housing scheme developer, different software like Google Earth Pro and Sketch Up Pro has been used for 3D visualization of proposed building in the case study area. Internationally, there is a lot of focus on green building construction technology. However, in Pakistan there is no research and implementation of this technology. We need to rectify this situation so that much needed energy can be saved and to promote sustainable housing.

Keywords: green buildings, energy efficient, sustainable housing, housing schemes and sketch up pro

Introduction

"Green building is the practice of creating structures and using processes that are eco -friendly and resource-efficient throughout a building's life-cycle from sitting to design, construction, operation, maintenance, renovation and deconstruction."

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EPA (2014) further expands this definition to include the classical building design concerns of economy, comfort and durability. The concept of 'sustainable or high-performance buildings' is by extension related to green buildings (EPA, 2014). According to the International panel on climate change (IPCC), "The building sector contributes about 31% of global energy related carbon dioxide emissions. These emissions grew at an average annual rate of almost 2% between 1971 and 1995" (2001). Pakistan has a relatively higher level of associated emissions in spite of its low per capita energy consumption. As far as climatic changes are concerned the National Climate Change Policy provides a framework for addressing the issues and adverse effects of climatic changes that Pakistan faces or will face in future.

Green buildings are becoming the torchbearers of sustainable development and gaining mainstream acceptance as an answer to growing global energy demands accentuated in large part by human induced climate change [3]. In case of typical residential buildings, energy consumption pattern is expensive and contributes in environmental degradation by producing carbon from fossil fuel heating and CFC's from air conditioning. On the contrary, eco-friendly homes are designed in such a way that they use maximum sun light and wind for proper ventilation; they are sealed and properly insulated to gain energy efficiency.

In Pakistan, there has been a rapid increase in the construction of housing schemes. Only when we introduce and implement the projects that are eco-friendly, our communities will also be like developed countries having a green future on sound financial grounds.

2. Literature Review

A green building can have colossal advantages, both substantial and impalpable. The quick and the most substantial advantage is the lessening of working energy and water costs ideal from the very first moment amid the whole life cycle of the building (Sohail & Qureshi, 2010-2011). Impalpable advantages of green building incorporate expanding efficiency of tenants, their wellbeing, security benefits and a green corporate picture.

As the consciousness of environmental change, decreasing common assets and energy costs spread, the interest in reasonable outline and sustainable development increases. We are living in a critical time period where new, major changes in planning and development are being initiated

that will affect our future achievement. "Around the world, 30-40% of all essential energy is utilized as a part of building (UNEP, 2007). As per an examination, building division is responsible for more than 40 cents of every dollar spent on world's energy necessities. In the event that we see towards the arrangement of this issue, the building area can be a considerably greater piece of the arrangement, giving probably the most financially savvy and convenient approaches to handle the issue and by giving manageable structures.

As buildings are responsible for a major portion of carbon emissions, they have a significant environmental impact by considerably using number of resources and energy. The potential for energy savings in the building sector is large (Castro-Lacouture, Sefair, Flórez, & Medaglia, 2009). Controlling low density sprawls and creating well designed and compact communities reduces reliance on fossil fuels and reduces greenhouse gas emissions.

The present energy consumption and carbon dioxide generation can be significantly reduced by adopting effective and sustainable building principles (IPCC, 2001). The environmental policy should promote sustainable housing, strengthen supply chains for sustainable housing and building capacity and stimulate demand for sustainable housing. Green building benefits incorporate natural, financial and social advantages. The potential ecological advantages are up gradation and assurance of biodiversity and biological systems; enhanced air and water quality; lessened waste stream and preservation and reclamation of common assets. Monetarily, potential advantages incorporate lower operation costs; business opportunity for green items and administrations; improved occupier profitability and the streamlining of life-cycle execution. Socially, potential advantages incorporate enhanced wellbeing and solace for occupants, limiting the weight on nearby foundation and enhanced style. Affordable housing ventures underline each of the three advantages since they supplant the decaying stock of houses which hurts nature most and gives the minimum monetary and social advantage.

