THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

RISUD

可持續城市發展研究院

RESEARCH INSTITUTE
FOR
SUSTAINABLE URBAN DEVELOPMENT

Innovative Solutions for Sustainable Cities

Research Group for Construction Virtual Prototyping

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

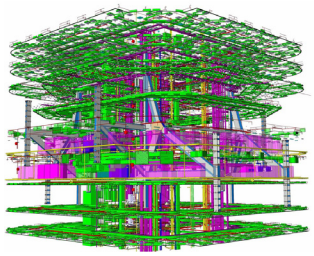
- Prof. Heng LI, Chair Professor of the Department Building and Real Estate
- Prof. H Q Fan, Associate Professor
- Prof. Johnny WONG, Assistant Professor
- Dr Ting HUANG, Senior Research Fellow
- Dr Xiaochun LUO, Senior Research Fellow

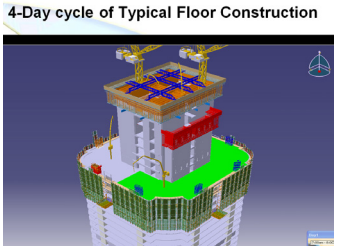
Mission

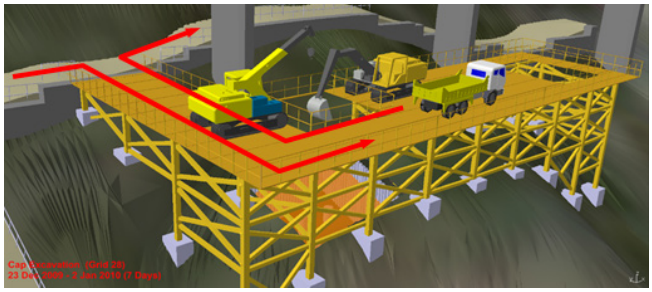
To utilize the cutting-edge information technology to improve construction industry. Explore technics to delivery projects with higher qualities and lower environmental impacts.

Main Research Areas

- Construction virtual prototyping (CVP) and building information modeling (BIM)
- BIM in project life-cycle management
- Informative and automotive construction
- Housing Industrialization
- IKEA mode in construction management
- Construction Informatics
- Proactive construction management platform
- Construction risk identification and management







Major Achievements/Impact

Books:

- Machine Learning of Design Concepts, Computational Mechanics Press. 1994.
- Environmental Management in Construction, A Quantitative Approach. Taylor & Francis. 2006

Editorial:

- Automation in Construction
- Construction Management and Economics
- Construction Innovation: Information, Process, Management

Awards:

Representative Research Projects

- Location-based Technologies for Asset Tracking and Risk Management, funded by the Innovative Technology Fund of the Hong Kong SAR Government
- Central-Wan Chai Bypass Tunnel (Causeway Bay Typhoon Shelter Section)
- Public Rental Housing Development at Tung Tau Cottage Area, funded by Housing Authority of the Hong Kong SAR Government
- Subway Risk Identification and Virtual Prototyping, funded by National Basic Research Program of China (i.e. National the Twelfth Five-year Plan)

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建築及虛擬模型研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

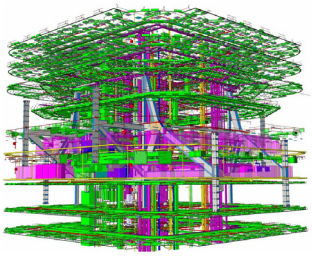
- 李恆教授, 建築及房地產系講座教授（組長）
- 樊宏欽博士, 副教授
- 黃國偉博士, 助理教授
- 黃霆博士, 高級研究員
- 羅小春博士, 高級研究員

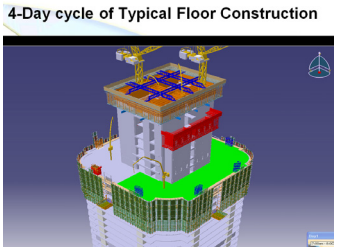
主要研究領域

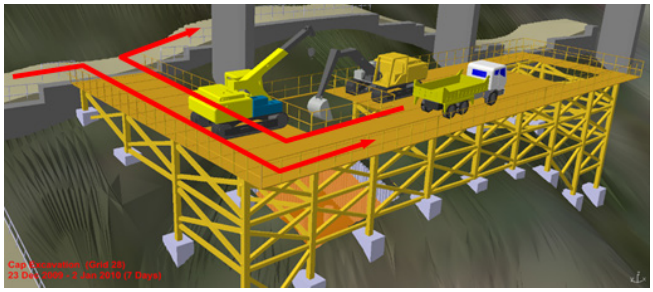
- 建築虛擬模型及建築信息模擬
- BIM在項目全生命週期應用
- 工程信息化及自動化
- 住宅工業化
- 宜家模式與工程管理
- 建造與IT技術
- 主控式項目管理系統
- 工程風險識別與管理

研究組理念

通過結合IT技術與建造業需求，利用虛擬模型在實際建築工程開始前及早發現工程中設計與組織的問題，運用主動式管理的方法提升建造業的效率，降低工程浪費。







主要研究成果及影響

專著:

- Machine Learning of Design Concepts, Computational Mechanics Press. 1994.
- Environmental Management in Construction, A Quantitative Approach. Taylor & Francis. 2006

期刊編委:

- Automation in Construction
- Construction Management and Economics
- Construction Innovation: Information, Process, Management

獎項:

代表性研究項目

- 基於定位技術之資產追踪及風險管理，香港創新科技署資助項目。
- 中環灣仔繞道項目建築模型與控制平台的應用研究，香港路政署資助項目。
- 東頭東平房屋項目全生命週期BIM應用研究，香港房屋署資助項目。
- 地鐵安全風險識別與虛擬施工，國家十二五資助項目。

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Research Group for Infrastructure Planning and Management

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Geoffrey Qiping Shen, Chair Professor of Construction Management, Department of Building and Real Estate (Group Leader)
- Dr Ann Yu, Associate Professor, Department of Building and Real Estate
- Dr Hongqin Fan, Associate Professor, Department of Building and Real Estate
- Dr Christabel Ho, Assistant Professor, Department of Building and Real Estate
- Dr Esther YUNG, Assistant Professor, Department of Building and Real Estate
- Dr Fan Xue, Postdoctoral Fellow, Department of Building and Real Estate

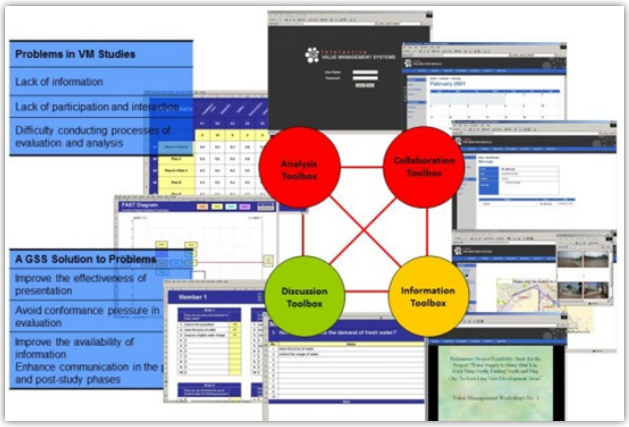
External Collaborators

- Prof. Guiwen Liu, Professor and Director of Academic Liaision Office, Chongqing University
- Prof. Xiaolong Xue, Professor and Associate Dean of School of Management, Harbin Institute of Technology
- Dr Rebecca Jing Yang, Senior Lecturer, Royal Melbourne Institute of Technology, Australia
- Dr Jacky Chung, Assistant Professor, National University of Singapore

Research Areas

An infrastructure is a physical structure and facility needed for the operation of a society. Infrastructure projects are normally large and complex in nature, which demands scientific planning and management to ensure value for money of these projects in their life time, and to meet the increasing needs and demands of the stakeholders including the general public. Our research group has undertaken a large number of research projects funded by the Research Grants Council in Hong Kong and we have participated in the planning and management of a number of infrastructure projects. Our expertise and research covers a wide range of areas including but not limited to: (1) stakeholder management in large infrastructure projects; (2) value engineering/management; (3) IT-based collaboration and decision support; (4) Construction information management, application of cutting-edge technologies such as mobile computing, computing intelligence, data mining; (5) Corporate social responsibility and ethics in construction industry.

Examples of the Research and Real Life Projects



- Analysing stakeholder-organization relationships in mega construction projects: a social network approach, Research Grants Council Hong Kong-General Research Fund, RGC-GRF 2012/13
- Construction equipment failure prediction: a data mining approach, Research Grants Council Hong Kong-General Research Fund, RGC-GRF 2010/11
- The effect of using group support systems on virtual value management workshops for major construction projects, Research Grants Council Hong Kong-General Research Fund, RGC-GRF 2009/10
- Life cycle cost management of heavy construction equipment using data mining techniques, Research Grants Council Hong Kong-General Research Fund, RGC-GRF 2009/10
- Managing multiple stakeholders in the briefing process of large construction projects, Research Grants Council Hong Kong-Competitive Earmarked Research Grant, RGC-CERG 2006/07
- A computer-aided toolkit for using the functional performance specification in the briefing process of construction projects, Research Grants Council Hong Kong-Competitive Earmarked Research Grant, RGC-CERG 2005/06
- Measuring the processes and outcomes of value management studies in construction, Research Grants Council Hong Kong-Competitive Earmarked Research Grant, RGC-CERG 2004/05
- Effect of using group decision support systems on the processes and outcomes of value management studies, Research Grants Council Hong Kong-Competitive Earmarked Research Grant, RGC-CERG 2003/04
- A best practice framework for systematic identification and precise representation of client's requirements in briefing, Research Grants Council Hong Kong-Competitive Earmarked Research Grant, RGC-CERG 2002/03
- Provision of Barrier-free Access Facilities at Public Footbridges, Elevated Walkways and Subways Phase 3, Highways Department, HKSAR Government
- Modernisation of East Wing of Tsuen Wan Water Treatment Works – Investigation, Water Supplies Department, HKSAR Government
- Feasibility Study of Mountain Bike Trail Network in South Lantau, Civil Engineering and Development Department, HKSAR Government

基礎設施規劃及管理研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 沈岐平教授，建設管理講座教授，建築及房地產學系（組長）
- 余帙芸博士，副教授，建築及房地產學系
- 樊宏欽博士，副教授，建築及房地產學系
- 何曼芳博士，助理教授，建築及房地產學系
- 容曉君博士，助理教授，建築及房地產學系
- 薛帆博士，博士後，建築及房地產學系

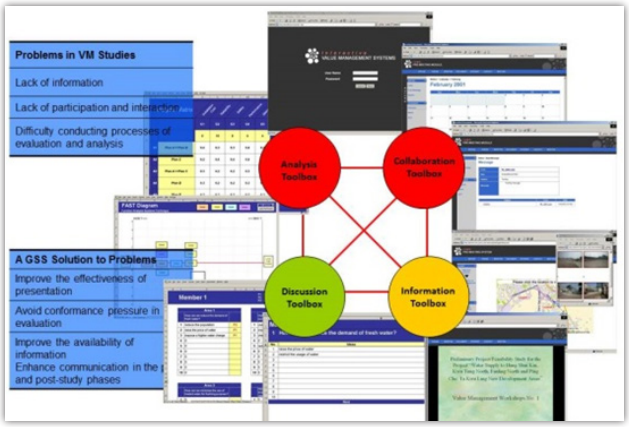
校外合作夥伴

- 劉貴文教授，重慶大學建築管理與房地產學院副院長，重慶大學國際合作與交流處處長
- 薛小龍教授，哈爾濱工業大學管理學院副院長
- 楊靜博士，澳大利亞墨爾本皇家科技大學高級講師
- 鍾健雄博士，新加坡國立大學助理教授

研究領域

基礎設施是社會運行所必須的物理結構和設施。基礎設施項目通常是龐大而複雜的，它需要科學的規劃和管理，以確保這些項目在全生命周期物有所值，同時滿足社會日益增長的需求和持份者包括廣大市民的需要。我們的研究小組已經進行了大量的由香港研究資助局資助的研究項目，也參與了一些實際基礎設施項目的規劃和管理。我們的專長及研究領域包括但不限於：(1) 大型基礎設施項目持份者管理；(2) 價值工程及管理；(3) 基於信息技術的項目協作及決策支持；(4) 施工信息管理及新技術包括移動計算，智能計算，數據挖掘的應用；(5) 建築業企業社會責任及道德規範

研究和實際項目例子



- 分析大型建設項目中的利益相關者組織關係的社會網絡方法，香港研究資助局優配研究金，2012/13
- 基於數據挖掘方法的建築施工設備可靠性分析，香港研究資助局優配研究金，2010/2011
- 重大建設項目虛擬價值管理工作坊群體支持系統的作用，香港研究資助局優配研究金，2009/10
- 基於數據挖掘方法的大型建築施工設備全生命周期成本管理，香港研究資助局優配研究金，2009/10
- 大型建設項目策劃過程中多個利益相關者的管理研究，香港研究資助局競爭專項研究基金，2006/07
- 在建設項目策劃過程中使用功能表現規範的計算機輔助工具包的研究，香港研究資助局競爭專項研究基金，2005/06
- 價值管理過程和結果的評估體系研究，香港研究資助局競爭專項研究基金，2004/05
- 使用群體決策支持系統對價值管理過程和結果影響的研究，香港研究資助局競爭專項研究基金，2003/04
- 在項目策劃過程中系統識別和精確表述客戶要求的最佳實踐框架的研究，香港研究資助局競爭專項研究基金，2002/03
- 在公共行人天橋、高架行人道和地鐵提供無障礙通道設施的研究，路政署，香港特區政府
- 荃灣濾水廠東翼的現代化的勘查研究，水務署，香港特區政府
- 在南大嶼山建設越野單車徑網絡的可行性研究，土木工程拓展署，香港特區政府

Research Group for Social Enterprises

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Carlos Lo, Professor, Department of Management and Marketing (Group Leader)
- Dr Israr Qureshi, Assistant Professor, Department of Management and Marketing
- Dr Na Ni, Assistant Professor, Department of Management and Marketing
- Full-time Researcher: one PhD student

External Collaborators

- Prof. Harry Barkema, London School of Economics
- Prof. Tima Bansal, Ivey Business School
- Dr Julie Battilana, Harvard Business School
- Dr Geoffrey Kistruck, Miami University
- Ms Babita Bhatt, Carleton Center for Community Innovation Carleton University
- Dr Donal Crilly, London School of Business
- Dr Bruno Dyck, University of Manitoba
- Dr Gregory Jackson, Free University of Berlin
- Dr Chris Marquis, Harvard Business School
- Dr Cuili Qian, City University of Hong Kong
- Dr Kent Walker, Winsor University

Objectives of Research

The research group proposes to examine the role and contributions of SEs to sustainable local communities in urban settings in Hong Kong, China, India and the Philippines. The focus is on social entrepreneurship and sustainable business models of SEs with a view to exploring policy frameworks for promoting and grooming SEs in the their quest to provide social services to local communities and foster sustainable urban development.

Main Research Areas

- Institutional Entrepreneurship
- Challenges and opportunities for SEs
- Social entrepreneur
- Social Capital
- Philanthropic foundations in China
- Social enterprises in China
- Corporate social responsibility

Current Research Projects

- Ni, N., Wu, Z., & Ding, S. (2012). Political Ties and Cost Efficiency in Philanthropic Foundations. September 2012 – July 2014. HKD121,100. Internal Competitive Research Grant (ICRG), The Hong Kong Polytechnic University. CNY215,000. National Natural Science Foundation of China
- Qureshi, I., Bhatt, B. and Kistruck, G. 2011.Social Outcomes of Social Enterprise: A Social Capital Framework. 2011 –2014, HKD527,745.GRF Grant.
- Qureshi, I. and Kistruck, G. 2010.Poverty Alleviation Through Social Intermediation: Role of Social Enterprise in Upliftment of Base of Pyramid. 2011 –2013, HKD278,703.GRF Grant.
- Yang, Y.,Ni, N., Wang, S. (2012).Research on Loss Spillover Mechanism: Empirical Evidence from Charitable Organizations. January 2013 – December 2015

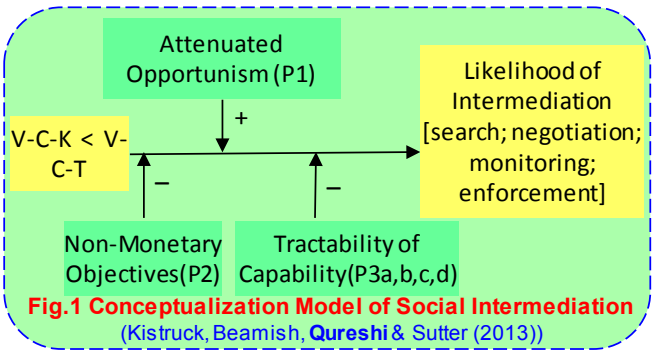


Fig.1 Conceptualization Model of Social Intermediation
(Kistruck, Beamish, **Qureshi** & Sutter (2013))

Recent Publications

- Fang, Y.,Qureshi, I., Sun, H., Mccole, P., Ramsay, E., & Lim, K (2013). Trust, Satisfaction, and Online Repurchase Intention: The Moderating Role of Perceived Effectiveness of E-commerce Institutional Mechanisms. *Management Information Systems Quarterly* (Forthcoming).
- Jackson, G., &Ni, N.(2013). Understanding Complementarities as Configurations: Using Set Theoretical methods. pp. 129 – 158, inConfigurational Theory and Methods in Organizational Research atResearch intheSociology of Organizations. edited by Bart Cambré, Axel Marx, and Peer Fiss.
- Kistruck G, Beamish, P,Qureshi, I, & Sutter C (2013) Social Intermediation in Base-Of-The-Pyramid Markets. *Journal of Management Studies*.
- Kistruck, G.,Qureshi, I., & Beamish, P. (2013). "Geographic and Product Diversification in Charitable Organizations," *Journal of Management*
- Sarkis, J.,Ni, N., & Zhu, Q. (2011).Winds of Change: Corporate Social Responsibility in China.Ivey Business Journal, January/February
- Walker, K., Ni.,Ni, N., & Dyck, B.Empirical Archetypes for Strong Corporate Environmental Performance. (Forthcoming inBusiness Strategy and the Environment)

社會企業研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 盧永鴻教授，管理及市場學系（組長）
- Dr Israr Qureshi，助理教授，管理及市場學系
- 尼娜博士，助理教授，管理及市場學系
- 全職研究人員：一名博士研究生

