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Effect of spatial ambience on thermal adaptation in tropics: Case of free-running shared spaces in coastal hotels of Sri Lanka

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Abstract

Accommodation sector accounts for 21% of the global CO_2 emissions and the competitiveness of tourism industry in future is primarily depended on hotel energy efficiency which plays a vital role in eco-efficiency of tourist operations.

Tourists on pleasure travel prefer hotels which promote environmentally friendly built environment with free-running interiors. Thus the study investigates the design implications of free-running shared spaces and the influence of spatial ambience on thermal adaptation of tourists in tropical coastal hotels. Selected case studies are most popular semi-residential coastal hotels designed by the renowned architect Geoffrey Bawa and the methodology is consists of indoor thermal investigation, structured questionnaire and interview survey.

Thermal investigation informs a heat stress indoor thermal environments in the shared spaces. Comparison of the actual sensation with the predicted comfort votes explicitly highlights a discrepancy between the two. Thermally uncomfortable warm interiors are being predominantly perceived as neutral to cool thermal environments. Thus indicates the shared spaces demonstrate a stimulus for adaptive approach and informs to explore the factors influencing the psychological adaptation.

Actual experiences of the tourists relaxing in the pool lobby of Heritance (PLH) were evident for the optimum effect of thermal adaptation in comparison to other shared spaces. The attributes of spatial ambience has influenced the feeling of thermal pleasure and pleasantness. These spatial experiences generated through openness and integration of surrounding environment has promoted psychological adaptation of the tourists relaxing in this space to tolerate heat stress indoor microclimates of tropics. Thus the findings of this research determine significance of spatial ambience as a strategy for energy efficiency of tropical hotels.

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Keywords: Coastal hotels; tropics; shared spaces; psychological adaptation; pleasantness

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1. Introduction

Tourism is one of the world's largest industries which support the economic growth of one third of the developing countries. Accommodation sector accounts for 21% of the global CO_2 emissions and the hotels rank among the top five types of buildings in the service sector for energy consumption. Nearly half of these emissions are shared by the hotels in the regions of North America (8%) and Asia pacific (6%) [1].With the current high growth emission trends in tourism, the sector may become a leading global source of greenhouse gas emissions in the future [2]. While climate change imposes greater threats on tourist destinations prioritization of sustainable tourism development is of prime importance. Thus the sustainable tourism policy recognizes to minimize the negative impacts of tourism on society and environment and maximize its positive contribution to conserve nature [3].

The "Agenda 21 for Tourism and Travel Industry" introduced by the World Travel and Tourism Council in cooperation with the World Tourism Organization informs the resource management and energy use as one of the prime issues of tourism [4]. Thus the competitiveness of tourism industry in future is primarily depended on hotel energy efficiency which plays a vital role in eco-efficiency of tourist operations.

Many studies conducted in the past decade discussed the energy use of hotels in terms of total energy use and Energy Utility Index (EUI). These studies were focused on hotels in few European countries, UK, New Zealand, Australia and countries in Asia such as Hong Kong, Singapore, Japan, Taiwan and Vietnam. Climate has an impact on EUI and higher values correspond to both the hot [5, 6] and cold [7, 8] weather. Moreover revealed electricity as the primary source of energy which accounts for 53% to 83% of the average total energy consumed [5, 6, 9, 10].

Air-conditioning dominates the hotel interiors and increases the annual energy consumption by 27% -77% depending on the type of the system [11]. Moreover, some studies were focused on energy use profiles in relation to building envelopes and energy saving scenarios is proposed for envelope thermal efficiency.

Resource efficiency as a major aim of the environmentally sustainable tourism illustrates two major concerns. One of the concerns is energy efficiency and application of renewable energy sources. Thus the existing literature sufficiently discussed the energy consumption and demand side energy management mechanisms for mechanical efficiency. However extremely limited research focus is noticeable on sustainable designs which promote resource efficiency by maximizing the use of natural light and ventilation in tourist facilities [3]. The sustainable development goal 12 on sustainable consumption and production of 2030 sustainable development agenda establishes sustainable tourism and sustainable building and construction as the sector focused task forces of this goal [12].

Thus the scope of this study is broadly focused on environmentally sustainable tourism interventions with a target towards resource efficiency through sustainable hotel designs. These designs integrate the natural setting of its immediate surrounding as an energy saving measure. Since there is an increasing trend to get attracted towards coastal tourism destinations in the tropics, less research interest is apparent on island countries. Thus, this research took place in Sri Lanka an island country on its way to become a major tourist destination of South Asia.

1.1. An overview of tourism in Sri Lanka

Tourist arrivals and accommodation in Sri Lanka increases by 25% every year and the Tourism Development Authority estimates an increase of 45,000 hotel rooms from the year 2011 to 2016 [13]. Hotel sector in Sri Lanka consumes 4-5% of the generated electricity of the country. Moreover the cost for electricity constitutes 18% of the total operational expenditure of a hotel, of which more than half is consumed for air-conditioning and 20% is for lighting [14]. With the current increasing trend in tourist arrivals, energy efficiency of tropical hotel buildings is one of the major challenges for the initiative on "greening" of tourism.

Coastal tourism on pleasure travel dominates the tourism and focuses on Southern coasts of the country. These tourists prefer hotels which promote environmentally friendly built environment with free-running interiors. However, except for very few hotels majority are unable to satisfy the aspiration of current tourist due to the widespread practice to patronize air-conditioned interiors for both private and shared spaces of a hotel.

Facility zoning of a hotel is composes of three distinct zones such as guest rooms, shared and service areas. Although there are limitations in promoting natural ventilation in private and service areas a greater potential is embedded in the design of shared spaces of tropical hotels. Thus the study investigates the design implications of free-running shared spaces and the influence of spatial ambience on thermal adaptation of tourists in tropics.