

Chapter 5

Earth Building Materials, Production, and Construction Techniques

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EXECUTIVE SUMMARY

Building materials and construction technology are strongly interrelated with the pillars for sustainable development (e.g. environment, society economy, culture and politics). Earth Building, an 11,000-year-old practice of building using sustainable and earth materials, is practiced worldwide. Earth has been used to construct walls, floors, roofs, and even furniture. Today it is estimated that between 33-50% of the world's population is housed in earth homes. This chapter reviews the two-year process of earth buildings and earth architecture carried out by the Department of Architecture Faculty of Built Environment and Engineering at National University of Malaysia (UKM). The current research emphasis is on the types, construction methods, and architectural aspects of earth buildings and earth architecture. The current manuscript compares type of earth buildings and their properties and applications based on building materials and architectural aspects in construction.

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ORGANIZATIONAL BACKGROUND

The sustainable development concept seems to be a promising approach toward global resource depletion and environmental pollution. From viewpoint of building materials and construction techniques, design to reduce pollution and resource consumptions plays a key role in sustainable developments whereas, satisfying demand and development as one part and keeping ecological environment as the other part are two critical issues that should keep balance. Innovation and improvement in building materials and construction methods to ameliorate sustainable development, Provide high quality of life for the occupants and users while reduction in environmental global and local impacts through conservation of energy and resources and protection of the site with economic benefits of low energy cost buildings take place (Hyde, 2008).

Based on the fundamental of sustainable development, building materials and construction technology should have specific characteristics to achieve the goals including the reduction in need of energy, design with sustainable and recyclable materials with continuous benefits of building materials as post-consumer resource and manipulating the widest possible renewable source of energy in sustainable design (Li 2011).

Building materials are known as the third largest group of CO₂ emitting in industry. Among building industry materials most of the amount of emitted CO₂ is produced by cement (Habert & Billard, 2010). Global warming is one of the consequences of increase in CO₂ level and influence the environmental, cultural, economic and social aspect of whole world. In parallel, Sustainable development in building materials suggest the application of one of the ancient building materials, Rammed earth, which is made up of sand, gravel and clay and water to form or mold. Rammed earth technology belong to China 2000 B.C. and is consider as one of the sustainable materials of the future design of buildings due to the presence of locally sourced Rammed earth materials and reduction the reliance on cement in building materials. This was an example regarding pros and cons of sustainable and industrial building material. Two significant future achievement of sustainability in urban community is the availability of cheap energy and environmental protection. The target of sustainability in building materials, production and construction techniques focuses on defined and set construction techniques in different places for achievable minimum energy building due to environmental benefits, economic achievements, thermal comfort and sustainable energy (Hyde, 2008).

The raw material used for process producing an earth building material is here-after described in this study as “earth mix”. Subsoil is the principal component of earth mix, occurring naturally between the layers of topsoil and parent rock material (Norton, 1986). Subsoil or substrata, is the layer of soil placed under the topsoil

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