校外合作夥伴

- Prof. Shui-Yan Tang，美國南加州大學
- Prof. Benjamin van Rooij，荷蘭阿姆斯特丹大學
- Prof. Harry Barkema，倫敦經濟學院
- Prof. Tima Bansal, Ivey Business School
- Dr Julie Battilana, Harvard Business School
- Dr Geoffrey Kistruck, Miami University
- Ms Babita Bhatt, Carleton Center for Community Innovation Carleton University
- Dr Donal Crilly, London School of Business
- Dr Bruno Dyck, University of Manitoba
- Dr Gregory Jackson, Free University of Berlin
- Dr Chris Marquis, Harvard Business School
- Dr Cuili Qian, City University of Hong Kong
- Dr Kent Walker, Winsor University

研究目標

本研究小組建議研究社企在香港，中國，印度和菲律賓等地的城市中社區可持續發展的作用和貢獻。重點是社會企業家和社企可持續的營商模式，探索可以促進和培育社會企業致力為社區提供社會服務和促進城市可持續發展的政策框架。

主要研究領域

- 機構創業
- 社企面對的挑戰和機遇
- 社會創業家.
- 社會資本
- 中國的慈善基金會
- 中國社企
- 企業社會責任

近期相關研究項目

- Ni, N., Wu, Z., & Ding, S. (2012). Political Ties and Cost Efficiency in Philanthropic Foundations. September 2012 – July 2014. HKD121,100. Internal Competitive Research Grant (ICRG), The Hong Kong Polytechnic University. CNY215,000. National Natural Science Foundation of China
- Qureshi, I., Bhatt, B. and Kistruck, G. 2011.Social Outcomes of Social Enterprise: A Social Capital Framework. 2011 –2014, HKD527,745.GRF Grant.
- Qureshi, I. and Kistruck, G. 2010.Poverty Alleviation Through Social Intermediation: Role of Social Enterprise in Upliftment of Base of Pyramid. 2011 –2013, HKD278,703.GRF Grant.
- Yang, Y.,Ni, N., Wang, S. (2012).Research on Loss Spillover Mechanism: Empirical Evidence from Charitable Organizations. January 2013 – December 2015

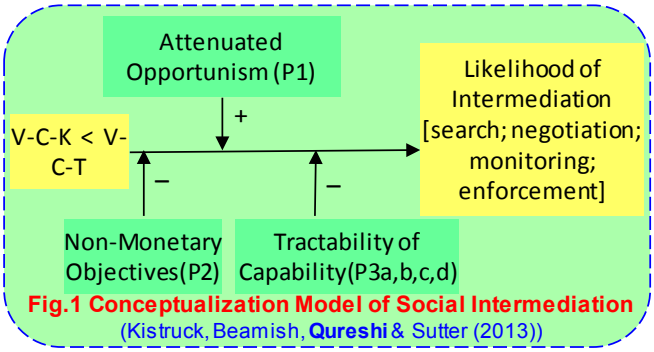


Fig.1 Conceptualization Model of Social Intermediation
(Kistruck, Beamish, **Qureshi** & Sutter (2013))

近期學術成果

- Fang, Y.,Qureshi, I., Sun, H., Mccole, P., Ramsay, E., & Lim, K (2013). Trust, Satisfaction, and Online Repurchase Intention: The Moderating Role of Perceived Effectiveness of E-commerce Institutional Mechanisms.Management Information Systems Quarterly (Forthcoming).
- Jackson, G., &Ni, N.(2013). Understanding Complementarities as Configurations: Using Set Theoretical methods. pp. 129 – 158, inConfigurational Theory and Methods in Organizational Research atResearch intheSociology of Organizations. edited by Bart Cambré, Axel Marx, and Peer Fiss.
- Kistruck G, Beamish, P,Qureshi, I, & Sutter C (2013) Social Intermediation in Base-Of-The-Pyramid Markets. Journal of Management Studies.
- Kistruck, G.,Qureshi, I., & Beamish, P. (2013). Geographic and Product Diversification in Charitable Organizations. Journal of Management
- Sarkis, J.,Ni, N., & Zhu, Q. (2011).Winds of Change: Corporate Social Responsibility in China.Ivey Business Journal, January/February
- Walker, K., Ni.,Ni, N., & Dyck, B.Empirical Archetypes for Strong Corporate Environmental Performance. (Forthcoming inBusiness Strategy and the Environment)

Research Group for Sustainable Land Use

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Edwin H. W. Chan, Professor, Department of Building and Real Estate (Group Leader)
- Dr Esther HK Yung, Dept of Building and Real Estate
- Dr Ivy SW Wong, Dept of Building and Real Estate
- Dr Wadu Jayantha, Dept of Building and Real Estate
- Prof. Carlos Lo, Professor, Department of Management and Marketing
- Prof. Yuk-chung Chan, Professor, Department of Applied Social Sciences
- Prof. Tim Jachna, Professor, School of Design
- Dr Chi-kwan Chau, Associate Professor, Department of Building Services Engineering
- Full-time Researchers: 2 research fellows & 12 PhD students

External Collaborators

- Prof. Steffen Lehmann, School of Architecture, Portsmouth University, UK
- Prof. Henk Visscher, OTB, Faculty of Architecture & Built Environ., Delft Uni. of Tech., Netherlands
- Prof. Shui-Yan Tang, Sol Price School of Public Policy, University of Southern California, USA
- Prof. Bo-sin Tang, Department of Urban Planning and Design, Hong Kong University
- Prof. Tunney Lee, Department of Urban Studies and Planning, MIT, USA
- Prof. Xun Li, School of Geography and Planning, Sun Yat-sen University, PRC.
- Pro. Craig Langston, Faculty of Society and Design, Bond University, Australia.
- Dr. Ying Jin, Department of Architecture, University of Cambridge, UK
- Dr. John Rake, Department of City & Regional Planning, UC Berkeley, USA.
- Dr. Ying Long, School of Architecture, Tsinghua University, PRC.

Objectives of Research

- To embrace a holistic theoretical framework for improving urban land-use and quality living policies by integrating environmental, social, and economic considerations.
- To examine the deficiencies of current urban land use and quality living policies in Hong Kong in light of the scientific findings.
- To develop an integrated policy theme for urban land use of Hong Kong and dense cities in China in light of scientific findings.

Main Research Areas

- Develop a coordinated policy for multi-layered sustainable use of space over road in dense urban areas – expanding the “grey to green” concept
- Develop a framework for understanding the dynamic relationships between urban sub-systems in the planning for new towns and smart cities, and the consequential policies in Hong Kong
- Develop a framework for sustainable integration of mega-projects into the urban renewal of dense cities
- Evaluate the economics, politics and institutions of land-use zoning and allocation for public open spaces in the territory
- Develop an integrated policy framework incorporating the concept of healthy aging into urban renewal projects for the needs of elderly
- Formulate an analytical framework to assess the sustainability of a built heritage conservation project in urban renewal
- Evaluate the policy/implementation gap of environmental policy and regulatory control of urban land-use and constructions for urban sustainability
- Set up an urban behavioral study (UBS) framework to promote the use of experimental economics and behavioral analysis in urban context.

Examples of Current Research Projects

- Chan E.H.W. & Yung EHK. et al 2015 A Framework for the Analysis of Embodied Carbon and Construction Cost of Heritage Conservation Projects 2015-17, HKD600,000, RGC: GRF Grant.
- Chan E.H.W. & Qian QK et al 2015 Cost-benefit-analysis (CBA) for Implementing Green Buildings (GB) Promotion Incentives: With Transaction Costs (TCs) Considerations, 2015-2017, HKD1,206,695, Construction Industry Council.
- Chan E.H.W., Lee T. et al 2014 Study of Density and Community Facilities for Neighborhood Planning: Part of a Larger Research Project on Re-defining the Density of City (joint research with MIT, USA), 2014-2017, HKD380,000, RISUD.
- Chan E.H.W. & Qian QK et al. 2014 Sustainable Planning Criteria (SPC) for Age-friendly Precincts (AFP) in the New Development Areas (NDAs) of Hong Kong, 2014 -15. HKD524,000, Public Policy Research, CPU.
- Chan, E.H.W. et al 2012 Social Considerations in Planning Public Open Space to Integrate Elderly People in Urban Renewal, 2012-2016, HK$1,023,000, RGC: GRF grant.
- Lo, C.W.H., Tang, S.Y., et al 2015 Campaign-Style Enforcement and Environmental Compliance in China: A Comparative and Longitudinal Study 2015- 2018, HKD722,850, RGC: GRF.
- Zhan, X-Y., Lo, C.W.H. and Tang, S.Y. 2016. Political Contexts, Work Situations, and the Implementation of Environmental Policy by Street-Level Bureaucrats in China. 2016-2018, HKD525,000. RGC: GRF grant.
- “Building Regulations and Control in the Face of Climate Change”: A New CIB Task Group TG79 established in 2011 with joint coordinators: Prof. Edwin Chan, Hong Kong Polytechnic University, China and Prof. Henk Visscher, Delft University of Technology, The Netherlands.

Examples of Publications

- **Chan E.H.W.** & HOU, J (2015) Developing a framework to appraise the critical success factors of transfer development rights (TDRs) for built heritage conservation, Habitat International.
- **Chan E.H.W.**, Wang A., and Lang W. (2016) Comprehensive Evaluation Framework for Sustainable Land Use: Case Study of Hong Kong in 2000–2010, J. Urban Plann. Dev.
- **Chan EHW**, Qian QK & Lam PTI (2009). The market for green building in developed Asian cities - perspectives of building designers, Energy Policy.
- Deng Y., Poon SW, **Chan EHW** (2016) Planning mega-event built legacies – A case of Expo 2010, Habitat International.
- Lai Y., **Chan EHW**, Choy L.(2016) Village-led land development under state-led institutional arrangements in urbanising China: The case of Shenzhen, Urban Studies.
- Lang, W., Radke, J.D., Chen, T., **Chan, E.H.W.** (2016) Will affordability policy transcend climate change? A new lens to re-examine equitable access to healthcare in the San Francisco Bay Area, Cities.
- Lee GKL & **Chan EHW,** (2008). The analytic hierarchy process (AHP) approach for assessment of urban renewal proposals. Social Indicators Research.
- Liu, N.N., **Lo, C.W.H.**, Zhan, X.-Y. and Wang, W. 2015. Campaign-Style Enforcement and Regulatory Compliance. Public Administration Review.
- Tang, S.Y., Li, P.H.Y., Fryxell, G. and **Lo, C.W.H.** Forthcoming. Enterprise-Level Motivations, Regulatory Pressures, and Corporate Environmental Management in China. Environ. Management.
- Visscher, H., Laubscher, J., **Chan, EHW.** (2016) Building governance and climate change: roles for regulation and related polices, Building Research and Information.
- Xu, Y., **Chan, EHW**, and **Yung, E**. (2014). “Overwhelming Farmland Conversion for Urban Development in Transitional China: Case Study of Shanghai.” J. Urban Plann. Dev.
- YEUNG JWK , **CHAN YC**, Lee BLK (2009). Youth Religiosity and Substance Use : A meta-analysis from 1995 to 2007. Psychological Reports.
- **Yung EHK** & **Chan EHW** (2016) Re-examining the Growth Machine Ideology of Cities: Conservation of Historic Properties in Hong Kong. Urban Affairs Review.
- **Yung EHK**, Conejos S., **Chan EHW** (2016) Social needs of the elderly and active aging in public open spaces in urban renewal, Cities.
- **Yung, E.H.K.**, Langston, C., & **Chan, E.H.W.** (2014) Adaptive reuse of shophouses in urban renewal districts in Hong Kong, Cities.
- **Yung, E.H.K.**, **Chan, E.H.W.**, Xu, Y. (2014) Sustainable development and the rehabilitation of a historic urban district - social sustainability in the case of Tianzifang in Shanghai, Sustainable Development.
- Zhan, X.-Y., **Lo, C.W.H.** and Tang, S.Y. 2014. Contextual Changes and Environmental Policy Implementation in China: A Longitudinal Study of Street-Level Bureaucrats in Guangzhou. Journal of Public Admin. Research & Theory.

土地可持續利用研究小組

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Tim Jachna教授，設計學院
周志坤，博士，屋宇設備工程學系
專職研究人員：博士後/研究院士2名、博士生12名

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- 香港大學，城市規劃及設計學系，鄧寶善教授
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- 中國大陸，中山大學，地理科學與規劃學院，李郇教授
- 澳大利亞，邦德大學，社會及設計研究所，Craig Langston教授
- 英國，劍橋大學，建築學系，JIN Ying博士
- 美國，伯克萊加利福尼亞大學，城市及區域規劃學系John Rake博士
- 中國大陸，清華大學，建築學院，龍瀛博士

研究目標

- 為改善城市土地利用及優質生活政策，綜合考慮環境、社會與經濟因素，創建全面的理論框架
- 利用可持續城市發展研究院(RISUD)的科研成果，檢視當前香港土地利用及優質生活政策中的不足之處
- 按照科學數據，為香港及中國密集型城市的市區土地利用和住房供應制定整體的政策主題

主要研究領域

- 制定用於密集城區道路上方空間的多層可持續利用的協調政策——發展“灰地變綠地”的概念
- 制定用於在香港的“新城鎮”與“智慧城市”規劃過程中厘清各個次級城市系統之間動態關係及相應政策的分析框架
- 制定框架用於整合大型項目推進密集型城市市區重建的可持續性
- 評估香港土地利用及公共開放空間配額相關的經濟、政策與規定
- 制定將健康老齡化理念納入市區重建項目以滿足老年人需求的整體政策框架
- 建立用以評估市區重建過程中文物建築保護項目可持續性的系統分析框架
- 評估環境政策、城市土地利用的規管、以及城市可持續發展建設之間的政策與執行差距
- 建立城市行為研究框架(UBS)，促進城市背景下運用實驗經濟學及行為分析方法

最新研究項目

- Chan E.H.W. & Yung EHK. et al 2015年優配研究基金項目（RGC: GRF Grant），「在文物建築保護項目中進行碳成本與建設成本計算的分析框架建構」2015-2017年，HKD600,000
- Chan E.H.W. & Qian QK et al 2015年建造業協會（CIC）研究項目，「綠色建築激勵計劃的成本收益分析：交易成本視點下的研究」2015-2017年，HKD1,206,695
- Chan E.H.W. Lee T. et al. 2014年可持續城市發展研究院與麻省理工學院（MIT）聯合研究項目，「鄰里規劃中密度與社區設施的研究：對“城市密度”重新定義的維度之一」2014-2017年，HKD380,000
- Chan E.H.W. & & Qian QK et al 2014年中央政策組公共政策研究資助計劃（CPU: PPR Scheme），「香港新發展區規劃關於友善融合長者的街區可持續準則研究」2014 -2015年，HKD524,000
- Chan, E.H.W. et al 2012年優配研究基金項目（RGC: GRF Grant），「市區重建中公共開放空間的規劃與融合長者的社會考慮因素」2012-2016年，HK$1,023,000
- Lo, C.W.H., Tang, S.Y., et al. 2015年優配研究基金項目（RGC: GRF Grant），「中國的運動化的實施與環境政策的服從：橫向與縱向的研究」2015- 2018年，HKD722,850
- Zhan, X-Y., Lo, C.W.H. and Tang, S.Y. 2016年優配研究基金項目（RGC: GRF Grant），「中國的政治背景，工作情境與街道組織對環境政策的實施」2016-2018年，HKD525,000
- TG79（2011年組建的CIB工作組）聯合負責人：香港理工大學Edwin Chan教授、荷蘭代爾夫特理工大學Henk Visscher教授，「面向氣候變化的建築規例及管治研究」

出版刊物

- **Chan E.H.W.** & HOU, J (2015) Developing a framework to appraise the critical success factors of transfer development rights (TDRs) for built heritage conservation, Habitat International.
- **Chan E.H.W.**, Wang A., and Lang W. (2016) Comprehensive Evaluation Framework for Sustainable Land Use: Case Study of Hong Kong in 2000–2010, J. Urban Plann. Dev.
- **Chan EHW**, Qian QK & Lam PTI (2009). The market for green building in developed Asian cities - perspectives of building designers, Energy Policy.
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- Lai Y., **Chan EHW,** Choy L.(2016) Village-led land development under state-led institutional arrangements in urbanising China: The case of Shenzhen, Urban Studies.
- Lang, W., Radke, J.D., Chen, T., **Chan, E.H.W.** (2016) Will affordability policy transcend climate change? A new lens to re-examine equitable access to healthcare in the San Francisco Bay Area, Cities.
- Lee GKL & **Chan EHW**, (2008). The analytic hierarchy process (AHP) approach for assessment of urban renewal proposals. Social Indicators Research.
- Liu, N.N., **Lo, C.W.H.**, Zhan, X.-Y. and Wang, W. 2015. Campaign-Style Enforcement and Regulatory Compliance. Public Administration Review.
- Tang, S.Y., Li, P.H.Y., Fryxell, G. and **Lo, C.W.H.** Forthcoming. Enterprise-Level Motivations, Regulatory Pressures, and Corporate Environmental Management in China. Environ. Management.
- Visscher, H., Laubscher, J., **Chan, EHW.** (2016) Building governance and climate change: roles for regulation and related polices, Building Research and Information.
- Xu, Y., **Chan, EHW**, and **Yung, E**. (2014). “Overwhelming Farmland Conversion for Urban Development in Transitional China: Case Study of Shanghai.” J. Urban Plann. Dev.
- YEUNG JWK , **CHAN YC**, Lee BLK (2009). Youth Religiosity and Substance Use : A meta-analysis from 1995 to 2007. Psychological Reports.
- **Yung EHK** & **Chan EHW** (2016) Re-examining the Growth Machine Ideology of Cities: Conservation of Historic Properties in Hong Kong. Urban Affairs Review.
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- Zhan, X.-Y., **Lo, C.W.H.** and Tang, S.Y. 2014. Contextual Changes and Environmental Policy Implementation in China: A Longitudinal Study of Street-Level Bureaucrats in Guangzhou. Journal of Public Admin. Research & Theory.

Research Group for Sustainable Public Design

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Kin Wai Michael SIU, Professor, School of Design (Group Leader)
- Keung HUNG, Assistant Professor, School of Design
- Y. H. Brian LEE, Assistant Professor, School of Design
- C. H. Benny LEONG, Assistant Professor, School of Design
- Yan LUXIMON, Research Assistant Professor, School of Design
- Full-time Researchers: 6 researchers and 15 research postgraduate students

Objectives of Research

The Research Group advocates and develops high quality designs of public environments and facilities for sustainable urban development.

Directions and Considerations

- Promotion of sustainable urban development through design research and practice;
- Focus on public environments and facilities;
- Exploration and development of sustainable public designs at policy, implementation and management levels;
- Balance in theoretical studies and design applications;
- All-round design approach to identify and tackle the public design problems related to urban sustainability;
- Promotion of collaborative research with researchers and designers from design, engineering, social sciences and humanities disciplines.

