

Analysis of Lahore Development Authority (LDA) Construction By-Laws

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Abstract

Currently, Pakistan is facing water scarcity and energy deficiency. In future, the problem can further escalate with increase in its population and development of infrastructure. So, it is a need of an hour to revise its construction by-laws, to improve them to have a sustainable development. For this purpose, an attempt has been made to analyze the construction bye-laws of LDA. In this study, LDA bye-laws are analyzed on the basis of LEED (Leadership in Energy & Environmental Design), which is a widely used green building rating system in the whole world. It is concluded that LDA bye-laws are lacking in clauses to generate water efficiency, energy efficiency and indoor environmental quality in the buildings. At the end, some suggestions are made which can be incorporated in LDA bye-laws to make them green up to some extent.

Keywords: Infrastructure, Construction By-laws, LEED, LDA By-laws, Green Building.

1. INTRODUCTION:

In present days, Pakistan is facing the problems of water scarcity and energy deficiency. Pakistan is one of the 36 most water-stressed countries in the world (Beham, 2018). Pakistan crossed the water scarcity line in 2005, it would run out of water by 2025 and more than 80% of water in Pakistan is considered unsafe (Shahmeer, 2018). Besides it, Pakistan is facing energy (electricity) deficiency as well. Present energy demand in Pakistan is almost 25,000MW and is facing the shortfall of 9,000 MW (Zafar Bhutta, 2018). In the future, these problems can further escalate if these problems are not addressed at present.

These major problems can be solved by sustainable development. Sustainable development is the development that meets the needs of present without compromising the abilities of future generations to meet their own needs (Brundtland, 1987). Sustainable development can be addressed by green buildings. A green building is a building that, in its design, construction and operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment. Green buildings preserve precious natural resources and improve our quality of life (WGBC, 2016). Green buildings promote sustainability without disturbing natural habitats. Green buildings reduce energy consumption, they save money and play a vital role in restoration of environment and habitat.

Lahore is the provincial capital of the Punjab, which is the most populous province of Pakistan. It is also the second largest city in the country. Lahore is rapidly growing in all its directions and creating environmental problems in all of its dimensions, which needs a huge infrastructure to cater the needs of its ever-increasing population. Unfortunately, it is happening at the cost of depletion of natural resources. The depletion of these resources can be excessively reduced by improving Lahore Development Authority (LDA) by-laws. LDA Housing Authority updates them on yearly basis. It is responsible for development in Lahore, Pakistan. It also regulates and issues permits for new construction projects.

To analyze LDA by-laws Leadership in Energy and Environmental design (LEED) is used in this study. LEED is most widely used green building rating system in the world. LEED has developed its own rating systems. The rating systems are categorized in five basic areas: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. But we are only focusing on the Water Efficiency and Energy and Atmosphere. LEED is flexible enough to apply on all types of the building but in this study, we will focus on residential house. The significance of this study is by updating the LDA construction by-laws, sustainability and restoration of natural habitat is introduced in Pakistan.

2. OBJECTIVES:

The construction By-Laws of LDA are analyzed on the basis of LEED. The objective of this study is to analyze LDA by-laws to make them water efficient and energy efficient. As they are among the major problems of Pakistan. Lahore Development Authority (LDA)

bye-laws are lacking in clauses to generate water efficiency, energy efficiency and indoor environmental quality in the buildings. At the end of this study economical, environmentally friendly and easy to implement suggestions are given which can be incorporated in the clauses of LDA by laws.

3. LITERATURE REVIEW:

LEED focuses on five main components of green buildings. They are Sustainable Sites, Water Efficiency, Energy and Atmosphere, Material and Resources and Indoor Environmental Quality. In this study, we will analyze LDA by-laws for water efficiency and energy efficiency as they are among the major problems of Pakistan.

As energy and water efficiency increases, they will help in preserving precious natural resources, which will otherwise deplete at the cost of abilities of the coming generation. The overuse of resources can also damage the habitat and eco-system. As the energy efficient buildings maintain favorable temperature, they can enhance the comfortability and efficiency of their occupants. They also help in reducing the operational cost of the building. The environmental friendly performance of green building can also not be underestimated as they emit greenhouse gases at considerably lower level as compared to conventional buildings because of reduced usage of cooling and heating appliances.

3.1. Water Efficiency:

Water efficiency is important component of green building. Its purpose is to reduce the consumption of water, its efficient use, reuse and recycling. Following are the strategies from LEED v4 homes which can help in achieving the goal up to some extent.