Energy efficiency and other supportability upgrades for low-salary family units have other advantages as well. Governments, energy suppliers, property proprietors, and citizens all experience coordinate budgetary, backhanded money related, and social welfare and job co-profits by green moderate lodging ventures. The enhanced quality and vitality of these

undertakings result in coordinate money related advantages such as decreased vitality bills, lessened expenses as help to low-wage families, diminished rates of close offs and in this way decreased related managerial expenses. Aberrant budgetary co-benefits help occupants, property proprietors and citizens and society in general.

2.1. Need of Green Housing

The need of green housing has been growing due to population growth, urbanization, slums, poverty, climate change, lack of access to sustainable energy, and economic uncertainty in Pakistan. The energy consumption in developing countries is more than that of developing countries, especially in domestic sector by individual household, so there is dire need of energy efficient provisions for Pakistan necessarily to meet energy demands through energy efficient buildings (Sohail, & Qureshi, 2010-2011). The energy use distribution in Pakistan and conservation of energy in percentages is given (see Table I & Table II).

Table 1
Existing Energy Use in Pakistan

Category	Energy Use Percentage
Industry	27%
Transport	17%
Agriculture	1%
Building	52%
Others	3%

Table 2
Existing conservation potential in Pakistan

Category	Energy Use Percentage
Industry	25%
Transport	20%
Agriculture	20%
Building	30%
Others	25%

2.2. Green Steps

Sustainable building development demands from the construction industry to made innovations in building materials and construction techniques. Smart material selection in a building construction can significantly contribute in achieving the green certification (Castro-Lacouture, Sefair, Flórez, & Medaglia, 2009). There are variety of materials that can be used for construction of eco-houses, but the Insulation is one of the bests, economical and easily available material in Lahore. Natural resource conservation is done by using available renewable resources which are solar energy, wind energy, geothermal energy and Bio fuels. These renewable resources not only conserve natural resources but also reduced the pollution load. The best option in city like Lahore is solar energy and biogas plant. Water conservation can be done by reuse of wastewater that is directly discharging in to water bodies after doing some treatment, treatment can be onsite and offsite but greener way is to treat and reuse of wastewater at the source such as grey water treatment and recycling system. For saver disposal or to recharge ground water and surface water sources high degree of treatment become necessary these days for this purpose offsite treatment plants (Biological Treatment Plant) would be the best option to have better effluent quality to reduce the water pollution and conserve fresh. The rural and urban migration along with extensive growth of big cities has impact onto the consumption of energy in an irregular manner, especially during the last decade the cities growth has resulted into usage of energy due to development of buildings denying energy efficiency building codes (UN Habitat, 2016).

E-Community housing scheme Sheikhupura has covered the more-green spaces. But they cover only a few aspects of LEED points, according to US organization LEED® (Leadership in Energy and Environmental Design) principles and guidelines 2009 (Potbhare, Syal, Arif, Khalfan, & Egbu, 2009).

2.3. LEED® (Leadership in Energy and Environmental Design)

United States Green Building Council (USGBC) runs a certification program called Leadership in Energy and Environmental Design (LEED) which defines green buildings as an ecosystem comprising of six components as shown in Figure 1 (Bisagni Environmental Enterprise BEE,

2014). Together these components present a step by step approach towards creating a green building from conception to commission.

Figure 1. LEED credit categories

2.4. Comparison of U.S. and Pakistan

The comparison of U.S. and Pakistan to investigate the provision of green building standards in Pakistan is given (see Table III).

Table3

Comparison of Green Building Standards

	UNITED STATES	PAKISTAN
Department	U.S department of Energy & EPA	Ministry of Environment or Renewable energy (proposed)
Council	USGBC (United States Green Building Council)	PGBC (Pakistan Green Building Council)
Certification systems	LEED and Green Globes	Not specified yet (can be LEED-Pakistan)
Source of Funding	National, State and Local programs for grants, tax-credits, loans etc	Initially banks can start funding mechanisms e.g: green loans
Areas	Homeowners, industry, government organizations, and nonprofits	Homeowners, industry, government organizations, and nonprofits
Standards	• ASTM International's Technical Subcommittee E06.71 on Sustainability and Performance of Buildings has developed several green building standards • Standard 189 • Standard for the Design of High-Performance Green Buildings	Some voluntary consensus-based organizations can develop standards
Source of Funding	National, State and Local programs for grants, tax-credits, loans etc	Initially banks can start funding mechanisms e.g: green loans

To date there is no green building energy efficiency code practice in Pakistan.