Research Areas

- Review of the current urban policies related to sustainable public environmental design;
- Development and improvement of sustainable public environments and facilities in densely populated urban areas;
- Development of FlexiDesign for new and changing urban needs;
- Exploration and development of sustainable public designs to promote quality urban lifestyles by considering physiological, psychological, cultural, social and ideological factors;
- Development of inclusive and user-friendly public designs for all, including the deprived, persons with disabilities and special needs.

Related Research and Design Projects

- Flexible street furniture for pedestrian precincts in densely populated urban areas;
- Interactive public playstructures for changing and diverse urban needs;
- Asian lifestyles and sustainable public environments and facilities;
- Applied ergonomics for public environments and facilities for persons with special needs;
- Inclusive public toilets for the visually impaired;
- Inclusive recycling facilities for assisting the disabled participate in sustainable urban development.

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可持續公共設計研究小組

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- 邵健偉教授，設計學院（組長）
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- 李宇軒，助理教授，設計學院
- 梁清河，助理教授，設計學院
- 張燕，研究助理教授，設計學院
- 全職研究員：6名研究員及15名研究生

研究目標

研究組致力於倡議和發展與城市可持續發展相適應的高品質公共環境和設施設計。

方向與考慮

- 通過設計研究和實踐促進城市可持續發展；
- 著眼於公共環境和設施；
- 在政策、實行、管理層面對可持續公共設計進行探索和發展；
- 在理論研究與設計應用兩方面進行平衡發展；
- 通過全方位路進來識別及解決與城市可持續性相關的公共設計問題；
- 推廣與設計、工程、社會學和人文學科學者及專業人士之間的合作研究。

研究領域

- 公共環境可持續性相關的城市政策檢視及研究；
- 發展並改善人口密集城市地區的公共環境設施的可持續性；
- 發展彈性設計以配合城市新及不斷變化的需要；
- 基於對生理、心理、文化、社會、意識形態等因素的考慮，發展有助於提高人們生活品質的可持續公共設計；
- 發展對不同群體具用戶親和性的公共設計，包括弱勢社群、殘疾人士及有特殊需求的人群。

相關研究和設計專案

- 人口稠密城市步行區彈性街道設施設計；
- 配合個別城市及變化不斷之需要的互動式公共遊具設計；
- 亞洲生活方式與可持續公共環境及設施設計；
- 應用人類工效學研究特別需求人士的公共環境及設施設計；
- 視障人士共融公共廁所設計；
- 協助殘障人仕參與可持續城市發展的可回收公共設施。

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Research Group for Sustainable Transportation Systems

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- Prof. Agachai Sumalee, Professor, Department of Civil and Environmental Engineering
- Dr W.T. Hung, Associate Professor, Department of Civil and Environmental Engineering
- Dr Mark S.C. Hsu, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Zhen Leng, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Tony N.N. Sze, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Yuhong Wang, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Barbara W.Y. Siu, Teaching Fellow, Department of Civil and Environmental Engineering
- Full-time Researchers: 32 research personnel
- Research Students: 17 PhD/MPhil students in full-time/ part-time mode

External Collaborators

- Prof. Hong K. Lo, Chair Professor, The Hong Kong University of Science and Technology
- Prof. S.C. Wong, Chair Professor, The University of Hong Kong
- Prof. Z.Y. Gao, Professor, Beijing Jiaotong University
- Prof. M.G.H. Bell, Professor, The University of Sydney

Objectives of Research

The research group aims to develop new niches in research with an in-depth study of dynamic transportation problems and travel choice behaviors.

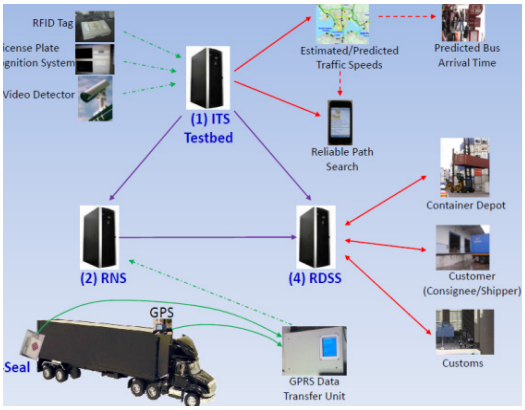
Main Research Areas

- Dynamic Travel Information Systems – concerning the provision of dynamic travel information for monitoring real-time traffic conditions.
- Advanced Public Transportation Systems – concerning the provision of dynamic transit information to passengers and transit fleet management operators.
- Dynamic Traffic Modeling – concerning the behaviors of personnel travel and goods movement over time.
- Sustainable Urban Transport Development – concerning sustainable transport projects, plans and polices over time.

Main Methods and Techniques

Advanced systems, models and techniques are developed for improving transportation planning and operations dynamically.
For example,

- Traffic Flow Simulator – provides off-line travel time database for Hong Kong.
- Intelligent Transportation System (ITS) testbed – provides real-time and predicted traffic information in Hong Kong; helps road users to find faster and reliable routes for their travel in advance or when driving.
- Real-time Navigation System (RNS) – connects with e-Seal sub-system for real-time navigating, tracking, and positioning trucks and containers.
- RFID-based Decision Support System (RDSS) – determines an optimal logistics strategy for cross-boundary container logistics management.



Examples of Applications

- Real-time Traveler Information System (RTIS) – Provision of real-time traffic speeds on major roads of Hong Kong by different colors on the Internet. (http://tis.td.gov.hk/rtis/ttis/index/main_partial.jsp)
- Journey Time Indication System (JTIS) – On-site provision of real-time average journey times from the locations of the journey time indicators to the exit of the cross-harbor tunnels.
- Speed Map Panels System (SMP) – On-site provision of real-time average journey times and traffic speeds in three colors on the major roads in the New Territories of Hong Kong.

RTIS

JTIS

SMP

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可持續運輸系統研究小組

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- 冷真博士，助理教授，土木及環境工程學系
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- 碩士及博士研究生:17人（包括全職和兼職）

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- 黃仕進教授，講座教授，香港大學
- 高自友教授，北京交通大學
- M. G. H. Bell 教授，悉尼大學

研究目標

該研究小組旨在開發新的研究領域，對動態交通問題和出行選擇行為進行深入研究。

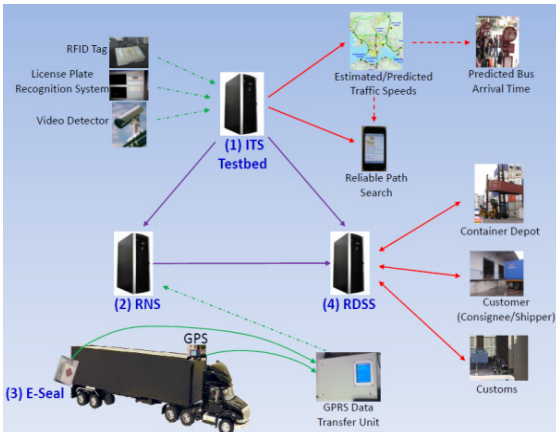
主要研究領域

- 動態出行信息系統 – 提供動態出行信息, 實時監測交通狀況。
- 先進的公共交通系統 – 提供動態的乘客換乘信息及換乘車輛運營管理。
- 動態交通模擬 – 隨時間變化的用戶出行行為及貨物移動模式。
- 可持續發展的城市交通 – 可持續發展的交通項目、規劃和政策。

主要方法和技術

開發先進的系統、模型和技術，以動態方式改進交通規劃和運作。
例如，

- 交通流模擬 – 提供香港地區的離線行車時間數據庫。
- 智能交通系統 (ITS) 試驗台 – 提供香港地區實時及可預測的交通資訊；幫助出行者在出發前或駕駛中搜尋最快、最可靠的出行路徑。
- 實時導航系統 (RNS) – 與電子簽章子系統相連接，實時導航，跟蹤和定位車輛及集裝箱運輸。
- 基於無線視頻識別的決策支持系統 (RDSS) – 為跨境集裝箱物流管理制定最優的物流策略。



應用實例

- 實時交通資訊系統 (RTIS) – 在互聯網上用不同顏色標注香港主幹道及市區道路的實時交通速度。(http://tis.td.gov.hk/rtis/ttis/index/main_partial.jsp)
- 行車時間顯示系統 (JTIS) – 現場提供從行車時間顯示器位置到過海隧道出口處的實時平均行車時間。
- 行車速度屏系統 (SMP) – 以三種不同　色現場提供香港新界區主幹道的平均行車時間和交通速度。

實時交通資訊系統 (RTIS)

行車時間顯示系統 (JTIS)

行車速度屏系統 (SMP)

Research Group for Sustainable Urban Design

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Timothy Jachna, Professor, School of Design (Group Leader)
- Laurent Gutierrez, Professor, School of Design
- Peter Hasdell, Associate Professor, School of Design
- Dr Gerhardes Bruyns, Assistant Professor, School of Design
- Full-time Researcher: one PhD student, Markus Wernli

Objectives of Research

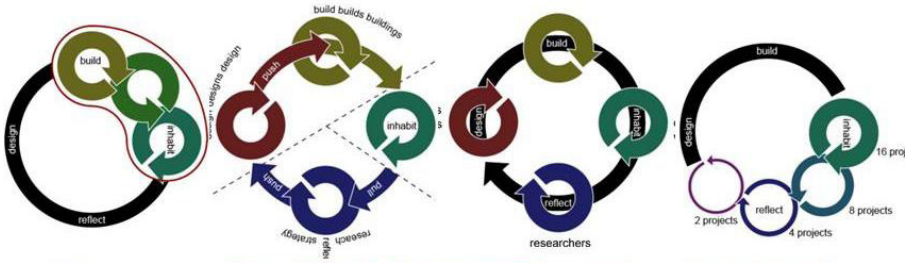
The research group aims to develop socially, culturally and environmentally sustainable approaches to the design of the built human spaces of cities, and to produce proposals demonstrating and promoting these principles by engaging specific sustainable urban design issues in Hong Kong and beyond.

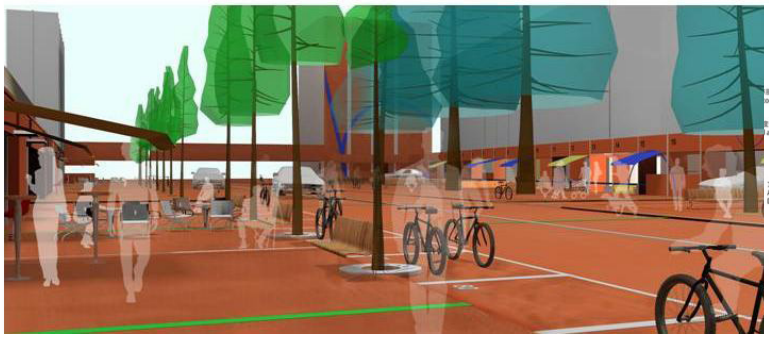
The core expertise of the group is in the analysis and design of the spaces of human habitation in cities, independent of scale (from the interior to the urban region) and use typology (residential, commercial, industrial), from a critical, culturally aware, human-centered perspective.

Our understanding of sustainable urban design draws together cultural, social, technological, functional, psychological, economic and political factors for the goal of achieving a holistic quality of life for urban inhabitants, working within natural ecosystems and cycles, respecting the local and global cultural context.

Main Research Areas

- Analyzing the relation between actual, proposed and potential urban design principles, the perceived quality of life of urban inhabitants, and environmental sustainability;
- Collaborating with other research groups to meaningfully and sustainably integrate technological innovations in the area of sustainability into everyday lives of people through urban design;
- Engaging current and emerging urban sustainability issues in urban design in Hong Kong and the region, and proposing urban design tactics and strategies to address these issues;
- Understanding socio-cultural and other contextual factors influencing the viability of achieving sustainable urban design in Hong Kong, in terms of barriers as well as opportunities, and the implications of these insights for urban design practice;
- Conducting studies of current models and norms in the design and use of urban spaces, in terms of social and environmental sustainability, and devising scenarios and proposals for more sustainable, alternative approaches;
- Facilitating the transfer of knowledge of sustainable urban design and development principles and practices into teaching in the School of Design.





可持續城市設計研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 設計學院 Timothy Jachna 教授 (組長)
- 設計學院 Laurent Gutierrez 副教授
- 設計學院 Peter Hasdell 副教授
- 設計學院 Gerhardes Bruyns 博士，助理教授
- Markus Wernli，博士生、全職研究員

研究目標

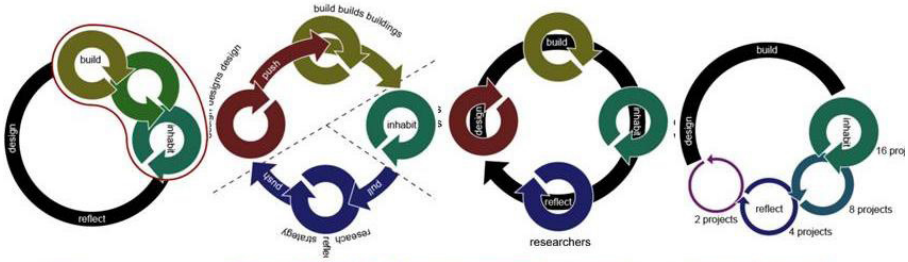
研究小組希望制訂可同時在社會、文化及環境三方面達致永續發展的城市建築空間設計方略，並藉著參與香港或其他地區一些有關可持續城市設計的具體課題，提出可以印證及推廣這些原則的建議。

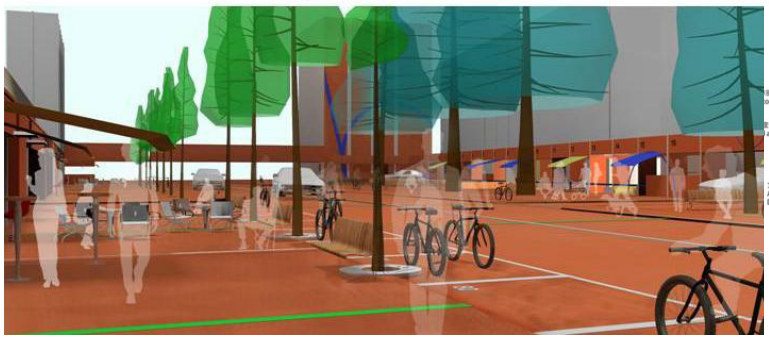
小組的核心專長在於分析及設計人類在城市的大小居住空間 (從室內到整個城市)，並從批判性、尊重文化和以人為本的角度應用類型學 (商住及工業建築) 知識。

基於對可持續城市設計學的認識，我們會通盤考慮文化、社會、科技、實用功能、心理學、經濟及政治因素，務求在不違反大自然生態系統及週期、尊重本地及環球文化的前提下，全面保障城市居民的生活質素。

主要研究領域

- 分析現行、建議及未來城市設計原則、城市人預期生活質素，以及環境可持續性之間的關係；
- 與其他研究小組合作，適當並持續地通過城市設計，把有助可持續發展的科技發明應用於人類的日常生活；
- 探討香港及區內城市設計現時及日後或會遇上的可持續發展難題；提出可以解決這些問題的城市設計方法和策略；
- 瞭解足以左右香港能否成功實現可持續城市設計的社會、文化及其他相關因素 (包括障礙及機遇)，以及這些因素對實踐城市設計原則的影響；
- 從社會及環境的可持續性出發，對現行的城市空間設計與使用模型和標準進行研究，並提出其他更符合永續發展的策略和建議；
- 把可持續城市設計及發展的原則和實務知識納入設計學院的教學內容，增進學生在這方面的認知。





Research Group for Urban Housing Policies

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Eddie Hui, Professor, Real Estate Discipline Leader, Department of Building and Real Estate (Group Leader)
- Prof. Francis Wong, Professor, Department of Building and Real Estate
- Dr Stanley Yeung, Associate Professor, Department of Building and Real Estate
- Four current research students (including PhD and MPhil students of both full-time and part-time modes), and six current full-time research personnel

External Collaborators

- Dr Kin-wah Chung, Assistant Professor, APSS
- Dr David Ho, Associate Professor, NUS

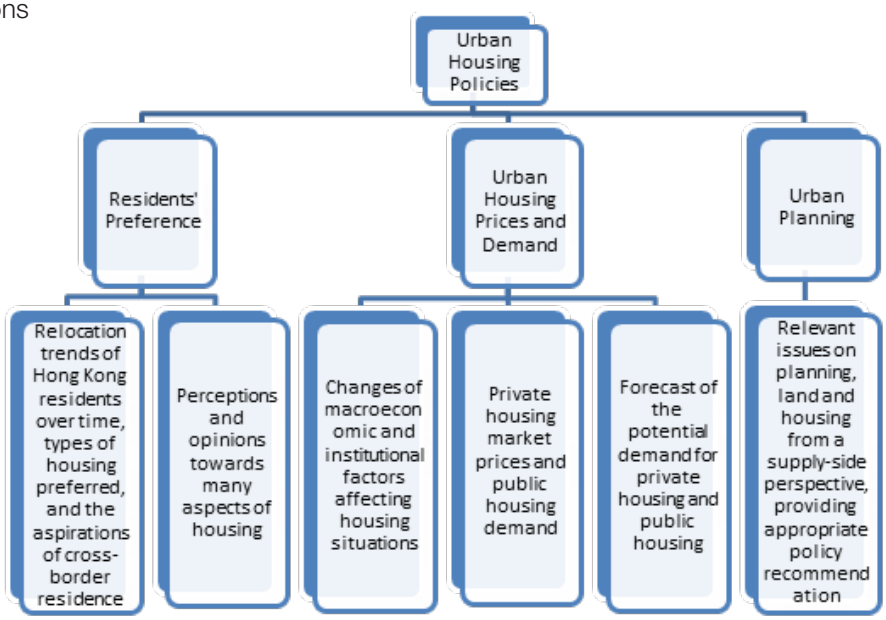
Objectives of Research

The research group aims to address issues related to the sustainability of urban housing. It has two **long-term research directions**: (1) Development of analytical approaches based on comprehensive and systematic factual information that offer an understanding of urban housing decisions made by Hong Kong's populace. (2) Provision of useful insights and policy directions for both government agencies and private property developers to respond to latent changes in population dynamics as well as housing consumptions on both sides of the border.

