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Review Article

Sustainability based on indigenous materials of building construction

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Construction of shelter is one of the basic and prime needs of human civilization. With the passage of time, the basic of construction of this shelter have evolved from simple caves to magnificent houses, palaces and like. Similar is the case with building materials and construction industry that has evolved from the use of simple straw, mud, thatch, and slates to modern day conventional building material like bricks, reinforced cement concrete, tiles, glass, steel, prefabricated materials and many more. As per research studies by the Shukla et al. [1] and Morel et al. [2], building industry today accounts for majority of energy usage for different building construction purposes. However, some research studies have also shown that if in place of conventional building materials indigenous or vernacular natural building materials are used for construction purposes, then a lot of energy can be saved which is often involved in manufacturing and transportation process of building materials. For this reason many researcher round the globe like Henri and Houben [3], Sharma et al. [4] and Kafodya et al. [5], are looking for sustainable building materials which can be advantageously propagated for minimizing the energy involved in building construction processes and have least negative impacts on the environment. In this succession vernacular and natural material like earth or soil is of high importance and very useful in terms of easy availability and workability, low cost of construction and maintenance, easy repair and maintenance, high energy efficiency, better acoustical advantages and like as discussed by Sharma et al. [6]. Other vernacular materials like bamboo, wood have been studied in this regard by Quiteria et al. [7]. It also reflects that vernacular architecture is increasingly gaining international research interest for revival and is looked upon as better alternative for partly or completely replacing modern conventional building construction materials.

Earth or soil is used in many different varieties for construction of houses such as adobe, rammed earth, cob,

wattle and daub, compressed soil blocks etc. as discussed by Delgado and Guerrero [8] and Falceto et al. [9]. This different use of earth is influenced by many factors like climatic factors, topography and living requirements of inhabitants of the area. Recent years have seen popularity of use of compressed earth blocks as reported by Reddy et al. [10]. However, use of sundried and unburnt or unbaked earth in building construction dates back to more a period of than thousand years as discussed by Minke [11].

In this line, in addition to use of indigenous building material, many researchers have also worked on incorporation of adaptive passive design measures which were already used in vernacular dwellings and now can be advantageously amalgamated in modern buildings as a remedy for the improving energy efficiency, decreasing emissions of harmful gases and dependency on nonrenewable building resources occurring in the building sector today. Use of indigenous material and practices of vernacular architecture in building construction over the time and time again have proven to be more sustainable and energy efficient than modern day conventional architecture practices.

The indigenous building construction materials very effectively maintain indoor thermal comfort environment and ultimately reduces the consumption of external energy through various measures like heating and cooling equipment which are also called active measures of energy as discussed by Priya et al. [12]. Involving the use of solar passive techniques, these indigenous and vernacular materials are not only sustainable resources but also provide comfortable indoors in a planned passive way as discussed by Chandel et al. [13]. Research studies have shown that the thermal comfort performance and evaluation of vernacular and traditional houses is better than modern conventional houses as studied by Singh et al. [14]. Thermal comfort depends on a number of elements like indoor



temperature, outdoor temperature, and relative humidity and clothing pattern of the residents of the house under study as shown by Singh et al. [15,16]. Therefore modern day planners, architects, designers, civil engineers, site planners and like people all involved in building construction processes in one way or the other must rethink about their choice of building construction materials for the reasons of sustainability and better green environment. Opting for healthy building choices will get reflected through the natural resources upon the environment which we are leaving for our future generations to come and which is the true essence of sustainability.

Letter

In context of above increasing research on sustainable building materials and also increasing environmental issues causing concern, it is important for the international research community to explore more ways in which the sustainable and indigenous building construction materials and techniques can be revisited and reused in amalgamation with modern lifestyle requirements.

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