2.5. Case Study Area: Grand Avenue Housing Scheme, Lahore

Grand Avenues Housing Scheme is the most recent venture of Urban Developers Associates. Situated on Ferozepur Road just 20 minutes' drive from Kalma Chowk, makes it effortlessly open. Grand Avenue is fitted with top notch facilities including street arrange, water supply, sewerage and seepage offices and 24 hour security arrangements.

All of the above and improvement costs incorporated into the publicized costs makes Grand Avenue Housing Scheme the most conservative and most effective undertaking to date. Likewise included are the cost of a group focus and diversion unit, medicinal offices, mosques, continuous power supply and a surprising thirty-five parks as shown in Figure 2 and Figure 3.

Figure 2. Location of Grand Avenue Housing Scheme, Lahore (https://earth.google.com/web/@31.34046544,74.37908947,213.17296874a,2242.02407063d,35y,-0h,0t,0r).

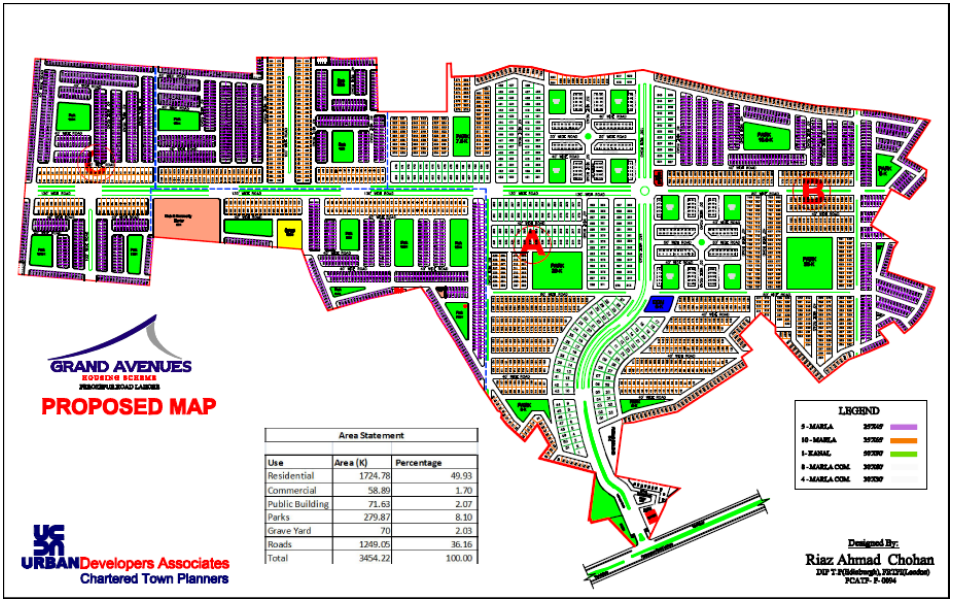

Figure 3. Master plan of grand avenue housing scheme, Lahore

The plot of 10 Marla with dimensions 30’ x 65’ (5915 Sq.ft) is situated in Grand Avenue Housing Scheme, Lahore. This plot is selected for the research work on energy efficient residential building for sustainable neighborhood.

The following are sizes of different rooms on the ground floor in the residential building given in Table 4.

Table 4

Sizes of Different Rooms in the Ground Floor in the Residential Building

- Entrance= 12’ x 6’
- Guest Room=10’9” * 15’3”
- Living Room=11’4.5”* 18’5.2”
- Kitchen=11’*7’6”
- Bed Room=11’* 10’10”
- Bed Room=11’4.5* 11’ 3”

The following are sizes of different rooms in the first floor in the residential building:

- Living Room= 14’4.5” * 11’3”
- Bed Room= 11’*10’10”
- Bed Room=11’4.5* 11’ 3”

2.6. Leadership in Energy and Environmental Design (LEED): Principles in the Proposed Building

The LEED (Leadership in Energy and Environmental Design) green building rating system is a voluntary certification programme aimed at reinforcing and promoting the high performance of sustainable buildings. The programme has a total of 110 points. Our study meets 61 points of the LEED and falls in the category of Gold certification. The major emphasis in the proposed building is given to the green building elements, plumbing design (separation of grey water from waste water and using it for gardening), solar panels, roof top gardening and other points related to sustainable sites, energy and atmosphere and indoor environmental quality. The proposed building is made energy efficient up to 40 % by introducing these points. Our research also deals with a comprehensive way to achieve energy efficiency in the building by considering the orientation of the building.