Main Research Areas

Over the next five years, the Research Group will undertake research in the following areas:

1. Relocation trends of Hong Kong residents over time, types of housing preferred (including HOS housing units), and the aspirations of cross-border residence
2. Changes of macroeconomic and institutional factors affecting housing situations
3. Private housing market prices and public housing demand
4. Forecast of the potential demand for private housing and public housing
5. Perceptions and opinions on different aspects of housing
6. Relevant issues on planning, land use, and housing from a supply-side perspective, providing appropriate policy recommendations



PhD Students and Research Topics

- Housing Settlement for Migrant Workers in China: A Case Study of Shenzhen (Miss Tao Li) (completed in 2012)
- The Impact of Social Housing on Residential Spatial Differentiation in Transitional China: the Case of Guangzhou (Miss Cindy Chen) (to be completed in 2014)

Recent Outputs

- Hui ECM and Yu KH (2012) Assisted Homeownership, Investment and their Roles in Private Property Price Dynamics in Hong Kong, *Habitat International*, 36: 219-225.
- Hui ECM, Li SM, Wong FKW, Zheng Y & Yu KH (2012) Ethnicity, Cultural Disparity and Residential Mobility: Empirical Analysis of Hong Kong, *Habitat International*, 36: 1-10.
- Hui ECM, Zheng X, Hu J (2012) Housing Price, Elderly Dependency and Fertility Behaviour, *Habitat International*, 36(2): 304-311.
- Jayantha WM and HUI ECM (2012) Housing Consumption and Residential Crowding in Hong Kong: A Long-term Analysis, *Journal of Facilities Management*, 10 (2): 150-172.
- Hui ECM and Zheng X (2012) Exploring the Dynamic Relationship between Housing and Retail Property Markets: An Empirical Study of Hong Kong, *Journal of Property Research*, 29(2):85-102.
- Hui ECM and Chen J (2012) Investigating the Change of Causality in Emerging Property Markets during the Financial Tsunami, *Physica A*, 391: 3951-3962.
- Hui ECM, Zhong JW and Yu KH (2012) Mobility and Work-residence Matching for New Immigrants in Hong Kong, *Habitat International*, 36:444-451.
- Hui ECM and Ng IMH (2012) Wealth Effect, Credit Price Effect, and the Inter-relationships between Hong Kong's Property Market and Stock Market, *Property Management*, 30(3):255-273.
- Wong FKW, Hui ECM, Chung KW, Li T and Lui E (2012) Housing for the Elderly in Hong Kong – Affordability and Preferences, Research Report, The Hong Kong Institute of Surveyors, August, 110pp.

城市房屋政策研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 許智文教授，建築及房地產學系（組長）
- 黃君華教授，建築及房地產學系
- 楊志威博士，副教授，建築及房地產學系
- 四位現就讀研究生(包括半日制及全日制碩士及博士研究生)，及六位全日制研究人員

校外合作夥伴

- 鍾劍華博士，副教授，APSS
- Dr David Ho，副教授，新加坡國立大學

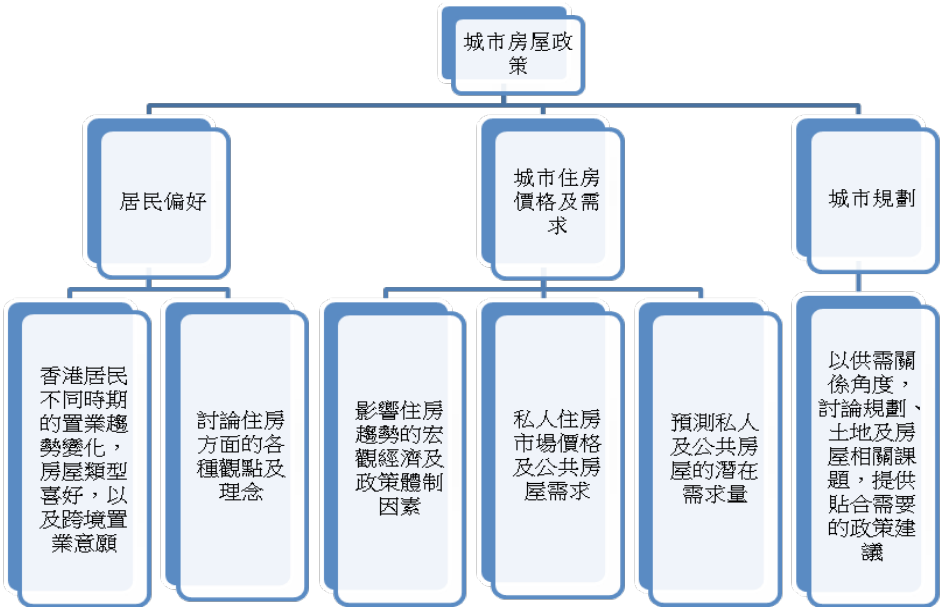
研究目標

該研究小組致力於“城市房屋可持續建設”的課題研究。具體而言，該小組嘗試應對兩大研究方向的長期挑戰：（1）根據反映香港市民城市住房決策的一系列綜合而系統性的可靠信息，建立一套完善的分析方法；（2）鑒於近年深港兩地人口動態及住房消費趨勢的變化，為政府部門及私人房地產發展商，提供深入意見及政策導向。

主要研究內容

在接下來的五年，該研究小組將進行以下課題方向的研究：

1. 香港居民不同時期的置業趨勢變化，房屋類型喜好（包括居者有其屋計劃單位），以及跨境置業意願。
2. 影響住房趨勢的宏觀經濟及政策體制因素。
3. 私人住房市場價格，及公共房屋需求。
4. 預測私人及公共房屋的潛在需求量。
5. 討論住房方面的各種觀點及理念。
6. 以供需關係角度，討論規劃、土地及房屋相關課題，提供貼合需要的政策建議。



博士生研究課題

- 中國移民工人的住房解決現狀：深圳研究（Miss Tao Li）（在2012年完成）
- 社會福利住房對傳統中國人住房在空間分佈上的影響：廣州研究（Miss Cindy Chen）（將在2014年完成）

相關論文

- Hui ECM and Yu KH (2012) Assisted Homeownership, Investment and their Roles in Private Property Price Dynamics in Hong Kong, *Habitat International*, 36: 219-225.
- Hui ECM, Li SM, Wong FKW, Zheng Y & Yu KH (2012) Ethnicity, Cultural Disparity and Residential Mobility: Empirical Analysis of Hong Kong, *Habitat International*, 36: 1-10.
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- Wong FKW, Hui ECM, Chung KW, Li T and Lui E (2012) Housing for the Elderly in Hong Kong – Affordability and Preferences, Research Report, The Hong Kong Institute of Surveyors, August, 110pp.

Research Group for Advanced Composites and Technology

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. L.M. Zhou, Professor, Department of Mechanical Engineering (Group Leader)
- Prof. J.G. Teng, Professor, Department of Civil and Environmental Engineering
- Dr J.G. Dai, Associate Professor, Department of Civil and Environmental Engineering
- S. Y. (Ben) Leu, Assistant Professor, Department of Civil and Environmental Engineering
- Dr H.M. Yao, Assistant Professor, Department of Mechanical Engineering
- Researchers: 2 Research personnel, 5 PhD students, 8 Master Students

External Collaborators

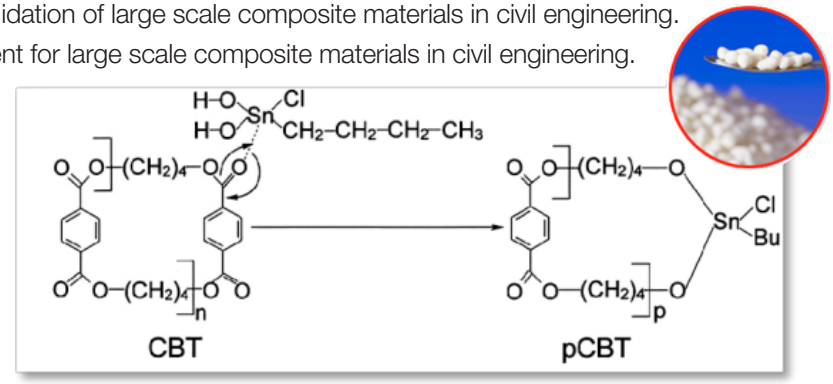
- Dr J.F. Zhang, Associate Professor, Harbin Engineering University
- Dr W.Y. Liang, Associate Professor, Harbin Engineering University

Objectives of Research

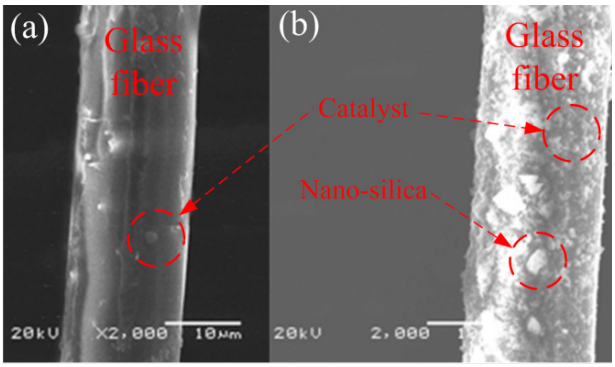
The research group aims to build up a strength at PolyU to enhance research activity on advanced composites and technology in civil and environmental engineering.

Main Research Areas

- High strength, recyclable and reusable thermoplastic composite materials.
- Multiphysics coupling response and coping mechanisms of composite materials/structures in civil engineering.
- Green multifunctional composite materials in civil engineering application.
- Structural theory and validation of large scale composite materials in civil engineering.
- Life reliability management for large scale composite materials in civil engineering.



High liquidity thermoplastic resin – Cyclic Butylenes Terephthalate (CBT)



Microphotographs of fiber surface treated by (a) catalyst; (b) catalyst and nano-silica.

(c) Secondary fabrication of thermoplastic composite materials

(d) Flexible assembly technology of large scale composite structures

Current Research Projects

- "Development and application of the new thermoplastic composite material in marine engineering", funded by the Ministry of Science and Technology of China, "Hong Kong, Macao and Taiwan Science & Technology Cooperation Program of China" (2014DFH50060).
- "Failure mechanism and multi-scale prediction of composite connected cabin", supported by National Natural Science Foundation of China (51379048).
- "Study on the key technologies of advanced thermoplastic resin CBT and composite materials", Guangdong innovation resource aggregation scheme, Industry-University-Research Collaboration Project.

先進複合材料與技術研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 周利民教授，機械工程系（組長）
- 滕錦光教授，可持續城市發展研究院
- 戴建國博士，副教授，土木及環境工程學系
- 呂紹元博士，助理教授，土木及環境工程學系
- 姚海民博士，助理教授，機械工程系
- 研究人員： 2 名研究人員，5名博士生，8名碩士生

校外合作夥伴

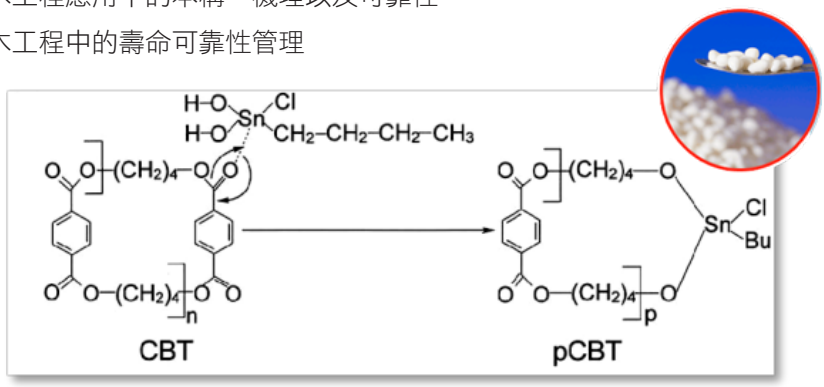
- 章繼峰博士，副教授，哈爾濱工程大學
- 梁文彥博士，副教授，哈爾濱工程大學

研究目標

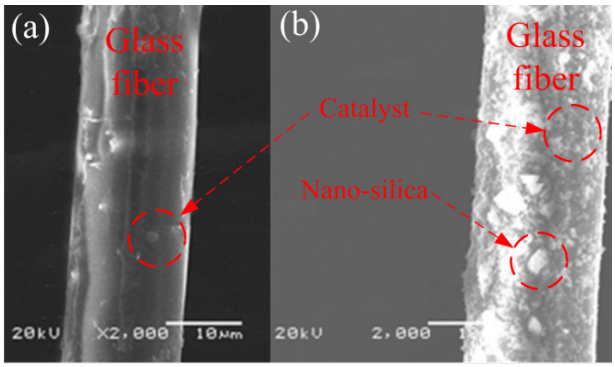
研究小組致力　於在香港理工大學建立一個專業團隊，以便對先進複合材料及其在土木與環境工程中的相關技術展開更深入的研究。開發高性能綠色環保型複合材料及應用技術，促進複合材料在土木領域中的應用。

主要研究領域

- 高強度、可循環、可再加工熱塑性複合材料
- 複合材料/結構在土木工程中多物理場耦合響應以及應對機制
- 多功能綠色環保復合材料在土木工程中的應用
- 大尺寸複合材料在土木工程應用中的本構、機理以及可靠性
- 大尺寸複合材料在土木工程中的壽命可靠性管理



高流動性熱塑性樹脂——環形對苯二甲酸丁二醇酯（CBT）



纖維表面的微觀圖
(a) 添加催化劑 (b) 添加催化劑與納米二氧化硅

(c) 熱塑性複合材料二次加工

(d) 大型複合材料結構柔性裝配技術

近期相關研究項目

- 科技部港澳臺科技合作專項“新型船用熱塑性複合材料合作研發及應用”（2014DFH50060）
- 國家自然科學基金“複合材料艙段連接失效機理及跨尺度性能預報”(51379048)
- 廣東省研發創新資源聚集計劃產學研合作項目“高性能熱塑性CBT樹脂及複合材料關鍵技術研究”

電郵: risud@polyu.edu.hk 網頁: www.polyu.edu.hk/risud

Construction Health and Safety Research Group

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Albert Chan, Professor, Department of Building and Real Estate (Group Leader)
- Prof. Francis Wong, Professor, Department of Building and Real Estate
- Dr Michael Yam, Associate Professor, Department of Building and Real Estate
- Dr Daniel Chan, Associate Professor, Department of Building and Real Estate
- Dr Edmond Lam, Instructor, Department of Building and Real Estate
- Dr Carol Hon, Postdoctoral Research Fellow, Department of Building and Real Estate

PolyU Collaborators

- Prof. Michael Siu, Professor, School of Design
- Prof. Li Yi, Professor, ITC
- Mr Albert Kwok, Senior Engineer, IC

Local Collaborators

- Prof. Joanne Chung, Chair Professor of Health Study, Hong Kong Institute of Education
- Dr Del Wong, Associate Professor, Technological and Higher Education Institute of Hong Kong (THEi)
- Dr Esther Cheung, Programme Manager, HKU SPACE

Overseas Collaborators

- Prof. Herbert Biggs, Professor, Queensland University of Technology
- Dr Don Dingsdag, Senior Lecturer, University of Western Sydney

Mission of the Research Group

The mission of the Research Group is to develop and apply safety measures to enhance construction health and safety. A safe and healthy environment is important to the success of a sustainable urban development. Due to inadequate planning in property development, the lack of professional property management, outdated standards for building design and uncoordinated control of dense urban living spaces, many of the ageing residential buildings are not in a healthy and safe condition. Likewise, work practices in the repair and maintenance sectors are not always carried out in a safe manner. Occupational health in construction is also of paramount importance. Summer time in Hong Kong is hot and humid. Construction workers are vulnerable to heat stress in summer as heat stroke has been known to cause a number of deaths and injuries. However, unlike most developed countries, there is no legal recommendation concerning the human work limit under hot weather in Hong Kong. One major reason may be the lack of empirical studies showing the human tolerance for working in a hot and humid environment. Therefore, scientific and empirical research in predicting the maximum work durations without jeopardizing the workers' health under different levels of heat stress is urgently needed.

Main Research Areas

Over the next five years, the Research Group will undertake research in the following areas:

- Designing for a Safe and Healthy Built Environment
- Implementation of the Mandatory Building Inspection Scheme (MBIS) in Hong Kong
- Management and Control of Ageing Residential Buildings
- Construction Safety for Repair and Maintenance
- Anti heat stress clothing for construction workers in hot and humid weather
- Impact of heat stress on construction workers

Main Technologies and Application Tools

The nature of the Research Group requires both quantitative and qualitative assessments. It calls for a multi-disciplinary team to conduct the research study and interpret the findings. The team possesses expertise and experience in occupational safety and health, materials sciences, textile sciences, biological and exercise sciences, occupational hygiene, and other relevant disciplines. A research project led by Prof. Albert Chan has scooped a Highly Commended Health and Safety Award in the 2012 International Innovation and Research Awards organized by the Chartered Institute of Building (CIOB) in the U.K.

