

國立臺灣大學園藝暨景觀學系

綠地生態系統服務研究室Greenland Ecosystem Services Lab, GES LAB



本研究室為綠地生態系統服務研究室（Greenland Ecosystem Services Lab, GES LAB），研究室始於2012年8月，主要研究綠屋頂、立面綠化、公園綠地等綠色基盤在都市環境中的生態系統服務，包括微氣候調節效益、改善空氣品質、休閒遊憩效益等，期在現今氣候變遷、都市化、環境品質下降的情況下，對永續發展提供助益。

生態系統服務(ecosystem services, ES)係指人類直接或間接從生態系統中受益，其涵蓋許多生態、生物物理、與社會價值的多面向概念，由自然資產透過結構、過程與功能，提供產品與服務予人類，包括食物供給、氣候調節、空氣淨化、休閒遊憩、美學體驗等，進而增進人類福祉。都市是人類聚居的主要空間，都市化是地表上重大的地貌改變，但儘管如此，都市仍然依賴生態系統提供的許多服務，然而都市擴張與都市發展規模、都市生活型態卻造成都市內部與都市外部自然環境的破壞，引發氣候變遷、生態系統與環境品質下降的危機，關注與提升生態系統服務將能增進環境品質、增進人類福祉、邁向永續發展。



研究室主持人

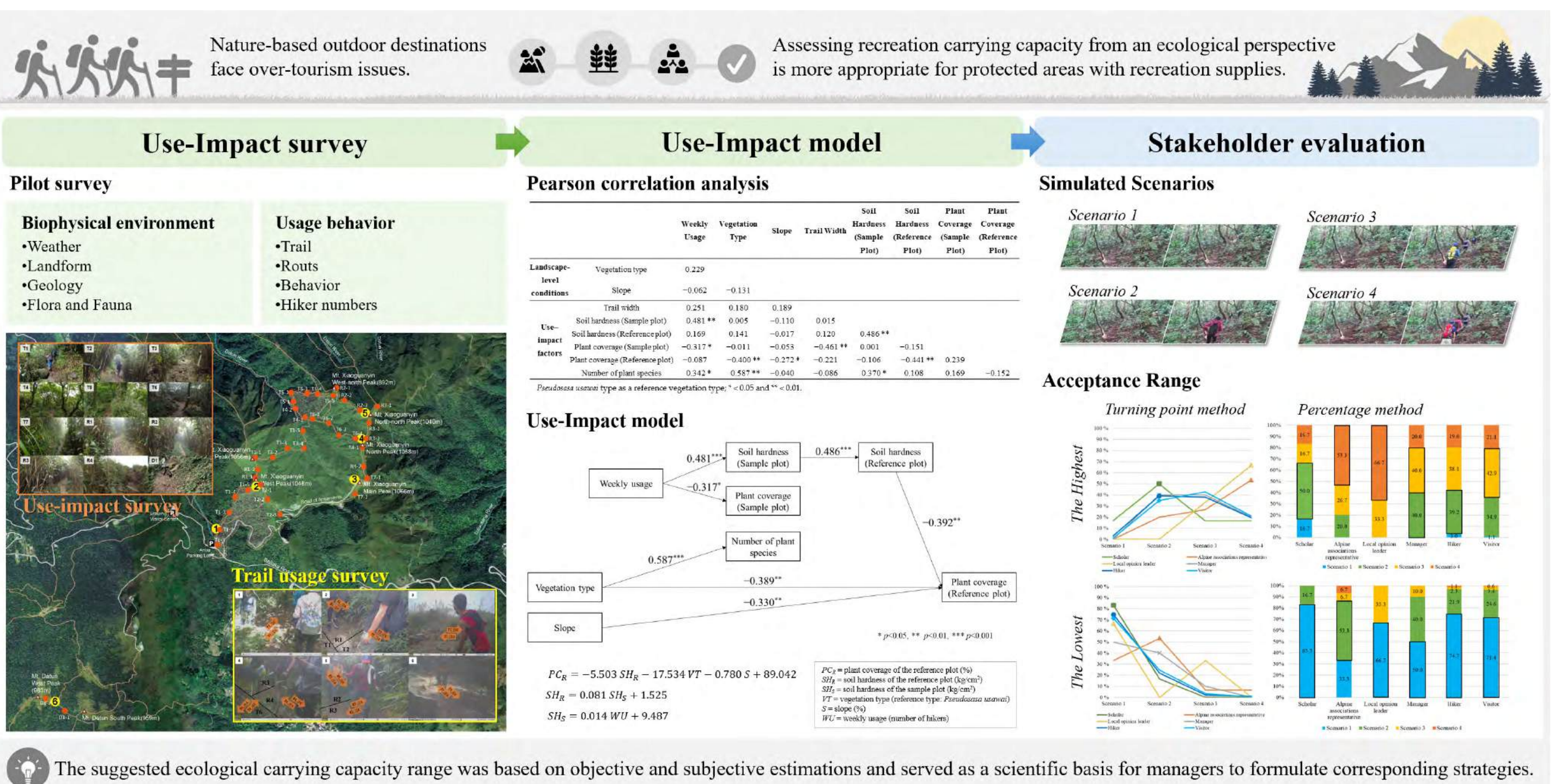
林寶秀 教授

生態系統服務評估與製圖
景觀規劃設計
景觀生態
綠地系統與綠色基盤
綠屋頂設計與效益評估
遊憩供給與需求

研究成果

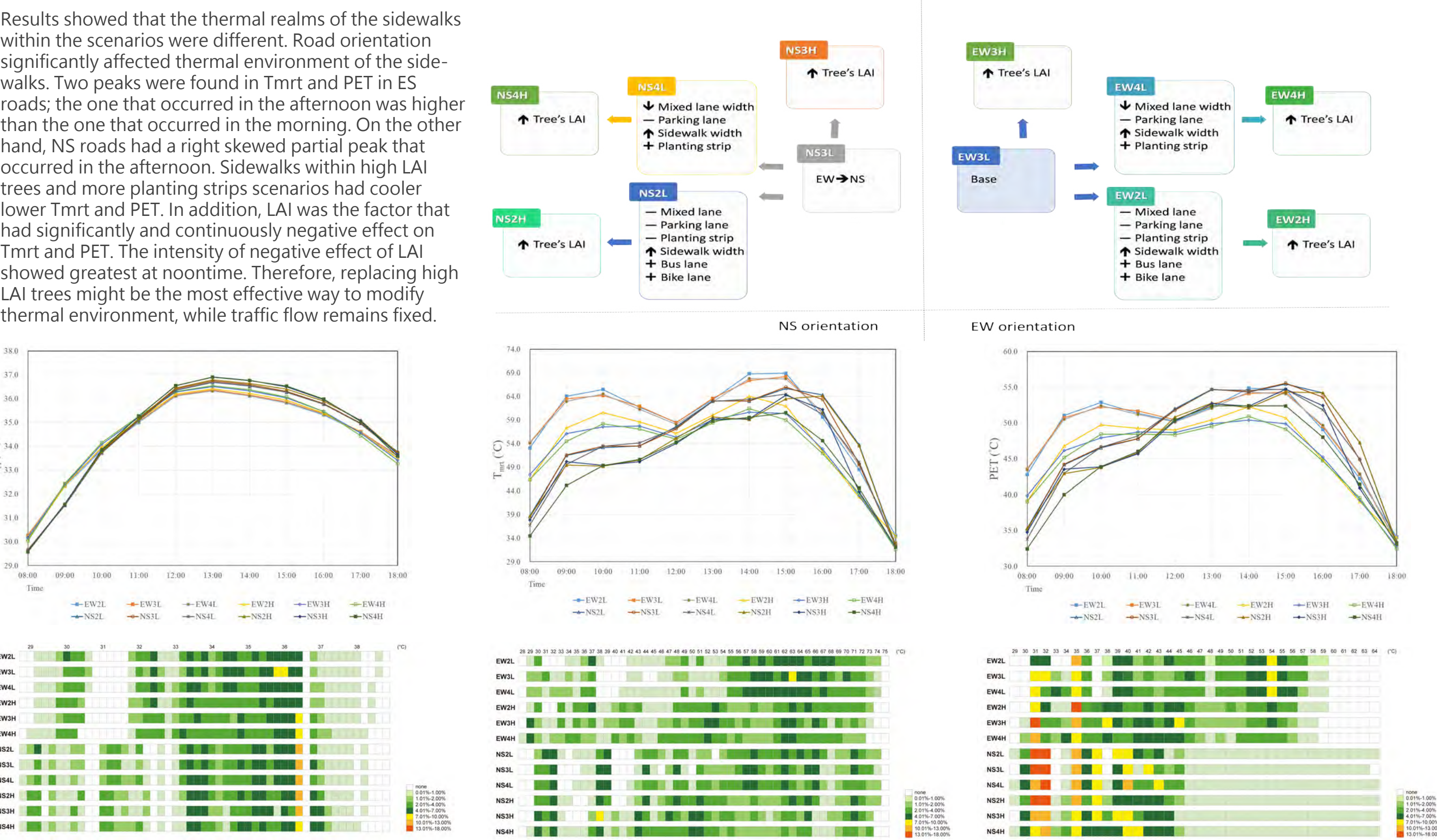
Ecological Carrying Capacity Estimation of the Trails in a Protected Area: Integrating a Path Analysis Model and the Stakeholders' Evaluation