2.7. LEED Points for Proposed Building in Grand Avenue Housing Scheme

LEED credit points for proposed buildings in the case study area is given as below in Table 5.

Table 5
LEED Credit Points for Proposed Buildings

Name of LEED's Category	Credit Points
Site Selection (SS) Credits	1
Development Density and Community Connectivity	5
Brownfield Redevelopment	1
Alternative Transportation—Public Transportation Access	6
Alternative Transportation—Parking Capacity	2
Site Development—Maximize Open Space	1
Storm Water Design—Quantity Control	1
Storm Water Design—Quality Control	1

Heat Island Effect—Roof	1
Light Pollution Reduction	1
Water Efficiency Credits	1
Water Efficient Landscaping	4
Innovative Wastewater Technologies	2
Water Use Reduction	4
Optimize Energy Performance	19
On-Site Renewable Energy	7
Regional Materials	2
Minimum Indoor Air Quality Performance	1
Low-Emitting Materials—Paints and Coatings	1
Total Credit Points	**61**

2.8. 3D Views of Proposed Green Building

The prospective views of the proposed residential building are shown below:

Figure 4. Proposed building layout

Figure 5. Front elevation

Figure 6. Outdoor landscaping

Figure 7. Windows orientation and low terrace gardening

Figure 8. Top view of building

Figure 9. Roof top gardening

3. Conclusion

Effective planning and design can optimize the use of natural and renewable resources. Green building materials should be ensured in the residential buildings so that maximum efficiency is gained. Support should be provided to develop Green Building Guidelines and Building Code, promote sustainable housing in municipal development plans and building by-laws needed to develop an implementation plan to promote green homes. In our case study area, the building is made energy efficient up to 40% (61 points) by incorporating various LEED points and green building techniques. Roof top gardening and use of photovoltaic panels provide a safer way to make buildings energy efficient and to reduce burden on electricity in order to overcome the household energy demands. Pakistan experiences hot weather for a greater part of the year. So, by using solar panel techniques the problem of load shedding can be solved. Moreover, by providing correct orientation to buildings and windows a lot of energy can be saved.

References

Bisagni Environmental Enterprise (BEE). (2014). *LEED v4 Credit Categories: Green building for the win.* Retrieved from:

https://www.bee-inc.com/2014/05/30/how-leed-certification-can-be-even-so-much-better-for-green-building/.

Castro-Lacouture, D., Sefair, J. A., Flórez, L., & Medaglia, A. L. (2009). Optimization model for the selection of materials using a LEED-based green building rating system in Colombia. *Building and Environment, 44*(6), 1162−1170.

Environmental Protection Agency (EPA). (2014). *Green Building* [Online]. Retrieved from: http://www.epa.gov/greenbuilding/pubs/about.htm

Google Earth. (n.d.). *Grand Avenue Housing Scheme, Lahore*. Available: https://earth.google.com/web/@31.34046544,74.37908947,213.17296874a,2242.02407063d,35y,-0h,0t,0r

IPCC. (2001). *Climate change 2001: Mitigation of climate change (a report of working group III to the third assessment report of the Intergovernmental panel on climate change)*. Cambridge, UK: Author.

Potbhare, V., Syal, M., Arif, M., Khalfan, M. M., & Egbu, C. (2009). Emergence of green building guidelines in developed countries and their impact on India. *Journal of Engineering, Design and Technology*, *7*(1), 99−121.

Sohail, A., & Qureshi, M. (2010-2011). Energy efficient buildings in Pakistan. *COMSATS Science Vision*, *16-17*, 27−38

UN Habitat. (2016). *Urbanization and development: Emerging futures (world cities report 2016)*. Nairobi: Author.

United Nations Environmental Programme (UNEP). (2007). *Buildings and climate change: Status, challenges and opportunities (UNEP standard)*. Retrieved from: http://www.unep.fr/en/

Yoon, S. W., & Lee, D. K. (2003). The development of the evaluation model of climate changes and air pollution for sustainability of cities in Korea. *Landscape and Urban Planning*, *63*(3), 145−160.