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Emerging dimensions of sustainability in institutes of higher education in India

Shaila Bantanur^{a,*}, Mahua Mukherjee^b, R. Shankar^b

^a IIT Roorkee, India

^b Faculty in Department of Architecture and Planning, IIT Roorkee, India

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Abstract

The institutions of higher education provide role models for excellence in education. But also have the added responsibility of providing guidance to the community for social upliftment and environmental sustainability. It becomes imperative, therefore to assess the extent to which sustainable practices have been adopted in these institutions and their adequacy. It is anticipated that a holistic assessment will indicate strengths and weaknesses in sustainability practices so that effective measures can be taken to initiate the creation of a more sustainable environment. To achieve the foregoing objective parameters like Land use and Energy have been identified. An analysis of the basic sustainability parameters with regard to the various institutional surveys indicates the changing trends over the years. The trend reflects institutional growth, improvement in the economy and growing of awareness of sustaining the ecological environment. However, the extent to which each parameter is addressed varies from institution to institution, as well as the geographical location and climatic variations due to the diverse nature of these two factors in the Indian context. Increasing awareness issues pertaining to sustainability in institutions of higher education is reflected by relevant practices adopted, however it is expected that initial momentum generated in this direction will lead to further adoption of sustainable practices consistent with the cultural geographical and socio economic scenario prevailing.

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1. Introduction

Educational campuses are a part of the urban ecosystem. It is important to gauge various activities within a higher educational campuses with regard to sustainability, within the immediate environ-the campus, so that they may

be groomed to shoulder the responsibility towards achieving a sustainable environment. A clearer understanding of the need for sustainability and how it can be achieved will to some extent enable to contribute towards a sustainable planet-to which the need is increasing with the passage of time. Sustainability as applicable to Higher Educational Campus is a process of developing and managing campuses through efficient use of renewable resources and other green practices. Sustainability practices differ from campus to campus and the perception about the sustainability differs from person to person. Some believe that they have

* Corresponding author at: IIT Roorkee, India.

E-mail address: shailabunty@gmail.com (S. Bantanur).

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met the challenges of sustainability through signing National or International declarations (Wright, 2002) and for some; it may be limited to introducing Master plans, Environmental plans, Environmental guidelines etc. (Velazquez et al., 2006). Energy consumption per square foot has been analysed for Rowan University (Peter et al., 2004). Works have been reported in Japan on the verification of energy consumption through investigations of energy consumed in the entire campus (Watanabe et al., 2005). A study was also conducted to review all the Chinese practices on establishing green universities including best practices and relevant policies. Another study called, a systems transformation analysis of seven case studies from seven worldwide universities was conducted and the evaluation was based on tri-dimensional Framework-Level-Actors (FLA) (Ferrer-Balas et al. (2008). Lukman et al. (2009) evaluated environmental performance of the University of Maribor on the basis of life cycle analysis. Ozawa-Meida et al. (2013) conducted a consumption based carbon footprint study for the UK University. Environmental Management System (EMS) was adopted by European Universities (Disterheft et al., 2012; Shaila et al., 2012). Emphasis more on Physical planning & Land use structure to make the campus more sustainable. Built spaces require energy to carry out various activities within. Energy is an important parameter which measurably contributes in making the campuses more sustainable. As the student's intake increases, new buildings are constructed resulting in an increase in the energy consumption. Various studies have been conducted on energy consumption structures to investigate the critical areas. Educational campuses cover a huge area where they have the higher potential of generating the energy from various renewable energy resources like Biomass, Solar thermal, Solar photovoltaic, Geothermal and Wind energy (Shaila et al., 2012).

2. Introduction to study area

Campus Sustainability in India is in its very nascent stage, not having been recognised even by many of the leading institutions at National level. Case study approach is employed in this paper, to identify Land use structure and actual Energy consumption structure along with sustainability initiatives undertaken. Indian Institute of Science (IISc) Bengaluru India and Indian Institute of Technology Kanpur (IITK) were selected located in different climatic zones (Fig. 1).

Brief profile of the institutions was collected from the respective institutions as shown in Table 1. Total population of Student, Faculty and Staff was collected from Dean Academics of the respective institutions to calculate per capita consumption of energy. Population trend over five years (2007–2012) of Student, Faculty and Staff is taken for study by considering 2007 as a baseline year (Fig. 2).

3. Data collection

Data were collected from administrators and service providers with regard to the quantities associated with each parameter and the measures adopted to make the environment sustainable. The data so collected, especially with regard to quantification of parameters were lacking consistency. IITK had adopted a data centric approach in keeping with emerging trends where as IISc had, maintained records based on past practices.

Based on the information provided by the institution, required data have been calculated. Like, in IISc, Plinth area is calculated based on AutoCAD Drawing of Campus Master Plan and to calculate built up area building photographs are taken to observe the number of floors. Thus, Built up area is calculated by multiplying plinth area by number of floors. Areas covered under roads, playgrounds, forest/farm land and unmanaged green spaces is calculated based on the AutoCAD drawing of Campus Master Plan.

Similarly, detailed data were not available in IISc, related to monthly power consumption in buildings like Institutional/Administrative, hostels and other facility buildings from the year 2007 to 2012. Whereas IITK, has detailed power consumption data on all types of buildings present in it (Table 2).

4. Methodology

The two select campuses lie in two different climatic zones of India. The select campuses were visited personally and primary data are collected from various departments of the institutions both by online and offline. Focus is given on Land use structure and Energy consumption structure; further detailed area covered under all the buildings was considered for their percentage distribution with respect to total campus area. Per capita distribution of area under various land uses has been calculated for both the institutions for comparative analysis. Data on Power consumption structure from 2007 to 2012 are considered to study the consumption trends and further per capita Power consumption has been calculated to draw the inferences. Finally, per student built area provided by the institutions is correlated with the per capita Power consumption to draw inferences.

4.1. Land use structure

Land use structures of both the institutions are analysed in two ways namely; Total built up area analysis and area covered by plinth area (footprint area) analysis. Built up area of buildings are grouped into four zones namely; Institutional and Administrative, Hostel, Staff quarters and Facility buildings. Foot print area of Land uses are grouped into ten zones namely; Institutional and Administrative, Hostels, Staff quarters, Facility buildings, Roads, Playgrounds, Forest/Farm land, Managed green spaces, Unmanaged green spaces and Water body. Depending on the areas being utilised by occupants in

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