This study integrated a path analysis model and stakeholder assessment to estimate the ecological carrying capacity of trails in a protected area. This study surveyed the biophysical environment along the trails and conducted a path analysis to establish the use-impact model for the trails in the study area. Based on the use-impact model, this study developed four-level usage scenarios and collected the stakeholders' acceptance evaluation to determine the ecological carrying capacity range. The results showed that the weekly usage of the trails directly affected the soil hardness and plant coverage of the trail. The trail's soil hardness directly affected the surrounding soil hardness, decreasing its plant coverage, while the vegetation type and slope also affected its plant cover. The stakeholders of the Mt. Xiaoguanyn Area reached a consensus on the ecological carrying capacity range, which was 288 to 404 total weekly hikers.



Study of thermal environment of sidewalks within varied urban road structures

Road is one of the major components that make up urban outdoor space. Due to the popularity of personal vehicles and urban sprawling, vehicle-oriented transportation has been dominating the road design for decades and worsening urban outdoor thermal environment. The purpose of this study was to assess the thermal environment of the potential humanity-oriented designed roads which expand sidewalks for better walking experience. To increase human thermal comfort, road orientation, the number of planting strips, and leaf area index (LAI) of trees were considered to develop alternative scenarios. Validated with field measurements by this study, ENVI-met was used to simulate the thermal environment of the sidewalks within the scenarios.



淨零排放與低碳新未來—景觀教育的挑戰與契機

本文以景觀全生命週期各階段目標與任務，歸納各階段景觀專業可發展的減碳與負碳作為，提出未來可能的淨零路徑需要的創新人才，於景觀教育的基礎、學制的架構下，從深化與拓展角度，試提三項景觀教育的挑戰，作為景觀教育與教學內容調整的參考，包括：未來人才應具備的能力、教育體系核心能力的發展與調整、產官學共構實踐。