Awards Won by the Research Group

Prize	Awarding Organisation
CIOB International Innovation and Research Awards 2012: Health and Safety Award	The Chartered Institute of Building (UK)
The Innovation Achievers Award for 2008/09	The Chartered Institute of Building International Innovation and Research Awards 2008/09
Gold Medal with the Congratulations of the Jury, 2008	36th International Exhibition Inventions, New Techniques and Product, Geneva, Switzerland
Award of High Scientific and Technological Level of the Invention, 2008	Romania Ministry of Education, Research and Youth, Presented by the Romania Ambassador to Switzerland, Ionel Sava
Gold Prize, Year 2000 Safety Paper Competition	Safety Specialist Group, Hong Kong Institution of Engineers

建造業健康及安全研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 陳炳泉教授，建築及房地產學系（組長）
- 黃君華教授，建築及房地產學系
- 任志浩，副教授，建築及房地產學系
- 陳煒明，副教授，建築及房地產學系
- 林偉明，導師，建築及房地產學系
- 韓嘉紅，博士後，建築及房地產學系

香港理工大學校內合作夥伴

- 邵健偉教授，設計學院
- 李翼教授，紡織及制衣學系
- 郭永強，高級工程師，工業中心

香港本土合作夥伴

- 鐘慧儀，講座教授，香港教育學院
- 王培林，副教授，香港高等科技教育學院 (THE i)
- 張泳沁，項目經理，香港大學專業進修學院

境外合作夥伴

- Prof. Herbert Biggs，教授，昆士蘭理工大學
- Dr Don Dingsdag，高級講師，澳大利亞西悉尼大學

團隊研究使命

研究團隊的使命旨在提出和應用一系列安全措施來提升建築項目施工安全與健康水平。安全、健康的環境對城市可持續健康發展至關重要。然而，由於缺少充分、專業的物業管理策劃，或建築物設計標準落後，以及城區高度集中的居住密度，大部分老舊建築都存在安全隱患。同時對該類建築物的維修與日常保養工作也沒有以安全的形式展開。建築業中職業健康問題也至關重要。香港夏季炎熱潮濕，建築工人極易受到高溫侵襲，且已經產生了大量致死、致傷事件。然而，與大多數發達國家不同，香港立法中缺少對高溫環境下工作人員的關切。其中一項重要原因在於缺少對工人在高溫潮濕環境中工作極限的實證研究。因此，在不危害工人健康的前提下，開展預測工人在不同程度高溫環境下最長工作時間的實證研究迫在眉睫。

主要研究領域

在接下來的五年中，研究團隊將在以下領域開展研究：

- 安全、健康施工環境的構建
- 香港建築物強制監管計劃的實施
- 老舊居住建築管控
- 建築物維修、保養施工安全管理
- 高溫潮濕環境下的隔熱服裝研究
- 高溫環境對建築工人的影響

主要技術及應用工具

研究團隊綜合運用定性與定量評價方法，並組建多學科交叉科研團隊開展相關研究。研究團隊在職業健康與安全、材料科學、紡織科學、生命運動科學及職業衛生等其他相關領域擁有專業特長。其中，由陳炳泉教授負責的一項科研項目已經獲得由英國皇家特許建造學會組織評選的2012年度國際創新和研究大獎—“健康與安全獎”。

研究團隊榮獲獎項

獎項	授予機構
2012年英國皇家特許建造學會國際創新及研究獎：健康與安全獎	英國皇家特許建造學會
2008/09創新成就獎	2008/09英國皇家特許建造學會國際創新和研究獎
評審團的祝賀金獎，2008	第36屆國際展覽發明，新技術與新產品，瑞士日內瓦
高科學和技術水平發明獎	羅馬尼亞教育部研究和青年部，由羅馬尼亞駐瑞士大使頒發
2000年安全徵文大賽金獎	香港工程師學會安全專家小組

Research Group for High-speed Railway Safety

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

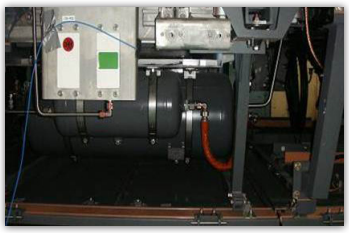
- Prof. Y.Q. Ni, Professor, Department of Civil and Environmental Engineering (Group Leader)
- Prof. J.H. Yin, Professor, Department of Civil and Environmental Engineering
- Prof. X.L. Ding, Professor, Department of Land Surveying and Geo-Informatics
- Dr D. Wang, Associate Professor, Department of Computing
- Dr X.J. Jing, Associate Professor, Department of Mechanical Engineering

External Collaborators

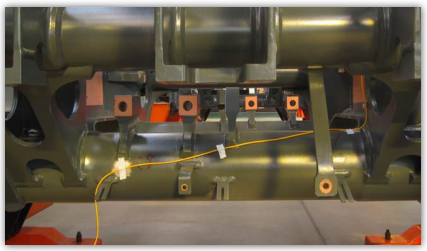
- Southwest Jiaotong University, China
- Beijing Jiaotong University, China
- Zhejiang University, China
- Dalian Jiaotong University, China
- University of Wollongong, Australia
- University of Nevada, USA
- University of North Carolina, USA
- China CNR Qiqihar Railway Rolling Stock Company Ltd., China
- China CNR Changchun Railway Vehicle Company Ltd., China

Research Topics

- Key theories and methods on structural inspection of high-speed rail tracks
- Limit state method-based design theories for high-speed rail tunnels and their applications
- Long-term dynamic stability of ballastless track subgrade for high-speed railway and limit state method-based design theories
- Monitoring and assessment of ride comfort of high-speed trains in operation
- Study of semi-active control of high-speed trains using magnetorheological dampers
- Development of a crack monitoring system for high-speed rail turnout tracks
- In-construction safety monitoring of Wuhan metro-tunnel cross-passage under Yangtze River by use of the FBG sensing technology
- Subgrade deformation monitoring of Beijing-Shanghai High-speed Rail during construction of an under-crossing tunnel
- Settlement monitoring of Beijing-Shanghai High-speed Rail



Installation of optical fibre sensors on suspension systems

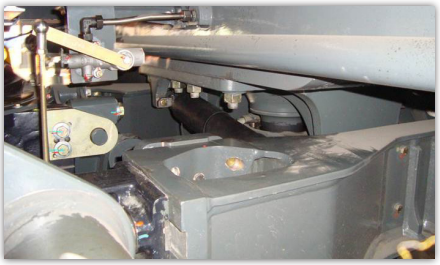


Installation of optical fibre sensors on bogies

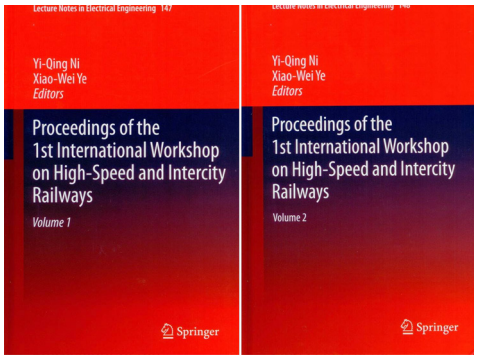
Monitoring of ride comfort of high-speed trains in operation

Damage Identification and crack monitoring of railway turnouts based on fiber optic and ultrasonic guided wave sensing technology

Full-scale vibration control testing using smart dampers for high-speed trains



Installation of smart MR dampers



高鐵安全研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 倪一清教授，土木及環境工程學系（組長）
- 殷建華教授，土木及環境工程學系
- 丁曉利教授，土地測量及地理資訊學系
- 王丹博士，助理教授，電子計算學系
- 景興建博士，助理教授，機械工程學系

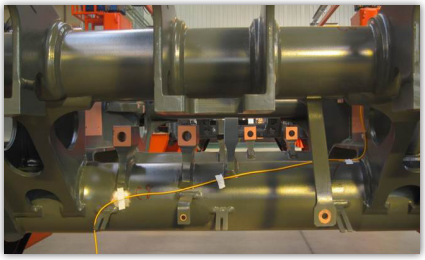
校外合作夥伴

- 西南交通大學
- 北京交通大學
- 浙江大學
- 大連交通大學
- 澳洲臥龍崗大學
- 美國內華達大學
- 美國北卡羅來納大學
- 齊齊哈爾軌道交通裝備有限責任公司
- 長春軌道客車股份有限公司

研究課題

- 高速鐵路軌道結構檢測關鍵理論與方法
- 高速鐵路隧道極限狀態設計理論及其應用
- 高速鐵路無砟軌道路基長期動力穩定性及基於極限狀態法的設計方法研究
- 高速列車運行時的舒適度監測與評估
- 基於磁流變阻尼器的高速列車半主動控制研究
- 高速鐵路道岔鋼軌裂紋監測系統研發
- 基於光纖光柵傳感技術的武漢越江地鐵隧道聯絡通道施工安全監控關鍵技術研究
- 寧蕪改線隧道工程下穿京滬高鐵正線路基段變形監測
- 京滬高速鐵路沉降監測

安裝於懸掛系統的光纖傳感器

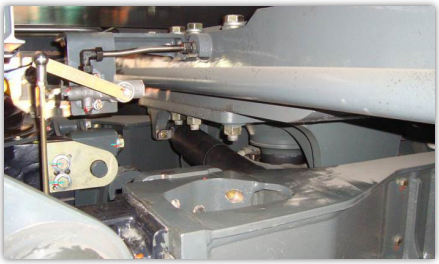


安裝於轉向架的光纖傳感器

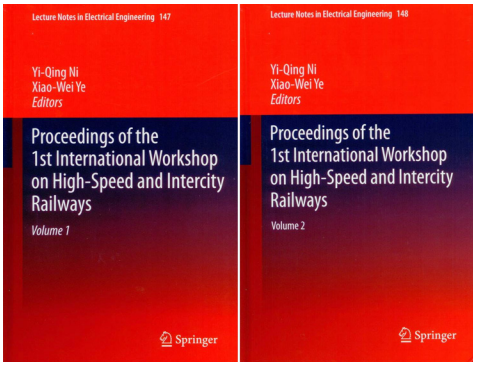
高速列車運行時的舒適度監測

基於光纖和超聲導波傳感技術的鐵路道岔損傷識別與裂紋監測

高速列車採用智能阻尼器的足尺振動控制試驗



智能磁流變阻尼器的安裝



Research Group for Infrastructural Monitoring

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Y.L. Xu, Chair Professor of Structural Engineering, Department of Civil and Environmental Engineering (Group Leader)
- Prof. S.S. Law, Professor, Department of Civil and Environmental Engineering
- Prof. J.H. Yin, Professor, Department of Civil and Environmental Engineering
- Prof. Y.Q. Ni, Professor, Department of Civil and Environmental Engineering
- Dr Y. Xia, Associate Professor, Department of Civil and Environmental Engineering
- Dr S.Y. Zhu, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Y.H. Wang, Assistant Professor, Department of Civil and Environmental Engineering
- Full-time research personnel: 36

External Collaborators

- Prof. J.W.M. Brownjohn, The University of Sheffield
- Prof. J.P. Ou, Dalian University of Technology
- Prof. B.F. Spencer, University of Illinois at Urbana-Champaign

Objectives of Research

The mission of the research group is to develop new technologies and methodologies for monitoring and assessing urban infrastructures to ensure infrastructures function properly at all levels of specified performance and to prevent them from sudden failure and fatal disaster.

Main Research Areas

- Fibre Bragg sensor networks for infrastructural monitoring;
- Wireless sensor networks for infrastructural monitoring;
- Performance-based design of infrastructural monitoring system;
- Optimization of sensor placements;
- Advanced data acquisition, transmission and management systems;
- New modelling technologies and model updating methods;
- Novel damage detection algorithms with consideration of uncertainties and operation conditions;
- Infrastructural monitoring-based bridge rating system;
- Infrastructural monitoring-based life-cycle deterioration models; and
- Performance simulation and assessment of infrastructure.

Key Research Projects

- Niche Area Fund: Performance-based health monitoring of large civil engineering structures
- RGC/GRF Grant: Synthesis of vibration control and health monitoring to mitigate earthquake hazards to building structures
- RGC/GRF Grant: Condition assessment of pre-stressed concrete box-section bridge deck with reliability-based results
- RGC/GRF Grant: Study on the fundamental behavior of the interface between cement grout and a completely decomposed granite soil in Hong Kong
- 863 Program: Technologies for condition monitoring and reliability control of supertall buildings during construction
- RGC/GRF Grant: Numerical analysis and field monitoring of temperature actions on supertall structures during the construction stage
- RGC/GRF Grant: Electromagnetic dampers for structural vibration control and power supply of wireless sensors
- Highways Department: Collaborative research on review of pavement design procedures in HK

Influential Applications

- Health monitoring of Tsing Ma Bridge
- Structural health prognosis for Stonecutters Bridge
- Structural performance monitoring for the 632-m-tall Shanghai Tower

Others

- Awards: ASCE Robert H. Scanlan Medal; Croucher Award; Natural Science Awards; Dean's Awards
- Books: Structural Health Monitoring of Long-span Suspension Bridges; Damage Models and Algorithms for Assessment of Structures under Operating Conditions
- Design standards: Design Standards for Structural Health Monitoring Systems (in Chinese)

基礎設施監測研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 徐幼麟教授，結構工程講座教授，土木及環境工程學系（組長）
- 羅紹湘教授，教授，土木及環境工程學系
- 殷建華教授，教授，土木及環境工程學系
- 倪一清教授，教授，土木及環境工程學系
- 夏勇博士，副教授，土木及環境工程學系
- 朱松曄博士，助理教授，土木及環境工程學系
- 王予紅博士，助理教授，土木及環境工程學系
- 全職研究人員：36人

校外合作夥伴

- Prof. J.W.M. Brownjohn，英國謝菲爾德大學
- 歐進萍教授，中國工程院院士，中國大連理工大學
- Prof. B.F. Spencer，土木工程講座教授，美國伊利諾伊大學香檳分校

研究目標

本小組的任務是研究城市基礎設施監測與評估的新技術、新方法，以確保基礎設施能夠在各種情況下正常運營，防止突發性故障與災害的發生。

主要研究領域

- 用於基礎設施監測的光柵光纖傳感網絡；
- 用於基礎設施監測的無線傳感器網路；
- 基於性態的基礎設施監測系統設計；
- 傳感器優化佈置；
- 先進的數據採集、傳輸與管理系統；
- 新的建模技術以及模型修正方法；
- 考慮不確定因素以及運營條件下新型結構損傷識別方法；
- 基於監測的橋樑評價系統；
- 基於監測的基礎設施全壽命退化模型；以及
- 基礎設施性能的模擬與評估。

主要研究項目

- 特設研究基金：基於性能的大型土木結構健康監測
- RGC/GRF項目：振動控制與健康監測相結合的建築結構地震減災
- RGC/GRF項目：基於可靠度的預應力混凝土箱型橋面板狀態評估
- RGC/GRF項目：香港水泥灌漿與全風化花崗岩土界面的基本特性
- 863 項目：超高層建築施工過程中的監測與可靠性控制技術
- RGC/GRF項目：超高層建築結構施工過程中的溫度數值分析以及現場監測
- RGC/GRF項目:用於結構振動控制及為無線傳感器供電的電磁阻尼器
- 路政署資助：香港路面設計程序

重要項目應用

- 青馬大橋（1377米主跨）健康監測
- 昂船洲大橋（1018米主跨）結構健康預測
- 上海中心(632米高)結構性能監測

其他

- 榮譽獎勵：美國土木工程師協會 Robert H. Scanlan 獎；香港裘槎優秀科研獎；教育部自然科學獎；院長獎
- 出版書籍:《大跨懸索橋樑結構健康監測》;《運營狀況下的結構損傷模型與評估》
- 設計規範:《結構健康監測系統設計標準》（中文）

電郵: risud@polyu.edu.hk 網頁: www.polyu.edu.hk/risud

Research Group for Sustainable Materials and Structures

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

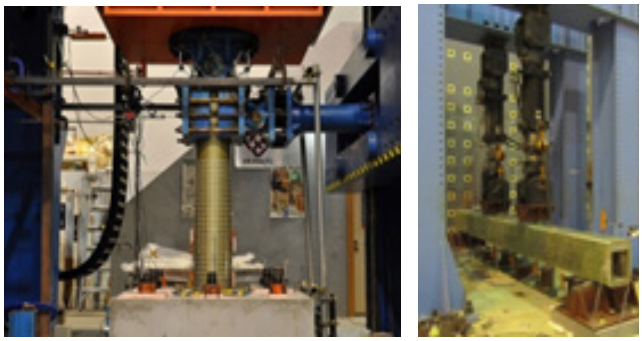
- Prof. Jin-Guang TENG, Chair Professor of Structural Engineering, Department of Civil and Environmental Engineering (Group Leader)
- Dr Jian-Guo DAI, Associate Professor, Department of Civil and Environmental Engineering
- Dr Zhen LENG, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Yu-Hong WANG, Assistant Professor, Department of Civil and Environmental Engineering

Mission

To advance the frontiers of knowledge and technology of materials and structures so as to minimize the life-cycle cost and carbon footprints of urban infrastructure.

Main Research Areas

- Prolongation of service life through innovative strengthening and retrofiting
- Durable structures based on fibre-reinforced polymer (FRP) and cementitious composites
- Sustainable pavement materials; ground tire rubber modified asphalt; photo-catalytic pavements
- Durability enhancement technologies
- Multi-scale life-cycle performance simulation
- Non-destructive techniques for structural performance evaluation
- Life-cycle management of reinforced concrete structures exposed to harsh/marine environments.
- Recycling of construction materials, including recycled concrete and recycled asphalt
- Impact of climate change on infrastructure
- Green rating of infrastructure

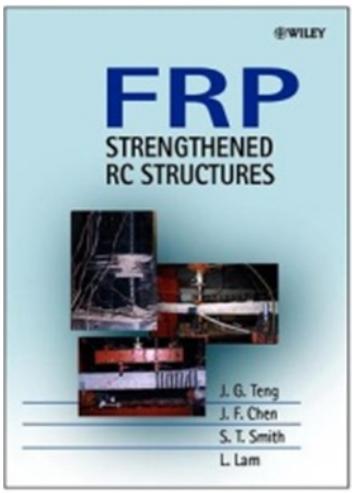


Hybrid FRP-concrete-steel double-skin tubular members

Major Achievements/Impact

J.G. Teng, J.F. Chen, S.T. Smith, L. Lam,
FRP: Strengthened RC Structures
ISBN: 978-0-471-48706-7, 266 pages
By John Wiley and Sons, January 2002

Invention of Double-Skin-Tubular Columns
(US Patent No: US7, 673, 432 B)



Research results widely adopted by design guidance documents around the world:

- 國家標準《纖維增強複合材料建設工程應用技術規範》
- American Concrete Institute Guidelines
- UK Concrete Society Guidelines
- Standards Australia Guidelines

Representative Research Projects

- Fracture control and reliability-based design of FRP composites and large-size FRP-reinforced concrete structures, a sub-project funded by the National Basic Research Program of China (i.e. 973 Program)
- Hybrid FRP-concrete-steel double-skin tubular beams, funded by the General Research Fund of the Hong Kong Research Grants Council
- Hong Kong guideline for the strengthening of concrete structures using FRP composites, funded by the Innovative Technology Fund of the Hong Kong SAR Government
- Development of thin wall panels based on basalt textile reinforced geopolymer for sustainable building construction, funded by the Innovative Technology Fund of the Hong Kong SAR Government
- Impacts of asphalt pavement construction on workers' health, funded by the Highways Department of the Hong Kong SAR Government

可持續材料及結構研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 滕錦光教授，結構工程講座教授，土木及環境工程學系（組長）
- 戴建國博士，助理教授，土木及環境工程學系
- 冷　真博士，助理教授，土木及環境工程學系
- 王予紅博士，助理教授，土木及環境工程學系

研究組理念

通過跨學科研究，推動土木材料及結構工程領域的知識創新和技術發展，為減少城市基礎設施的全壽命成本以及碳足迹作出貢獻。

主要研究領域

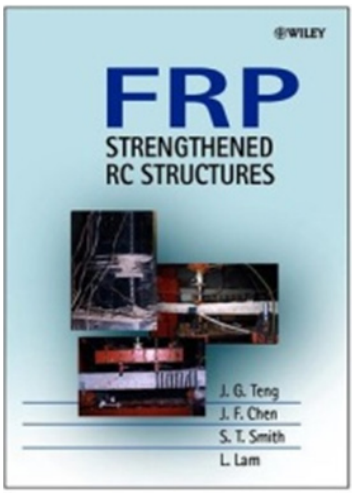
- 用於結構延壽的新型修復/加固技術
- 基於纖維增强（樹脂基及水泥基）複合材料的高耐久性結構
- 可持續性路面鋪裝材料；輪胎膠粉改性瀝青；光催化路面鋪裝
- 結構耐久性提升技術
- 結構全壽命性能的多尺度模擬
- 用於結構性能評估的無損檢測技術
- 海洋及嚴酷環境下混凝土結構的全壽命管理
- 土木材料的循環利用：再生混凝土及再生瀝青
- 氣候變化對基礎設施安全性的影響
- 綠色基礎設施的評價方法

高性能FRP-混凝土-鋼雙壁空心構件

主要研究成果及影響

專著：J.G. Teng, J.F. Chen, S.T. Smith, L. Lam,
FRP Strengthened RC Structures, John Wiley and Sons, 2002.

