



Building adaption model in assessing adaption potential of public housing in Singapore

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ABSTRACT

Building adaptation is instrumental in curbing building degradation and urban dilapidation. Owing to budget constraint, the policy decision makers who manage substantial public buildings always face the problems of which existing buildings should be selected for adaptation. A tool is required to aid them to prioritise existing buildings based on their adaptation potential. Thus, the aim of this study is to develop a model which acts as a tool for the policy decision makers to perform the challenging work of prioritising the existing public housing for adaption. This research presents a conceptual framework for assessing adaptation potential of existing public housing in Singapore and discusses its validation process. The results show that the proposed approach is effective in estimating the adaptation potential of existing residential buildings. In practice, the decision makers can use this model to rank existing buildings' adaptation potential and select those buildings with high potential for adaptation, with the intention to optimise the allocation of a tight building adaptation budget.

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1. Introduction

Public housing accommodates 82% of Singaporeans, and about 95% of public housing occupants own their apartments on 99-year leases [1,2]. Nevertheless, when Singapore first gained its national independence from Malaysia, it encountered an acute problem of housing shortage for the population. The Singapore government therefore launched the Home Ownership Programme to seek the goal of 'a roof over every head'. As a result, substantial public residential buildings (better known as the Housing and Development Board (HDB) estates) were built in the 1970s and 1980s, accounting for nearly one-third of the total HDB estates. Compared with new HDB estates, those built in the 1970s and 1980s have become less attractive to the young generation for two reasons. First, the living standard in Singapore continues to be enhanced [3]. Second, public buildings built in the 1970s and 1980s were to shelter the population, but not to provide them with highly structured and systematic buildings [4].

In order to solve this problem, the Singapore government introduced a long-term public housing renewal policy [4], embracing a set of heavily subsidised building adaptation programmes, such as LUP (Lift Upgrading Programme), SERS (Selective En-bloc Redevelopment Scheme), HIP (Home Improvement Programme), and NRP

(Neighbourhood Renewable Programme). The extent of the adaptation works for various programmes is provided in Table 1, and these programmes are only implemented if at least 75% of the eligible HDB households want them [3].

Nevertheless, current policies for building adaptation in Singapore are made on the basis of 'rule of thumb' by merely considering a limited number of criteria: building age, building conditions, a good geographical spread of precincts across HDB estates, and the degree of occupants' support for adaptation programmes [1]; decision makers therefore always face the problem of buildings needing adaptation, since they do not have a scientific way to identify the adaptation potential for a building. Besides, public housing adaptation projects lay considerable financial pressure on the government. In 2008, for instance, the expenditure for the Singapore public housing adaptation was (past tense) approximately 447.5 million US dollars, accounting for 15% of the HDB annual spending budget [1]; the public housing adaptation budget is so tight that decision makers have to prioritise existing buildings according to their adaptation potential and only select existing buildings that have high potential for this [5].

Previous research has studied a number of factors that may be relevant to the determination of building adaptation potential (BAP). Langston et al. [5] noted that the assessment of building adaptive reuse opportunities relied on factors like expected useful building lifespan, building age, and housing obsolescence. Wilkinson et al. [6] developed a building attribute database in which adaptation assessment factors

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