3.1.1. Water Metering

Water metering is an important tool to track water consumption and leakages. If water is billed then it can largely reduce water consumption. The consumer will be motivated to follow different strategies to reduce water consumption. For example, by applying efficient fixtures and repairing any leakages on time etc. Water metering is prerequisite of LEED.

3.1.2. Storm Water Quality Control

Storm water runoff can be controlled on site by increasing pervious areas which will help on site infiltration to recharge ground water table. It will also help to reduce the contamination of storm water.

3.1.3. Water Reuse

There are many different strategies by which water can be reused. For example, by the provision of rainwater harvesting and gray water use they can be encouraged in LDA by-

laws. If the water is recycled at the city level and is charged by the wastewater producers then the consumption of wastewater can be reduced effectively.

3.2. Energy Efficiency:

Energy consumption can be reduced at national level by building energy efficient infrastructure. It can be a giant step towards the reduction of greenhouse gases emission which are major contributors of climate change. Following are the strategies addressed in LEED which can be incorporated in LDA by-laws to produced energy efficient infrastructure.

3.2.1. Building Orientation

Building orientation is an important factor by which solar energy can be harvested in winter season and building can be saved from direct heat in summer season. As Lahore lies in the region where summer and winter both are intense but summer season lasts longer as compared to winter season.

The building orientation should be so that the sunlight should not enter in the building directly. Otherwise the energy consumption of the buildings will increase because of the usage of cooling systems, which will also result in emission of greenhouse gases.

3.2.2. Insulation

Its purpose is to minimize heat transfer with the proper design and installation of insulation material which can help in reducing the use of cooling system in summer season and heating systems in winter season.

3.2.3. Reduce Heat Island Effect

Heat island effect can be reduced by encouraging plantation on site. By the shade of trees direct exposure of walls to the sun can be reduced. Similarly, by roof vegetation or by implementing the material on roof having high Solar Reflective Index (SRI) the heat island effect can be reduced.

3.2.4. Windows

Windows are the source of light and ventilation inside the buildings. Windows sizes should be addressed in by-laws depending upon the climatic zone and floor area ratio of the buildings and which will fulfill the requirements of Energy Star, version 3 pathway.

4. ANALYSIS:

Table 1: Comparison between LEED credit numbers and LDA clauses

Components	LEED Credit Numbers	Corresponding LDA Regulations
Water Efficiency	WE Prerequisite: Water metering is mandatory	-----
	SS Credit: Storm water quality control increase pervious cover and on-site infiltration to reduce contamination of runoff and disruption of natural hydrology.	-----
	WE Credit # 1.1: Rainwater management system will help to use the rainwater for indoor and outdoor purposes. For indoor use, design the storage tank to hold at least 50 percent of the roof area	Regulation 6.6.6: All buildings to be constructed in future in Lahore should have provision for roof top rainwater harvesting commensurate with its plinth area.
Energy Efficiency	EA Credit: Suitable Building orientation can help in controlling the inside temperature of the building and can save the energy by preventing the usage of energy consuming appliances like lights and bulbs	-----
	EA Credit # 2: Insulation should be according to the Energy Star, version 3 requirements.	-----
	EA Credit # 3: Heat Island Reduction, applies to home. Describes the area for vegetation in homes and the plantation of trees. Which helps to maintain the temperature of the building and shading for hardscape.	Regulation 2.2.3: It only describes the ground coverage and floor area ratio (FAR).

	EA Credit # 4: Windows dimensions should be decided based on climatic zone and window to floor area (WFA) ratio.	-----
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6. CONCLUSIONS:

Following conclusions can be drawn from the conducted study:

- In LDA regulations water metering should be mandatory for the buildings which is not mentioned in current by-laws.
- The LDA by-laws regulation should restrict the pervious areas to recharge ground water and to reduce storm water runoff.
- LDA regulations are lacking in addressing building orientation which should be mentioned in them.
- No regulations related to insulation are mentioned in LDA by-laws. They should also be addressed in by-laws to increase energy efficiency of buildings.
- Regulation 2.2.3 mentions only ground coverage and Floor Area Ratio. Vegetation should be encouraged on open areas.
- Dimensions of windows are not being discussed in LDA by-laws. They should be suggested in by-laws on the basis of climatic zone and Window to Floor Area ratio.

In the next step rules should be defined to restrict the sizes of on-site pervious areas for infiltration, open spaces for vegetation, size of windows and orientation of buildings.

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