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A framework for conservation construction plan model (CCPM)

Anqi WANG\textsuperscript{a}, Edwin CHAN\textsuperscript{a,}\textsuperscript{*}, Stanley YEUNG\textsuperscript{a}

\textsuperscript{a}The Hong Kong Polytechnic University, Hong Hum, Kowloon, Hong Kong, China

Abstract

Land development and construction activities influence adversely on the ecological environment, in most circumstances. However, the growing awareness of sustainable development and peoples’ willingness to pay for natural landscapes enable developers to gain rather than lose profit from land conservation activities. Therefore, confronting the conflict of land development and land conservation, it is important to understand the relationships between construction plan and its conservation implications as well as economic benefits. This study proposed a framework of conservation construction plan model (CCPM), and three parts of the model framework were represented. Literatures of landscape features and their relationship with housing prices were reviewed, as the basis of model design. This study contribution to the body of knowledge with a set of factors, related to land use structure, landscape environment, conservation value, residential development characteristics, construction density, housing price, etc. which were identified and considered in the model. It also contribute the CCPM to show construction plan scenarios with different land use structures and patterns and to compare the scenarios with changes in economic and environment values, etc. The model framework would contribute to creative construction plans, as a supporting tool for making scientific decisions, preserving land ecological value and maximizing the integrated utility of land resources.

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1. Introduction

Due to the environment pressure on construction works and the increasing requirement for resource efficiency, the concept of sustainable development becomes more and more important in construction industry. The competitiveness

* Corresponding author. Edwin CHAN. Tel.:852-2766 5800.
E-mail address: bsedchan@polyu.edu.hk
in construction market could be remarkably influenced by contribution of sustainable construction practice. [1] However, the costs and benefits lose related to sustainable construction become great barriers to its wide spreading. The question of whether environmental performance in construction could increase or reduce the projects’ profitability was fiercely debated in industry and academia. To reach the target of improving in both environmental and economic or financial performance, mechanisms of better access to certain markets, differentiating products, costs adjusting, promoting environment performance and environmental management etc. were pointed out and applied to practice. [2, 3]

The planning and design phases in construction offered the greatest potential for influencing project performance. [4] Construction plan also played a vital role in the improving the environment performance of construction projects, determining the land use layout and land cover distribution of the construction site. Since land cover change from natural land to developed land would adversely affect soil, vegetation, water quality, and other ecological resources [5, 6], the land be preserved for natural conservation and landscaping design has higher environmental or ecological value than developed land. Therefore, to increase conservation land and reduce developed land would be effective to achieve sustainable construction, especially for mega infrastructure projects and large area development. In order to conduct actual implementation, it is important to understand the relationships between land use layout and its environmental implications as well as economic benefits, which should be explained and emphasized, including the higher net profits, increased asset values, etc. [7]

To explore the relationship between land conservation and economic benefits in construction plan, a framework for developing the conservation construction plan model (CCPM) was proposed in this study. Whether peoples’ willingness to pay for natural landscapes enables developers to gain rather than lose profit from land conservation activities could be answered with this model. To figure out the relationship between landscape features and housing prices, related literatures were first reviewed. The principles of making different scenarios by adjusting planning factors and evaluating different plans were then introduced. And processes of model running were illustrated with flow charts. The model is proposed to be used not only to theoretically obtain the optimal conservation construction plan, but also to evaluate and compare different construction plan scenarios for practical decision making.

2. Research Methods

2.1. Landscape features and housing prices

Land values were influenced by construction planning factors, such as lot size, landscape feature, density, etc. For example, higher housing values in a subdivision may result from smaller blocks, interconnected greenways, and a single entrance that provides a sense of arrival.[8, 8a] Many researchers also identified the positive effects of nature landscaping on housing price. These landscape features included neighborhood association-owned forest and water, as well as public parks.[9, 10] Relationship between landscape features and housing prices the basis of CCPM, indicating financial benefit of conservation plan as well as its potential market demand. Literatures using hedonic price model to explore the relationship between landscape features and house prices were reviewed, it is suggested that preserved open space, and grass or water views would raise housing price by 5% [11] to 13.2% [12], varied among international cities and cases[13, 14]. This premium value may increase as the distance to the open space shortened. [15, 22] It indicates that although the land for open space could not be sold directly for housing supply, they produce premium value to house nearby through improved living environment.

2.2. Construction planning factors and revenue

A set of factors in construction planning influence the amount of housing supply, which determined the revenue of the construction project. According to “Measures for Formulating City Planning” in China, land use category, site coverage, building height, plot ratio, greening rate, regulations of infrastructure and public service facilities were the compulsory contents in regulatory plan for detailed land development control. Governments and developers could negotiate about land sale conditions and these construction planning factors would be adjusted to reach a consensus. Normally for developers, the more houses were sold, the more revenue would be earned. Therefore, they would strive
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