先期規劃 綜合規劃

低碳土地空間規劃、綠色運輸、低碳生活、綠電能源系統、財務計畫、藍綠基礎規劃、碳捕捉存再利用技術



基本設計 細部設計

空間配置、低碳設施設計、低碳生活、低碳工法與材料、高碳匯潛能設計、環境保育營造、人工地盤綠化、碳捕捉存再利用技術



工程營建 工程監造

工地管理、循環再利用、低碳工法與材料、綠電能源、工地綠化、碳捕捉存再利用技術



營運 維護

綠能資源再利用、AI智慧管理、績效評估與獎勵、綠色採購、低碳生活型態教育宣導、綠化維護、碳捕捉存再利用技術

規劃階段 Planning

設計階段 Design

工程施作階段 Construction

維運管理階段 Operation



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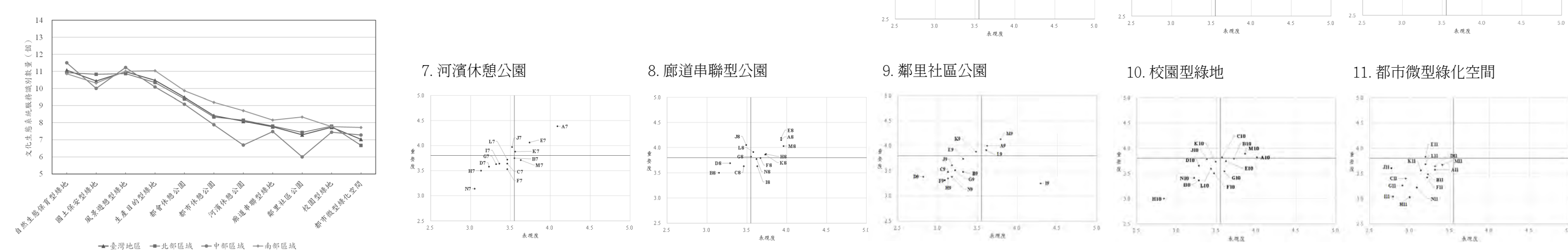