美國專利：Double-Skin-Tubular Columns
(US Patent No: US7, 673, 432 B)



研究成果已經被國內外指南/規範廣泛采納：

- 國家標準《纖維增強複合材料建設工程應用技術規範》
- American Concrete Institute Guidelines
- UK Concrete Society Guidelines
- Standards Australia Guidelines

代表性研究項目

- 應用FRP實現重大工程結構高性能與長壽命的基礎研究，國家重點基礎研究發展計劃項目(973 項目)課題一，編號2012CB026201。
- FRP-混凝土-鋼組合雙壁空心梁，香港政府研究資助局項目。
- 纖維增强複合材料加固混凝土結構技術指南的編制，香港政府創新及科技基金(ITF) 資助項目。
- 玄武岩纖維增强地質聚合物薄型墻板在可持續建築中的應用，香港政府創新及科技基金(ITF) 資助項目。
- 瀝青鋪裝對施工人員健康的影響，香港政府路政署項目。

Urban Geo-hazards Research Group

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Jian-Hua YIN, Department of Civil and Environmental Engineering (Group Leader and Chair Professor of Soil Mechanics)
- Prof. Kam-Tim CHAU, Chair Professor in Geotechnical Engineering, Department of Civil and Environmental Engineering
- Prof. Xiao-Li DING, Chair Professor of Geomatics, Department of Land Surveying and Geo-Informatics
- Prof. Wen-Zhong SHI, Chair Professor and Head, Department of Land Surveying and Geo-Informatics
- Prof. Wei JIN, Chair Professor, Department of Electrical Engineering
- Dr Yung-ming CHENG, Associate Professor, Department of Civil and Environmental Engineering
- Dr Andy LEUNG, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Jianbo ZHU, Assistant Professor, Department of Civil and Environmental Engineering
- Full-time researchers: 3 Post-Doctoral Fellows, 2 Research Associates, 4 Research Assistants, 12 PhD students, 4 technicians.

External Collaborators

- Prof. WANG Sijing, Institute of Geology and Geophysics, Chinese Academy of Sciences
- Prof. CHEN Zuyu, Department of Geotechnical Engineering, China Institute of Water Resources and Hydropower Research
- Prof. CUI Peng, Institute of Mountain Disaster and Environment, Chinese Academy of Sciences

Objectives of Research

The objectives are to conduct scientific and technological research on identification, assessment and mitigation of geohazards with a focus on sustainable urban development.

Main Research Areas

- Study of the distributions and risks of geo-hazards in Hong Kong and a selected region (5.12 earthquake zone) of Sichuan Province, China.
- Study of the characteristics of geo-hazards, such as landslides and debris flows in Hong Kong and selected regions in China.
- Development of technologies for surveying, data analysis and processing of geo-hazards, such as InSAR, laser scanning, and GIS
- Development of technologies for monitoring and warning of geo-hazards, such as Fiber Bragg Grating (FBG), fully distributed BOTDA/BOTDR optical fiber, and GPS technologies
- Development of computer methods and models for analyzing three-dimensional slope stability, deformation, and movement of debris flows
- Development of methods and technologies to stabilize slopes and reduce the impact of debris flows.

Main Facilities for Research

- There are three labs: Soil Mechanics Lab, Rock Mechanics Lab and Geology Lab.
- Selected facilities: cyclic true axial system, cyclic hollow cylinder system, cyclic and stress controlled triaxial apparatus, double cell triaxial apparatus, suction-controlled direct shear box, soil nail pullout box, large-size rock direct shear box, rock triaxial apparatus, conventional instrumentation, FBG interrogators, fully distributed BOTDA instrument, sound emission instrument.
- A large-scale multi-purpose facility for physical modelling of the impact of debris flows on flexible barriers and geo-hazards and geotechnical structures.

Selected Research Projects

- Study on the pullout resistance of pressure-grouted soil nails in completely decomposed granite soils
- Study on the field pullout resistance of soil nails with comprehensive instrumentation in a soil slope
- Development and application of a three-dimensional limit method for stability analysis of slopes in Hong Kong
- Experimental study on the interface shear strength behavior of a cement grouted nail in completely decomposed granite soils
- A theoretical and experimental study on rockfall dynamics
- Development of an innovative FBG sensor based technology for monitoring movements of slopes
- Long-term monitoring and performance evaluation of a soil nailed slope in Hong Kong
- Development and application of FBG-based sensors for monitoring geotechnical structures
- Physical modelling study of the impact of debris flows on flexible barriers
- Discrete Element Modeling (DEM) of debris flows and their impact on on flexible barriers.

城市地質災害研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 殷建華教授，土木及環境工程學系
  (組長和土力學講座教授)
- 周錦添教授，岩土工程專業講座教授，
  土木及環境工程學系
- 丁曉利教授，大地測量與信息系統講座教授，
  土地測量及地理資訊學系
- 史文中教授，講座教授和系主任，
  土地測量及地理資訊學系
- 靳偉教授，講座教授，電機工程學系
- 鄭榕明博士，副教授，土木及環境工程學系
- 梁日暉博士，助理教授，土木及環境工程學系
- 朱建波博士，助理教授，土木及環境工程學系
- 全職研究人員：
  3名研究院/博士後，2名副研究員，
  4名助理研究員，12名在讀博士，4名實驗室技術員

校外合作夥伴

- 王思敬院士，地質與地球物理研究所，中國科學研究院
- 陳祖煜院士，岩土工程研究所，中國水利水電科學研究院
- 崔鵬院士，山地災害與環境研究所，中國科學研究院

研究目標

研究目標主要是在地質災害的識別、評估和減灾防灾方面開展科學技術研究，關注城市的可持續發展。

主要研究領域

- 香港地區及5.12汶川地區地震帶地質灾害及分布特點的研究
- 香港地區及中國大陸一些區域的滑坡、泥石流等地質灾害特性研究
- 地質勘查、數據分析處理等方面的技術開發，例如InSAR、激光掃描和GIS
- 地質災害的監測及預警等方面的技術研發，例如光柵光纖技術、分布式光纖技術及全球定位技術
- 三維邊坡穩定性/變形和泥石流的計算機分析和建模技術的研發
- 邊坡加固和降低泥石流灾害的方法和技術的研發。

主要研究設施及設備

- 三個室內實驗室：土力學實驗室，岩石力學實驗室和地質實驗室
- 主要研究設備：動三軸實驗儀，空心圓柱儀，動/應力控制的三軸儀，雙室三軸實驗儀，吸力控制直剪儀，土釘拉拔試驗箱，大型岩石直剪試驗機，岩石三軸實驗儀，其他常規實驗儀器；FBG解調儀，全分布式BOTDA采集設備，聲發射實驗設備
- 用於泥石流碰撞柔性防護網，地質災害和岩土結構研究的多功能大型物理模擬設施。

典型研究項目

- 全風化花崗岩土中壓力灌漿土釘拉拔特性研究
- 土質邊坡現場安裝多種傳感監測儀器的土釘拉拔特性研究
- 三維極限法在香港邊坡穩定性分析的研究及應用
- 全風化花崗岩土中水泥注漿土釘的界面剪切强度試驗研究
- 墜石的動力學理論和試驗研究
- 基於光柵光纖技術的邊坡變形監測的技術開發
- 土釘支護的香港邊坡長期監測和支護效果評估
- 基於光柵光纖技術的用於岩土構築物監測的傳感器開發及應用
- 泥石流碰撞柔性防護網的物理模擬試驗研究
- 泥石流運動和泥石流碰撞柔性防護網的離散元模擬研究。

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Research Group for Corporate Environmental Management

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Eric W. T. Ngai, Professor, Department of Management and Marketing (Group Leader)
- Prof. Carlos Lo, Professor, Department of Management and Marketing
- Dr Ricky Chan, Associate Professor, Department of Management and Marketing
- Dr Daniel Ng, Associate Professor, Department of Logistics and Maritime Studies
- Dr Mike Lai, Associate Professor, epartment of Logistics and Maritime Studies
- Dr Haitian Lu, Associate Professor, School of Accounting and Finance
- Full-time Researchers: one PhD student

External Collaborators

- Prof. Shui-Yan Tang, University of Southern California
- Prof. Benjamin van Rooij, Amsterdam University

Objectives of Research

The research group sets its research objective on the study the role and contribution of the business community to sustainable urban development. It seeks to (1) provide a comprehensive overview of corporate environmental management practices among companies in urban cities; (2) identify various factors, both internal and external to these companies, that affect such practices; (3) evaluate their environmental performance; and (4) identify green strategies to assist these companies strengthen their environmental management capacity.

Main Research Areas

- The changing institutional environment for urban sustainability
- Green management system
- Green information systems
- Green product stewardship
- Green production
- Green marketing
- Green logistics and distribution
- Green producer responsibility

Current Research Projects

- Lai, K.H. 2012. Evaluating Eco-control among Chinese Manufacturers. 2012–2014, HKD 734,680. GRF Grant.
- Lo, C.W.H., Tang, S.Y., Zhan, X-Y and Li, P.H.Y. and Wang, W. 2012. Assessing Ecological Modernization in China: A Longitudinal and Comparative Study of Stakeholder Demands and Corporate Environmental Management Practices. 2013–2016, HKD881,100. GRF Grant.
- Ng, C.T., Cheng, T.C.E., Pinedo, M. and Yang, L. 2012 - 15. A Time-Dependent Dynamic Tariff System in an Electricity Retail Market with CO2 Emissions Control, HKD487,826. PPR Grant.
- Ngai, E.W.T., Chan, L.K., To, C.K.M., Ching, V., Lau, M. P., 2009 – 2011.Innovative Energy and Utility Management System in Textile Processing, HKD4,410,000, ITF Grant.
- Ngai, E.W.T. and Cheng, B. 2011-14. Design and Development of an Intelligent Decision Support System for Real-time Monitoring of Energy Usage: A Design Science Approach. HKD433,000, GRF Grant.

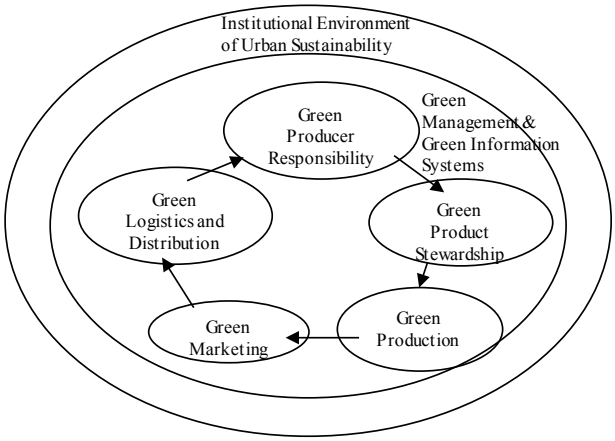


Fig.1 Conceptualization of the Study

Recent Publications

- Lai, K. H. and Wong, C.W.Y. (2012). Green Logistics Management and Performance: Some Empirical Evidence from Chinese Manufacturing Exporters. Omega, 40 (3), 267-282.
- Yee, W.-H., Lo, C.W.H. and Tang, S.Y. (2013). Assessing Ecological Modernization in China: Stakeholder Demands and Corporate Environmental Management Practices. The China Quarterly, 213, 101-129.
- Lu, H.T. (2008). The Role of China in Global Dirty Industry Migration. Oxford, UK: Chandos Publishing, Oxford.
- Ngai, E.W.T., To, C.K.M., Ching, V.S.M., Chan, L.K., Lee, C.M., Choi, Y.S. and Chai, P.Y.F. (2012). Development of the Conceptual Model of Energy and Utility Management in Textile Processing: A Soft Systems Approach. International Journal of Production Economics, 135, 607-617.

企業環境管理研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 倪偉定教授，管理及市場學系（組長）
- 盧永鴻教授，管理及市場學系
- 陳怡光博士，副教授，管理及市場學系
- 吳志圖博士，副教授，物流及航運學系
- 黎基雄博士，副教授，物流及航運學系
- 陸海天博士，副教授，會計及金融學院
- 全職研究人員:一名博士研究生

校外合作夥伴

- Prof. Shui-Yan Tang，美國南加州大學
- Prof. Benjamin van Rooij ，荷蘭阿姆斯特丹大學

研究目標

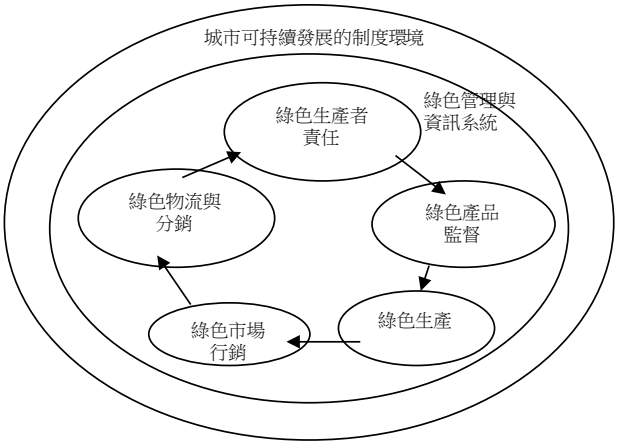
本研究小組將對商業團體對可持續城市發展擔當的角色和產生的貢獻進行相關研究。其目的在於（1）對企業在城市中的環境管理措施進行全面的概述;（2）識別和確認影響上述措施的內外影響因素;（3）評估公司的環境績效;以及（4）提出可提高公司環境管理能力的綠色戰略。

主要研究領域

- 城市可持續發展的變更制度環境
- 綠色管理系統
- 綠色資訊系統
- 綠色產品監督
- 綠色生產
- 綠色市場行銷
- 綠色物流與分銷
- 綠色生產者責任

近期相關研究項目

- 黎基雄, 2012年, 中國製造商的生態控制評估, 2012-2014, HKD734, 680. 優配研究金
- 盧永鴻, 鄧穗欣, 湛學勇, 李漢英, 王瑋, 2012年, 評估中國的生態現代化：持份者要求與企業環境管理實踐的追踪及比較研究, 2013-2016, HKD881, 100. 優配研究金
- 吳志圖, 鄭大昭, Pinedo, M., 楊柳, 2012. 電力市場中的動態收費系統以及二氧化碳排放量的控制. 2012-2015, HKD487, 826. 公共政策研究資助計劃
- 倪偉定, 杜堅民, 麗陳娟, 程少明, 2009-2011, 用於紡織生產處理過程的創新能源管理系統, HKD4, 410, 000, 創新及科技基金
- 倪偉定, 張健淳, 2011年, 設計與開發用於即時監控能源使用的智慧決策支援系統：採用設計科學方法, 2011-2014, HKD433, 000, 優配研究金



圖表1 研究概念

近期學術成果

- Lai, K. H. and Wong, C.W.Y. (2012). Green Logistics Management and Performance: Some Empirical Evidence from Chinese Manufacturing Exporters. Omega, 40 (3), 267-282.
- Yee, W.-H., Lo, C.W.H. and Tang, S.Y. (2013). Assessing Ecological Modernization in China: Stakeholder Demands and Corporate Environmental Management Practices. The China Quarterly, 213, 101-129.
- Lu, H.T. (2008). The Role of China in Global Dirty Industry Migration. Oxford, UK: Chandos Publishing, Oxford.
- Ngai, E.W.T., To, C.K.M., Ching, V.S.M., Chan, L.K., Lee, C.M., Choi, Y.S. and Chai, P.Y.F. (2012). Development of the Conceptual Model of Energy and Utility Management in Textile Processing: A Soft Systems Approach. International Journal of Production Economics, 135, 607-617.

Environmental Energy Research Group

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Meng Ni, Professor, Department of Building and Real Estate (Group Leader)
- Dr Wai-Hung (Thomas) Lo, Associate Professor, Department of Applied Biology and Chemical Technology
- Dr Ga-lai Law, Assistant Professor, Department of Applied Biology and Chemical Technology
- Dr Po-Heng (Henry) Lee, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Shao-Yuan Leu, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Peng Zhang, Assistant Professor, Department of Mechanical Engineering
- Dr Liang An, Assistant Professor, Department of Mechanical Engineering
- Dr Steven Boles, Assistant Professor, Department of Electrical Engineering

Objectives of Research

The research group was established to address emerging issues of the 21st century related to Water Shortage, Energy Security, Environmental Threats, and Climate Change. The goals of our joint research were, but not limited to the *"Simultaneously Converting Low Valuable Biomass and Wastewaters into Useful Resources for Water Reuse, Pollution Control, Recovery of Energy and Chemicals, and Reduction of Greenhouse Gas Emissions"*.

