UNIVERSITI TEKNOLOGI MARA

ARCHITECTURAL DESIGN STRATEGIES FOR ENHANCING GREEN ROOF PERMEABILITY AS INCLUSIVE URBAN PUBLIC REALMS IN MALAYSIAN CITIES

AZLAN ARIFF BIN ALI ARIFF

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ABSTRACT

Rapid urbanisation in Malaysian cities has accelerated the depletion of green spaces, demanding the need for innovative architectural strategies that promote environmental and social resilience. Green roofs, while widely recognised for their ecological benefits, remain underutilised as inclusive public spaces. This research addresses that gap with the aim to develop architectural design strategies to enhance the permeability and accessibility of green roofs, positioning them as integral components of the urban public realm. The study pursues four objectives; to identify key parameters of building accessibility through theoretical and precedent analyses of urban connectivity, evaluate these parameters via building simulations and assessments reflecting public-space functions, formulate design strategies derived from mixed-method analysis, and validate the resulting framework through expert and stakeholder feedback. Using convergent parallel mixed-methods approach, the study integrates thematic analysis, document reviews, DepthmapX space syntax simulations, observational building assessments, and focus group discussions. Findings reveal nine critical parameters, namely location, signage, safety, capacity, amenities, maintenance, accessibility for all, community engagement, and educational integration that collectively inform the theoretical and conceptual framework specifically aimed towards developing architectural strategies for enhancing green roof permeability as inclusive urban public realm in Malaysian cities. These frameworks provide a structured reference for architects and planners to assess and design green roofs as accessible, socially engaging, and environmentally responsive public spaces. The research contributes to Sustainable Development Goals (SDG 10 and SDG 11) by promoting inclusive design principles within urban sustainability agendas. Its outcomes offer practical implications to inform urban policy, architectural education, and professional design practice, advancing the discourse on socially sustainable architecture and reinforcing the role of green roofs as inclusive permeable extensions of public realm within the built environment in Malaysian cities.

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CHAPTER 1
INTRODUCTION

1.1 Research Background

In current sprawling growth of urban fabric where building footprints predominates green lung, green roof has become an ideal solution towards reducing carbon footprints. More green roofs are welcomed within urban fabric all over the world and recognised as part of sustainable approach (Xie et al., 2024). In Malaysia, implementation of green roof is evident through Green Building Index (GBI) Assessment Tool for Non-Residential Building (NRNC) where roof application option should constitute at least 50% vegetated surface of coverage (Aun, 2009).

With adaptation of green roofs onto various typologies of green building, undoubtedly green roof has found its reputation as potent sustainable feature with significant outcomes in terms of energy efficiency (Yüksel & Sözer, 2019). While green roofs may require special expertise and unconventional construction which may result in high initial capital, the positive outcome of green roof can be benefited throughout extended building lifespan, making most of sustainable-focused project willingly include green roof as part of investment.

While the glory brought by the green roof is only viewed in terms of its forte in sustainable and green approach, the potential of green roof as public space are often overlooked. Green roofs are typically situated on top of building with open area and greeneries surrounding which makes a great outdoor venue for various recreational space programs (Taylor, 2019). However, due to some unresolved misconceptions and the failure of looking the potential of green roofs in different perspectives, makes the usage of green roof is not fully optimised and stagnant. This is evident from the use of green roof as merely healing view (O'Hara et al., 2022) instead of getting public closer to nature and to actually engage with tangible experience of green roofs (Ariff et al., 2024).

Urban densification has compelled contemporary cities to explore new forms of green infrastructure that can restore ecological balance while accommodating human activity within compact environments. Among these, the green roof has evolved beyond its conventional ecological role, increasingly positioned as a potential extension of the