鄧誼柔

碩士班研究生113級

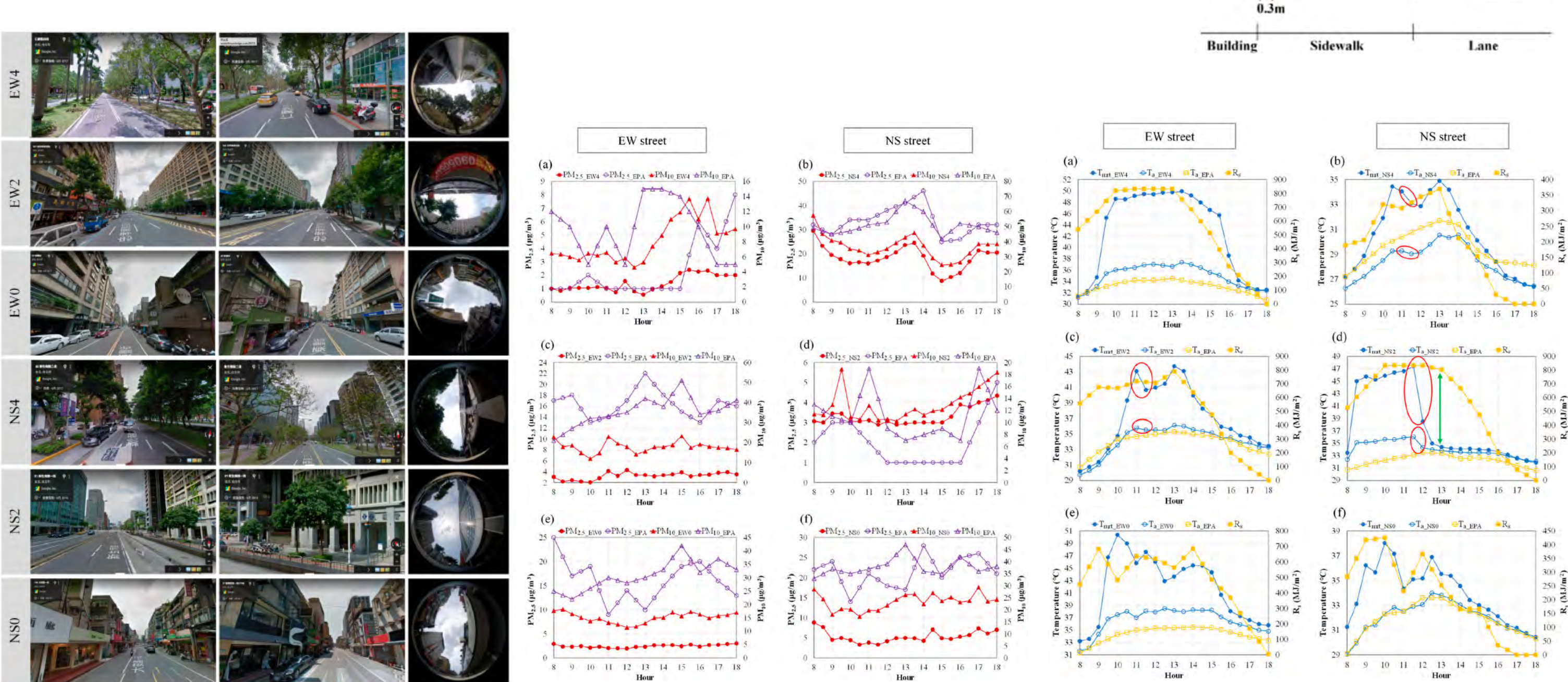
綠地系統文化生態系統服務識別與評價：受益者觀點分析

綠地提供多種文化生態系統服務讓人們透過體驗而從中受益，而綠地本身的環境特性以至於經營管理皆有其階層性。本研究基於文化生態系統服務的非物質與無形特性，從受益者觀點進行各級綠地文化生態系統服務的識別、重要度與表現度評價。以文獻回顧及專家深度訪談，將綠地系統歸納為11層級，並彙整前人研究歸納14項文化生態系統服務，據以發展結構式問卷。以臺灣民眾為受訪對象，採網路問卷調查民眾對各級綠地文化生態系統服務之識別，針對識別的文化生態系統服務，進行進行重要度與表現度評價。研究結果顯示，綠地層級越高文化生態系統服務的識別數量與識別度越高，綠地文化生態系統服務之重要度普遍高於表現度，層級越高，多數文化生態系統服務座落於「持續保持區」及「過度重視區」，而層級較低的都市微型綠化空間，各文化生態系統服務項目皆位於「改善重點區」及「次要改善區」。



Effects of Street Spatial Structure on Micrometeorological Condition and Air Quality—A Case Study of Taipei City

This study conducted field measurements to explore the effects of street spatial structure on micrometeorological condition and air quality on both hot and cool days in Taipei City. Six street canyons with an aspect ratio of one, but varied in street orientation, street width, sky view factor, and number of planting strips, were selected for observations. In this case study, it was observed that, as well as the meso-scale phenomena, the local and micro-scale (street canyon structure) had influences on street air temperature, mean radiant temperature, and wind velocity. However, the local and micro-scales only had minor effects on relative humidity for both hot and cool days. Shade effect on temperature by street trees was observed; this effect could cause 2 degrees drop on mean radiant temperature and about 0.5 degree drop on air temperature. Our analyses and field measurements also revealed that, in some cases, concentrations of PM2.5 and PM10 were found to be correlated with local street canopy structure; however, in some cases, the meso-scale process was found to be the dominant factor. We also found that concentrations of CO and O3 were inversely correlated in the street canyon. The findings of this study provide introductory scientific data and guidelines for urban street designers to improve thermal comfort and air quality.