Main Research Areas

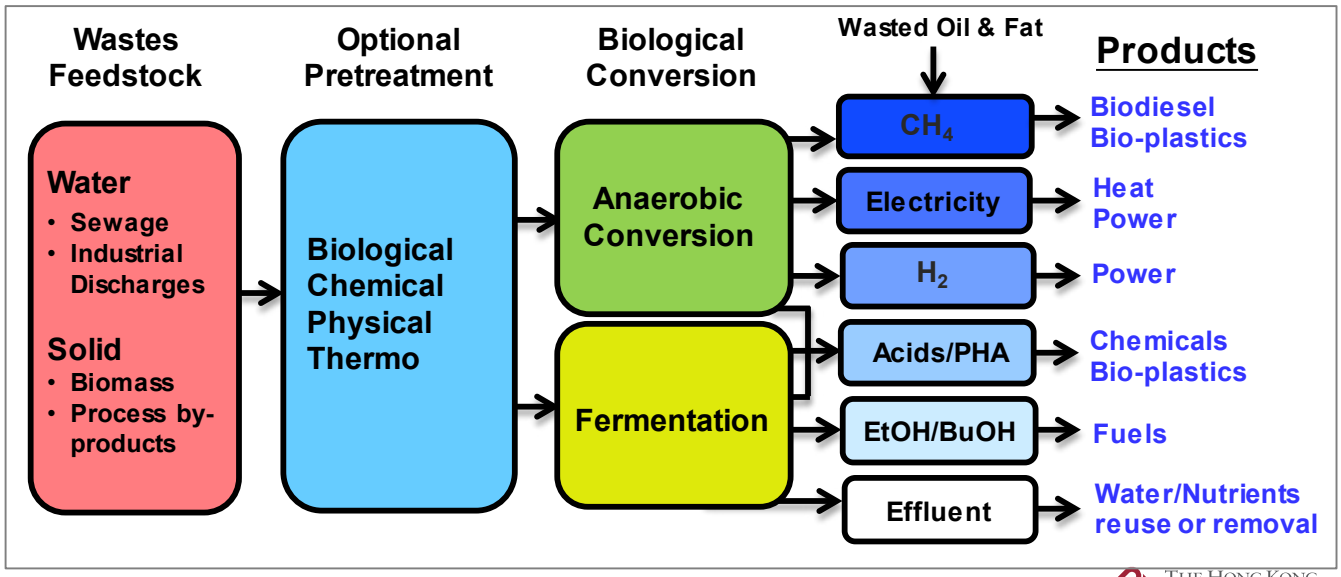
- Water Reuse – developing novel technologies for generating qualified effluents from wastewaters for water reclamation at low energy consumption;
- Simultaneous Pollution Control and Recovery of Energy or Chemicals – converting urban-generated biomass (such as wasted papers, woods, and fibres) into biofuel, electricity, and high-value products;
- Reducing Carbon Footprint and Greenhouse Gas Emissions – applying proper tools to reduce the existing and/or potential effects on global climate changes while developing our technologies

Examples of Applications

Main Technologies and Application Tools

- Membrane Separation – investigating cost-efficient fouling control technologies and processes for reusing water permeated from wastewaters;
- Biofuel/Biogas Production Processes – applying biorefinery, anaerobic digestion techniques, and other biological/chemical processes to generate green energy and other useful by-products from solid wastes and wastewaters;
- Advanced Fuel Cells and Electrochemical Cells - converting wastewaters or biogas to electricity via bio/electrochemical reactions, such as by via solid oxide fuel cells or microbial fuel cells; converting waste metal (i.e. Al) to electricity via advanced electrochemical cells;
- Energy Storage and Distribution – establishing efficient energy storage and distribution system for further utilization;
- Energy Auditing, Greenhouse Gas Emissions & Carbon Footprint Analysis/Monitoring – optimizing energy efficiencies for wastewater treatment facilities and applying carbon footprint analysis to evaluate treatment alternatives for solid wastes.

Research Scopes



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環境能源研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

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- 勞偉雄博士，副教授，應用生物及化學科技學系
- 羅嘉麗博士，助理教授，應用生物及化學科技學系
- 李伯亨博士，助理教授，土木與環境工程系
- 呂紹元博士，助理教授，土木與環境工程系
- 張鵬博士，助理教授，機械工程學系
- 安亮博士，助理教授，機械工程學系
- Dr Steven T. BOLES，助理教授，電機工程學系

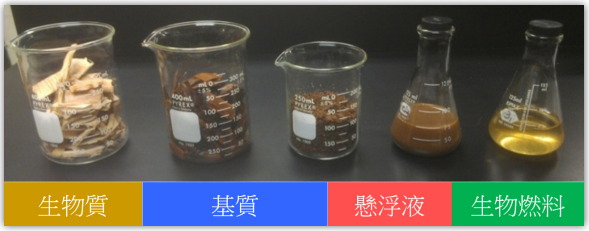
研究目標

本研究組是針對21世紀水資源短缺、能源危機、環境污染、氣候變化等一系列挑戰而成立。研究組的目標包括（但不局限於）－將低價的生物質、固體廢棄物與廢水轉換為可利用的資源，如替代能源與高附加價值之化學物；同時控制污染並降低溫室氣體排放，有效實現廢棄物之減量與再利用。

主要研究領域

- 水的再利用－開發低能耗的污水淨化與回收再利用之新技術；
- 污染控制及廢棄物之轉化－將城市發展與人類活動所產生的廢金屬或生物質（如廢紙、木材和纖維）轉化為電力、生物燃料，或高品位的產品；
- 減少碳足跡和溫室氣體排放－應用和發展合適的研究工具以減少都市經濟發展中的碳排放，從而降低對全球氣候變化的影響。

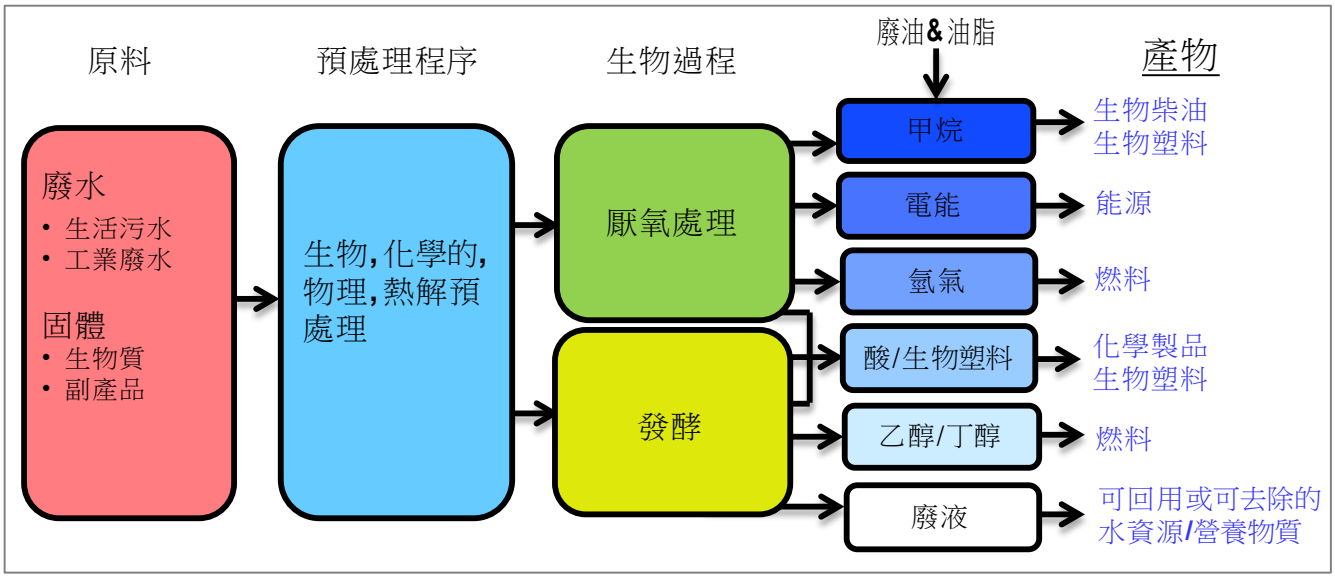
應用實例



主要的技術

- 薄膜技術－研發高效能並易於控制阻塞之薄膜技術，並將其利用於廢水過濾與水回收；
- 生物燃料/生物沼氣生產技術－利用厭氧消化技術及其他生物或化學技術（如氣化、高溫熱解等）來產生清潔能源和高價值的副產品；
- 先進的發電裝置－研發高效率的固體氧化物燃料電池或微生物燃料電池將廢水或生物沼氣轉換為高品位的電能；通過先進的電化學反應器將廢金屬(如鋁)轉換為有用的電能；
- 儲能及能源分佈－研發電化學裝置，如先進的可充電電池，流動型電池等，以實現高效儲能與能源分佈的最佳化；
- 能源審計、溫室氣體排放及碳足跡分析與監測－優化污水與廢棄物處理設施及流程以提高能量效率並減少碳排放。

研究範疇



Research Group for Nano-materials for the Environment

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Pauline P. Li, Professor, Department of Applied Biology and Chemical Technology (Group Leader)
- Dr Jian-Guo Dai, Associate Professor, Department of Civil and Environmental Engineering
- Dr Po-Heng (Henry) Lee, Assistant Professor, Department of Civil and Environmental Engineering

Objectives of Research

The research group aims to build cutting-edge nanotechnology-based research capability for improving the natural and built environment. Nanomaterials are applied to develop cost-effective and high-performance methodologies and systems for treatment of water, wastewater, solid waste, air pollutions, as well as resource recovery, water reuse, and desalination. They are also applied to enhance mechanical and durability performance of construction materials, and to develop green concrete technology.

Main Research Areas

(i) Design and Synthesis of Novel Nanomaterials
Developing synthetic strategies to prepare nanomaterials with desirable functions and properties for specific applications

(ii) Sensing and Detection of Pollutants
Nanoparticle-based chemosensors for selective detection of emerging contaminants

(iii) Water Treatment and Remediation
Adsorption using novel nanosobents and nanostructured materials; filtration using nanofibers and nanofilters; advanced membrane separation; desalination; disinfections

(iv) Simultaneous Pollution Control and Resource Recovery
Recovery and treatment of wastewaters, solid wastes, air pollutions, and greywater, while considering of greenhouse gas reduction

(v) Energy Production and Conversion from low-valuable Feedstock
Nanomaterial enhanced application devices

(vi) Enhancement of Construction Materials
Durability improvement of cementitious materials in extreme environments; mechanical enhancement of cementitious matrix

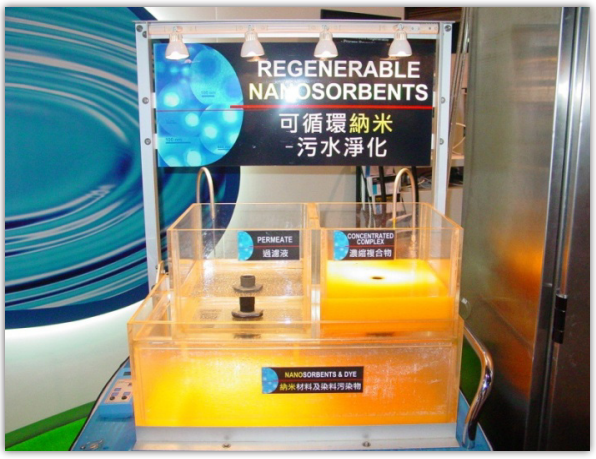
(vii) Green Concrete Technology
Storage of carbon dioxide in concrete; low carbon concrete

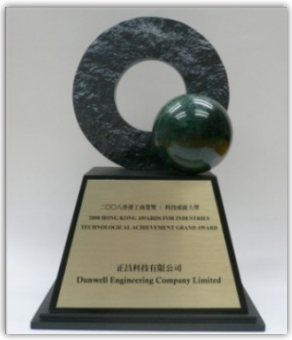
Main Technologies and Application Tools

- Using bottom-up approach to design and synthesize nanomaterials with specific functions and properties
- Characterization of nanomaterials with varisous advanced analytical instruments and techniques
- Design and synthesis of nanoparticles for sensing, detection, adsorption, encapsulation and immobilization
- Design and fabrication of novel nano-fibers filters and nano-admixtures
- Fabrication of novel nanofiltration membrane
- Design and fabrication of nano-coating materials

Example of Application

Patented technology using regenerable nanosorbents for wastewater treatment was licensed to Dunwell Engineering Co. Ltd. Hong Kong, to develop nanotechnology-based wastewater treatment system. This technology won the 2008 Hong Kong Awards for Industries: Technological Achievement Grand Award.





環保納米材料研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 李蓓教授，應用生物及化學科技學系（組長）
- 李伯亨博士，助理教授，土木及環境工程學系
- 戴建國博士，助理教授，土木及環境工程學系

研究目標

研究小組致力于研究最前沿的納米技術來改善自然和建築環境。納米材料可用來開發經濟有效的技術，用於處理廢水、固體廢物、空氣污染以及進行海水淡化。此外，它們亦可用來改善建築材料的力學性能及耐久性，以及發展環保混凝土技術。

主要研究領域

(i) 新型納米材料的設計與製備
按照具體的用途和性能要求，設計和開發具有特定功能的納米材料

(ii) 污染物的辨別與檢測
開發以納米材料為基礎的化學傳感器，用於快速和準確地檢測污染物

(iii) 水的淨化與再利用
開發新型納米吸附劑和功能材料；開發功能形的以納米纖維和納米過濾為基礎的水淨化體系，高級膜分離技術以及海水淡化和消毒技術

(iv) 同步污染控制與資源回收
開發回用廢水、中水，固體廢物，減少空氣污染，減少溫室氣體的技術

(v) 廉價原料的發電及轉化技術
使用納米材料改進應用設備效率

(vi) 建築材料的增强與改進
改善水泥基材料在極端環境下的耐久性；增强水泥基體材料的力學性能

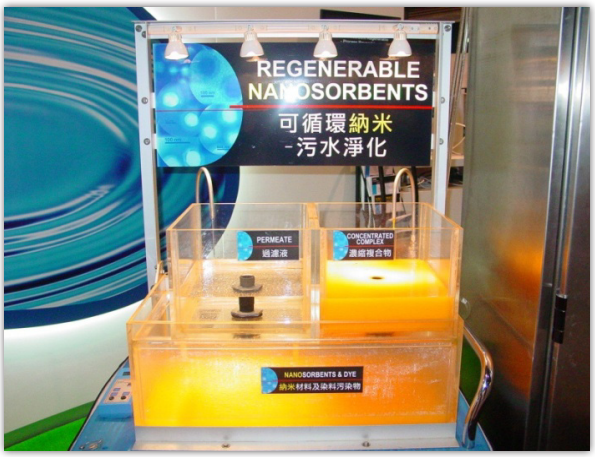
(vii) 環保混凝土的研發
開發將二氧化碳儲存於混凝土中的技術以及低碳混凝土技術

主要研究方法

- 使用由下至上的納米材料合成方法來設計和製備有特定功能的納米材料
- 通過使用各種先進的分析儀器和技術來簽定納米材料的結構與性能
- 設計和合成用於分子辨別、檢測、吸附、包裹和固定的納米材料
- 設計和製造新型的納米纖維過濾器和納米摻合料
- 製造新型的納米過濾膜
- 設計和製備納米塗層材料，納米碳管增强材料

應用實例

將可再生的納米吸附劑用于廢水處理的專利技術已授權給了香港正昌集團(Dunwell Engineering Co. Ltd. Hong Kong)，用於開發以納米技術為基礎的廢水處理體系。該技術榮獲了2008年的香港工商業獎：科技成就大獎(Technological Achievement Grand Award) 。



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Research Group for Regional Air Quality

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

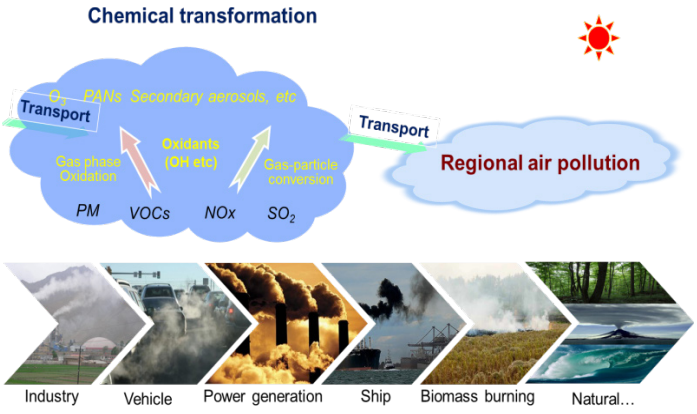
- Prof. Tao WANG, Professor, Department of Civil and Environmental Engineering (Group Leader)
- Dr Hai Guo, Associate Professor, Department of Civil and Environmental Engineering
- Dr K.S. Lam, Associate Professor, Department of Civil and Environmental Engineering
- Full-time Researchers: 4 postdoctoral fellows and 10 PhD students

Objectives of Research

- To understand the levels, sources, atmospheric processes and impacts of regional air pollution;
- To support governments in developing control strategies and policies.

Main Research Areas

- Emissions sources, chemistry, and dynamic transport of regional air pollution by photochemical ozone, particulate matter, acid deposition;
- Source apportionment, cross-border impact of air pollution;
- Air-quality management.



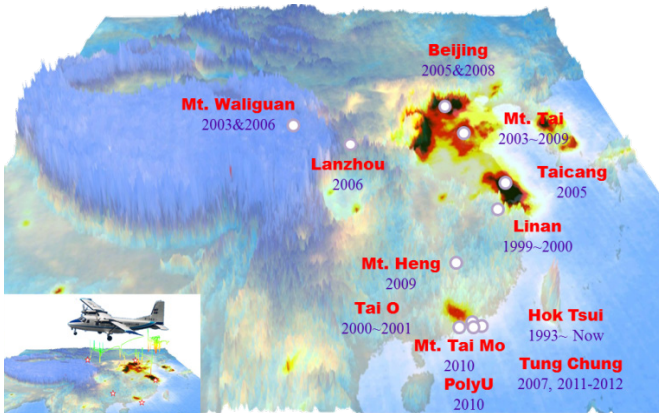
Sources and processes of air pollution

Research Facility and Tools

- Advanced instrumentation for measuring gaseous and particulate pollutants; state-of-the-art computer models for simulating air pollution;
- Background air monitoring station at Hok Tsui.

Previous Studies and Impacts

We have conducted research in the Hong Kong-Pearl River delta region, the Yangtze River delta, and the North China plain (including Beijing), which are the three most important regions of China economically. We have also studied the chemistry of the maritime atmosphere of the South China Sea and the western Pacific and of the continental atmosphere over the Qinghai-Tibet Plateau.



Some highlights of our studies

- We demonstrated that a rapid rise in energy consumption in China has already affected background air quality which has far-reaching consequences for human health, crops/ forests, and the climate. The findings have helped the United Nations Environment Programme and the World Meteorological Organization in assessing climate change and air pollution in Asia.
- Our research contributed to air-quality improvements for the 2008 Beijing Olympics.
- We led a national research project on acid rain study and recommended control strategies to the Central Government.
- We initiated many air quality studies on photochemical smog and haze in Hong Kong, and the findings have helped the HKSAR government in revising the Air Quality Objectives for Hong Kong and in formulating anti-pollution measures.

