

國立臺北大學九十七學年度第二學期博士學位論文提要

論文題目：以道路路網為基礎之綠廊道網絡規劃模式 論文頁數：241

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論文提要內容：

西元 1990 年代初期，為處理都市化現象所造成景觀機能逐漸被破壞的問題，「綠廊道網絡」的理念逐漸在歐美各都市發展且越顯重要，希冀藉此提昇景觀環境的品質與提供人類戶外娛樂活動的場所。其中，道路路網雖然是造成景觀碎裂的禍首之一，但亦可以被利用為人工廊道系統進行縫補，例如以道路網為基礎建構綠廊道網絡系統，來連結都市內的開放空間與公園綠地，達到景觀美學與休憩空間之延續。然而，在都市建立綠廊道網絡需同時顧及景觀(landscape)與社會(society)兩個系統與目標，惟目前國內外文獻在綠廊道網絡規劃僅探討評估指標，或僅著重於景觀的分析，忽略與社會向度間的整合與串聯；此外，若在經費有限之情況下欲提高綠廊道網絡的規劃價值與可行性，則必須對綠廊道規劃期程作有效的安排，故如何建立具有多方面考量、有系統與具有期程性之綠廊道網絡規劃方法，是必須進行深入分析與探討的議題。

緣此，本研究目的在於同時考量景觀與社會向度，並且以既有道路路網為基礎，分別建立整體及期程之都市綠廊道網絡規劃模式，供規劃者參考應用。研究首先探討綠廊道網絡相關理論與規劃文獻，歸結出都市綠廊道網絡發展所應考量之規劃向度與分析之基礎；繼而利用階層分析法(AHP)，釐清綠廊道網絡應考量之重要因素，並建構都市綠廊道網絡規劃之目標體系；第三部份針對都市公園綠地系統之空間結構與格局，進行景觀結構分析，作為後續模式應用之基礎；第四部份則利用多目標 0-1 規劃方法建立整體都市綠廊道網絡規劃模式，在專案規劃與預算充裕的情形下，找出哪些路段適合做為綠廊道來連接都市中之公園綠地，形成完整之綠廊道網絡系統；第五部分納入時間因素、嵌塊體連結之先後順序與灰色規劃方法，在部份參數與預算資訊不明確的情況下，建構多目標灰色 0-1 規劃之期程都市綠廊道網絡規劃模式，並且利用本研究設計之灰色一階演算法進行模式求解，尋找最有利之期程策略，以提高綠廊道網絡施行之可行性。此外，本研究將整體及期程之都市綠廊道網絡規劃模式實際應用於台北市，產生多個替選方案供市政府都市發展、運輸系統與環境景觀規劃等部門進行規劃之參考。根據上述之研究成果，可歸結以下幾項研究貢獻：

- 一、以多目標規劃方法，建立以道路路網為基礎之都市綠廊道網絡規劃模式，系統化地權衡景觀與社會兩個向度，並且納入時間因素、嵌塊體連結之先後順序與灰色規劃方法，除了能夠更切合實際需要地規劃綠廊道網絡配置路線，更是過去規劃與研究所尚未探討的。
- 二、本研究結合灰色規劃方法與 Jahanshahloo et al.(2005)所提出的一階演算法，設計出一套多目標灰色 0-1 規劃之求解方法，能夠找出多目標灰色 0-1 規劃之非劣解集合，以提供規劃者多元的決策空間。
- 三、本研究所進行的實例分析結果，可提供台北市政府進行都市綠廊道網絡規劃之參考，並且發現至多可增加台北市 410,649 平方公尺的綠地面積，約 0.15% 的綠敷率，以及將既有綠地串連為網絡的效果。

關鍵詞：綠廊道、網絡規劃模式、多目標 0-1 規劃、灰色規劃、一階演算法。

ABSTRACT

THE MODEL FOR URBAN GREENWAY NETWORK PLANNING BASED ON THE ROAD NETWORK SYSTEM

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April 2009

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Greenway networks have received increasing attention recently due to its importance in solving the landscape and human problems caused by urbanization development. Despite roads being one of the most destructive elements in the landscape fragmentation process, they can be adopted as corridors to connect fragmented green space and provide recreational space in urban areas. Developing greenway networks in urban areas should consider both landscape and social needs, but most previously studies focus only on summarizing greenway planning guidelines and landscape analysis by ignoring integrations with social needs. Furthermore, development of scheduling greenway network is necessary when budget limitation. Therefore, developing a systematic approach with varied and time-frame considerations is essential for greenway network planning.

This study aims at developing the greenway network planning (GNP) and greenway network scheduling (GNS) models based on the existing road network to consider landscape and social needs simultaneously. This study consists of seven parts. First, the research scopes including motivation, purpose, and methodology were defined. Secondly, the essential factors that should be considered in urban greenway network planning were explored via literature and theory review. Thirdly, the analytic hierarchy process was used to identify the importance of the considered factors. Assessing the spatial structure of green space in Taipei City was presented the forth part, and the assessment results were prepared for model applications. In the fifth part, 0-1 multi-objective programming was designed for the GNP model, and the one-stage algorithm approach was employed to solve the model. Sixthly, time scheduling, patch connecting order and grey programming method have been subsumed to build the GNS model, using grey 0-1 multi-objective programming, and the grey one-stage algorithm was developed to generate alternative greenway network scheduling programs. Finally, the GNP and GNS models were applied in the case study of Taipei City, and the alternative greenway network programs could inform the local planning process for integrating urban development, transportation and landscape planning.

There are three contributions that have been drawn in this study:

1. The approach of using the multi-objective programming method to deal with the trade-off between landscape and social needs, and subsuming the time scheduling and patch connection priorities is a pioneer research for greenway studies.
2. The grey one-stage algorithm combining the grey programming method and the one-stage algorithm can be applied to generate all non-dominated solutions for the grey multi-objective 0-1 programming problems and provides flexible decision space to planners.
3. The case study of Taipei City provides a reference to local government for the developing greenway network planning programs, which suggests to increasing 410,649 m² green spaces, about 0.15% green covering rate, at most and reaching the purpose of connecting urban park systems.

Key words: greenway, network design problem, multi-objective programming, grey programming, one-stage algorithm