A method to detect the spatial matching relationship of supply and demand of recreation ecosystem services (RES) as policy and decision-making support in a protected area

Recreation ecosystem services (RES) link closely to human well-being and benefit mutually to biodiversity conservation. However, how to assess and detect the spatial matching of RES remains a challenge. Based on the ES cascade model and referring to previous studies, this study defined RES Supply Potential, RES Demand, RES Flow, and RES Match/Mismatch to convey these terms' intrinsic appropriately; and Recreation Accessibility was treated as a RES supply term. The proposed method consisted of three assessment parts and an overlay analysis. RES Supply Potential and Recreation Accessibility were assessed by indicator assessment method. RES Demand and RES Flow were assessed from the beneficiaries' perspective by administering web-based questionnaires. The matching relationship between RES Demand and RES Flow was further analyzed to detect RES Match/Mismatch. An overlay analysis was then conducted to examine the spatial relationship between the RES Match/Mismatch and the resource supply status to provide specific management information. Through a questionnaire with reliability and content validity and 634 samples (95% confidence level, 4% confidence interval), the detected RES Match/Mismatch of this study was trustworthy. This study revealed four RES Match/Mismatch levels in Yang-mingshan National Park (YNP). Only 5.51% of YNP belonged to M (RES Demand = RES Flow), MM-1 (RES demand < RES Flow) accounted for 7.12% and had high Recreation Accessibility, which was the area that the managers should first launch dispersed actions to avoid or minimize over-wisdom impacts. The proposed method could not only detect RES Match/Mismatch rationally and directly but also obtained multiple spatial datasets to support decision-making.

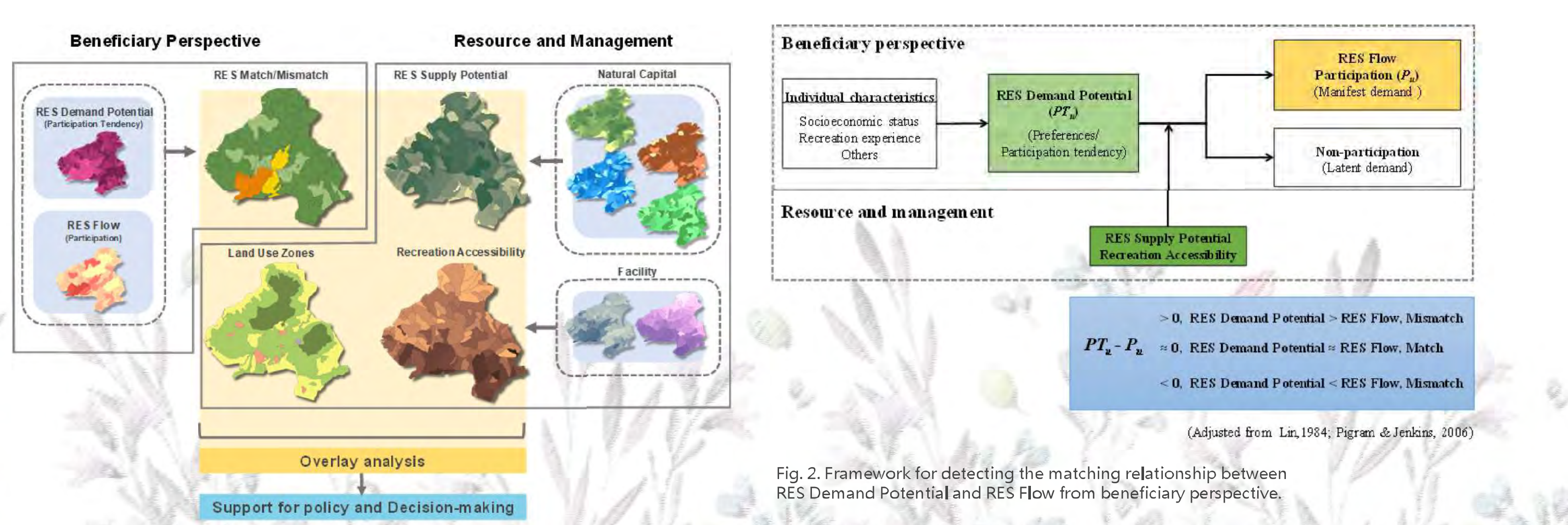


Fig. 1. The method and procedure for assessing and detecting the spatial matching relationship of supply and demand of RES as policy and decision-making support.

Fig. 2. Framework for detecting the matching relationship between RES Demand Potential and RES Flow from beneficiary perspective.