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區域空氣質素研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

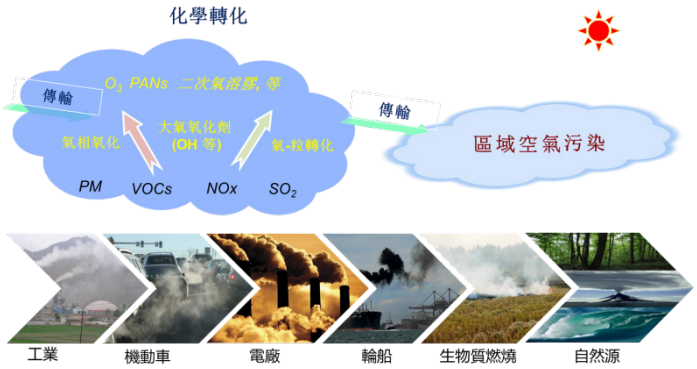
- 王韜教授，土木及環境工程學系（組長）
- 郭海博士，副教授，土木及環境工程學系
- 林嘉仕博士，副教授，土木及環境工程學系
- 全職研究人員：
  4個博士後研究員和10個博士研究生

研究目標

瞭解和掌握區域空氣污染的水平、來源、大氣過程及其影響，並為政府制定污染控制對策提供科學依據。

主要研究領域

大氣光化學臭氧、大氣顆粒物、酸沉降等主要區域空氣污染的排放源、化學機制和動力傳輸過程；空氣污染物的源解析，跨界傳輸和影響等；空氣質量管理。



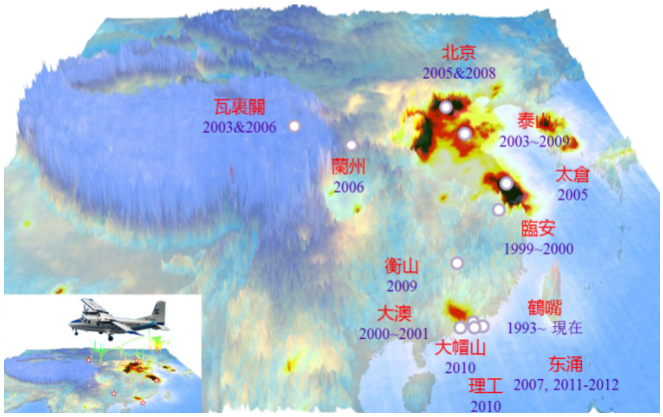
區域空氣污染的來源和過程

研究設施和工具

先進和完善的氣態和顆粒物污染監測儀器；先進的大氣污染計算機模擬模式；鶴嘴背景空氣研究站 。

研究成果及影響

研究團隊先後在香港-珠三角地區、長三角地區和華北平原（包括北京）等中國經濟最具活力地區開展了系統和長期的研究。並對南中國海和西太平洋地區的海洋大氣和青藏高原大陸性背景大氣的化學過程進行了研究。



主要研究發現及影響

- 伴隨能源消耗的大量增加，中國背景地區空氣質量惡化趨勢明顯，對人體健康、農作物和氣候變化具有重要意義。此研究發現被聯合國環境規劃署和世界氣象組織應用於亞洲空氣污染和氣候變化評估報告。
- 研究結果為2008年北京奧運會空氣質量保障方案的檢驗和改善作出了貢獻。
- 領導國家基礎科學研究計劃（973計劃）研究了中國酸雨的沉降機制、輸送態勢及調控原理，為國家制定酸雨控制對策提供科學依據。
- 在香港發起多項針對光化學烟霧和灰霾的大氣科學研究，研究結果為香港特區政府在空氣質素指標的修訂和污染控制措施的制定提供參考依據。

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Research Group for Sustainable Waste Management

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Chi-Sun Poon, Department of Civil and Environmental Engineering (Group leader)
- Dr Ann Yu, Associate Professor, Department of Building and Real Estate
- Dr P.H. Lee, Assistant Professor, Department of Civil and Environmental Engineering
- Dr S.Y. Leu, Assistant Professor, Department of Civil and Environmental Engineering
- Dr Dan Tsang, Assistant Professor, Department of Civil and Environmental Engineering

Background

The rapid urbanization of the modern world has made solid waste management an acute and imminent issue globally. Notwithstanding the concerted efforts for waste reduction and recovery (resulting in a recycling rate of 49%) in Hong Kong, about 13,000 tonnes of solid waste are still disposed of every day at the three strategic landfills. Given the scarcity of land and limited natural resources, the current practice of solely relying on landfill disposal is non-sustainable. The heterogeneous nature and continuous growth of waste generation presents a burgeoning challenge to Hong Kong and major cities in Mainland China, as exemplified by the recent controversy in Hong Kong regarding the proposals to construct a mega-sized (3,000 tonnes per day) waste incinerator and to extend the three strategic landfills.

Specific Goals

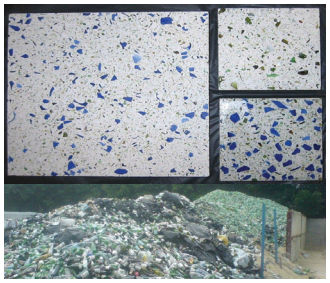
- To eliminate the potential hazards and minimise environmental impacts of treatment technologies for unavoidable wastes;
- To develop novel and multidisciplinary applications for resource recovery from waste recycling;
- To evaluate waste management/recycling options with particular focus on the correlation between public policy, economic/sustainability analysis, and stakeholders' behavioural change.

Main Research Areas

(i) Management and recycling of construction waste

In Hong Kong, over 3,300 tonnes of construction waste are required to be disposed of at landfills every day. The PolyU has been conducting research on construction waste management and recycling for over 15 years, with the development of commercially viable recycling technologies (e.g. eco-blocks produced with recycled construction waste). Recent research results indicated that there are still rooms for improvement in the construction industry to minimize waste generation and increase waste recycling.

(ii) Management and recycling of waste glass



Discarded glass, being one of the significant municipal waste types has been a major concern in Hong Kong as few recycling channels can be identified. Government data shows that about 300 tonnes of glass waste is generated daily in Hong Kong, however, the recovery rate is only about 4-5%.

The Research Group has undertaken extensive research studies on the use of recycled glass as aggregate replacement in different concrete products, including eco-glass paving blocks, and architectural mortars. Further research is being carried out to extend the application of waste glass in asphalt and concrete.

(iii) Management and recycling of food waste

Food waste constitutes over 40% (over 3,500 tonnes per day) of the municipal solid waste stream. Available recycling options include centralized treatment (required collection and transportation) by anaerobic digestion, composting, or conversion to animal feed; and decentralized treatment by composting or aerobic digestion at waste generation sources with minimum transportation requirement. Different levels of community commitments and environmental impacts are involved in these options. It is important to provide a holistic assessment of the overall sustainability of the management alternatives to identify key impacts and facilitate the decision-making process.

(iv) Management and recycling of waste timber and wood waste

Only a small percentage of used timber is recovered for recycling. Disposal of timber waste is a non-sustainable practice leading to rapid depletion of the limited landfill space and formation of greenhouse gases and wastewater. A market for recyclables and an awareness of the profound environmental benefits are of major importance in promoting on-site construction waste sorting practices for recycling. It is necessary and highly rewarding to establish new recycling options and provide recommendations for formulating guidelines or contractual requirements for improving timber waste recycling in Hong Kong.

可持續廢物管理研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 潘智生教授，土木及環境工程學系（組長）
- 李伯亨博士，助理教授，土木及環境工程學系
- 呂紹元博士，助理教授，土木及環境工程學系
- 曾超華博士，助理教授，土木及環境工程學系
- 余帙芸博士，助理教授，建築及房地產學系

背景

現代社會城市化的快速發展使得固體廢物管理成為一個嚴重而又迫切的國際難題。在香港，儘管在各界共同努力減少及回收廢物的情況下，回收率已達49%，每天仍有13, 000噸的固體廢物需要棄置於三個堆填區。鑒於土地稀少以及自然資源有限，單靠將廢物棄置於填埋區是不可持續的。廢物成分混雜以及不斷增加, 給香港和中國內地大城市帶來了迅速增加的挑戰，近期香港由於提議興建大型焚化爐 (每日處理廢物量3, 000噸) 及擴充三個堆填區所引發的爭論就是例子。

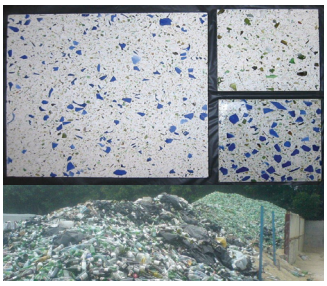
具體的研究目標

- 消除各類無法避免的廢物的潛在危險，並減小相關處理技術對環境造成的影響；
- 在廢物循環再利用中，為資源回收開發出創新的和跨學科的應用方法；
- 評估不同的廢物管理及循環再用方案，尤其注重公共政策，經濟效益/可持續發展分析及持份者行為改變的相互關係。

主要研究領域

(i) 建築廢物的管理及循環再用

在香港，每日有超過3, 300噸的建築廢物需要棄置於填埋區。香港理工大學進行建築廢料管理和循環利用的研究已經超過十五年，並成功地開發了商業可行的循環利用技術，例如各類由建築廢物生產的環保磚。近期進行的研究顯示，在建築行業中，在減少廢物產生及增加廢物循環再用兩方面仍有改善的空間。



(ii) 玻璃廢物的管理及循環再用

廢棄玻璃是都市廢物的一大類別，由於本地對玻璃的循環再用途徑不多，廢棄玻璃在香港已經成為一個受關注的大問題。政府資料顯示在香港每天大約有三百噸的玻璃廢物產生，而回收率只有4-5%。研究小組在將廢棄玻璃作為骨料替代物生產混凝土上作了廣泛的研究，研究包括玻璃環保地磚以及玻璃建築砂漿。研究已經進一步推展到將玻璃廢物用在瀝青及混凝土中。

(iii) 棄置食物的管理及循環再用

香港每天的食物廢物超過了3, 500噸，占都市固體廢物的40%以上。現有的廢棄食物循環再用方案有：將廢棄食物收集和運送至處理中心進行集中缺氧分解，製成堆肥或轉化為動物飼料；或者在個別產生食物廢物的地方以最少的運輸需求進行分散處理，直接將食物廢物製成堆肥或進行帶氧分解。這些方法都不同程度地需要社會承擔及影響環境。在循環再用食物廢物上，對各種食物廢物管理方案的整體可持續發展進行全方位評估，找出重要的影響因素並為整個決策過程提供方便尤為重要。

(iv) 廢棄木材的管理及循環再用

在香港，只有少部分使用過的木材被回收及循環再用。將木材棄置是一種不持續的方法，因為這種方法會很快地消耗掉有限的堆填空間及產生溫室氣體以致廢水。循環再用物料市場的形成以及人們環保意識的提高對於促進建築廢物現場分類和回收非常重要。研究小組認為，建立新的廢棄木材循環再用方案及對方案中的指引和合約條款推薦一些規範是必要並值得推展的工作。

Urban Ecosystems Research Group

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Xiangdong Li, Professor, Department of Civil and Environmental Engineering (Group Leader)
- Dr Hai Guo, Associate Professor, Department of Civil and Environmental Engineering
- Dr Henry P.L. Lee, Assistant Professor, Department of Civil and Environmental Engineering
- Prof. Shun-cheng Lee, Professor, Department of Civil and Environmental Engineering
- Prof. Chi-sun Poon, Professor, Department of Civil and Environmental Engineering
- Dr Dan C.W. Tsang, Assistant Professor, Department of Civil and Environmental Engineering
- Prof. Onyx Wai, Professor, Department of Civil and Environmental Engineering
- Full-time Researchers: Five postdoctoral researchers and six PhD students

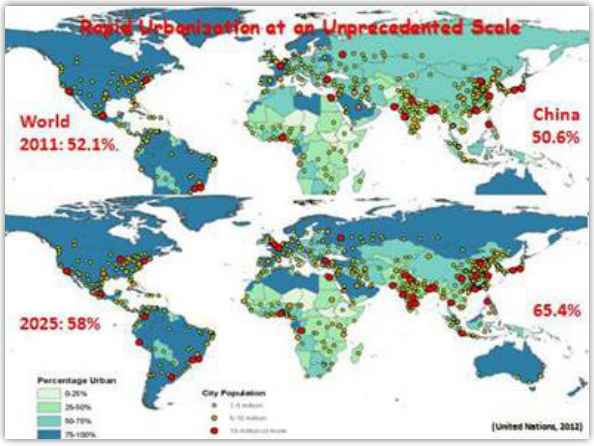
Objectives of Research

The mission of the Research Group on Urban Ecosystems (RGUE) focuses on understanding environmental processes of all the air-water-land components in the ecosystems of large cities that have been modified as a result of various urban activities.

Main Research Areas

- To assess the environmental quality of large urban parks in Hong Kong and other mega cities in the Pearl River Delta (PRD) region;
- To investigate the typical urban air pollutants and exposure pathways along the remote site - sub urban - urban gradients under subtropical climate conditions;
- To study the changes of surface water flows in new urbanised areas and their impact on nutrients and pollutants' loadings in modified streams and rivers, and coastal zones of south China;
- To evaluate the typical mass-balance of key nutrients and representative pollutants in large cities of the region (e.g., Hong Kong and Guangzhou).

Pollutants in the urban ecosystems



Research Significance and Value

Urban ecosystems are located in the man-built infrastructure covering a large portion of land surface with high population density and energy/material flows. The biogeochemical cycles of nutrients and pollutants are controlled by complex interactions between society and the environment. The processes are significantly different from natural ecosystems. Urban factors, such as impervious surfaces, engineered water flows, landscape choices and human demographic patterns, all affect the material process and environmental quality in large cities.

The key research issues of the research group will include surface water channels and pollutant loadings in city clusters, typical urban air pollutants in the region (e.g., traffic- related emissions and industrial sources), and the mass material balances in mega cities of Asia (e.g., Hong Kong and Guangzhou). The results obtained from the research laboratory will provide vital information for future land management and urban planning in this fast-developing subtropical region. The outcomes of the research will also help policy makers in other parts of the world devise plans for urban management and the long-term sustainability of urban ecosystems.

城市生態系統研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 李向東教授，土木及環境工程學系（組長）
- 郭海博士，副教授，土木及環境工程學系
- 李伯亨博士，助理教授，土木及環境工程學系
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- 曾超華博士，助理教授，土木及環境工程學系
- 韋永康教授，土木及環境工程學系
- 全職研究人員：博士後五名，博士生六名

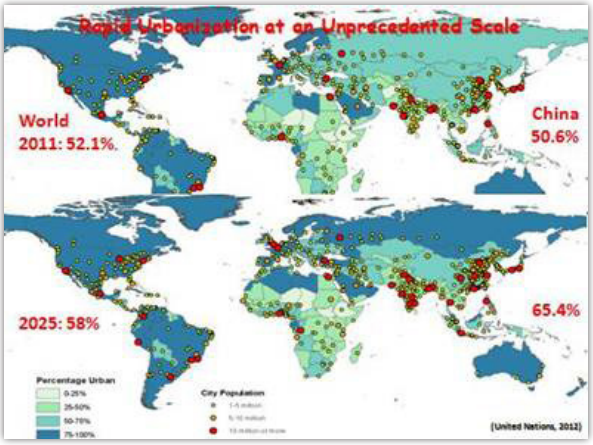
研究目標

城市生態系統研究小組旨在研究因城市活動所產生的各種人為生態系統中空氣、水及陸地之間的環境作用和過程，為提高城市環境品質提供科學基礎。

主要研究方向

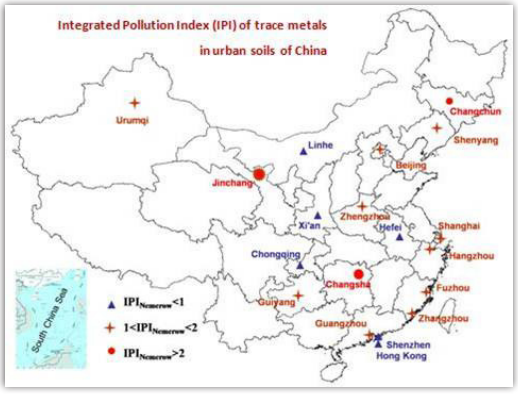
- 評估香港和珠江三角洲中特大城市的大型市內公園的環境品質；
- 調查亞熱帶地區典型空氣污染物及其沿偏遠地區–近郊–城區不同的環境暴露途徑；
- 研究新城市化區域的地表水流的變化及它們對中國南部河流和沿海地區富營養化及污染物負荷的影響；
- 評價大城市中主要營養物和典型污染物的質量平衡（例如，香港和廣州）。

Pollutants in the urban ecosystems



研究意義

城市中基礎設施林立，人口高度密集，能量消耗/物質流通量極大，所以城市生態系統具有與自然生態不同的特性。城市生態系統中社會與環境之間複雜的相互作用控制了營養物質和污染物的生物地球化學循環。城市因素，例如不透水層、人工改造的河流系統、土地利用和人口分佈模式，都顯著影響了大型城市的環境品質。



本研究小組的研究課題主要包括：城市群的地表水的污染物負荷，典型城市空氣污染物（例如，交通排放和工業污染源），大型城市的物質質量平衡（例如，香港和廣州）。城市生態實驗室的建立，對研究迅速發展的亞熱帶地區的土地管理和城市規劃具有極其重要的意義，也為世界其它地區的城市管理及城市生態系統的長期可持續性發展等政策的制定提供重要的科學支持。

Research Group for Urban Noise Mitigation

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. S K Tang, Professor, Department of Building Services Engineering (Group Leader)
- Dr C K Chau, Associate Professor, Department of Building Services Engineering
- Dr Y S Choy, Assistant Professor, Department of Mechanical Engineering
- Dr R C K Leung, Associate Professor, Department of Electronic and Information Engineering
- Dr T K N Wong, Associate Professor, Department of Electronic and Information Engineering
- Full-time Researchers: One post-doctoral fellow, more than 15 PhD students and research personnel.

External Collaborator

- Prof. K M Li, Professor, Mechanical Engineering Department, Purdue University

Objectives of Research

The research group aim to develop methodologies and technologies to establish a framework for creating a sustainable acoustical environment for a highdensity urbanized city. Its major tasks will focus on the research and development of effective mitigation measures, sound propagation / transmission modelling, human noise annoyance model and innovative solutions to complicated acoustical problems.

Main Research Areas

(i) Ventilation-enabled High Sound Insulation Façade Devices
In a densely populated city like Hong Kong, innovative noise mitigation devices are required for alleviating noise exposure problems. For building use, such devices must allow for natural ventilation. In-depth research on their design has been carried out as sound insertion loss and natural ventilation rate are two contradicting issues.

(ii) Innovative Duct Noise Control Devices
Broadband low static pressure loss compact duct silencers are important as they allow a better control of HVAC noise and at the same time reduces substantial amount of fan energy consumption.

(iii) Soundscape and Human Noise Annoyance Modelling
The soundscape approach is a novel alternative for noise control. The concept aims to reduce human annoyance through manipulating the sound environment rather than reducing the noise exposure level. Emphasis is placed on promoting well-being and enhancing the health of the urban population.

(iv) Innovative Beamformer Technique for speech perception enhancement
Investigation has been carried out on producing microphone-array beamformers that are independent of the frequency-spectra of signals and interference. These beamformers will allow listeners to tune the desired azimuth-elevation, while no prior information is needed of the interference.

(v) Direct Numerical Simulation of Sound Generation and Production
Continuous effort have been made on novel one-step computational methods which can reliably compute the generation and propagation of sound, especially for the area of aeroacoustics, environmental sound propagation and active control.

Main Technologies and Application Tools

- Double layer ventilation windows
- Conservation Element and Solution Element approach to aeroacoustic simulations
- Compact plate duct silencer

Examples of Applications

PolyU Homantin Student Hostel
The PolyU Double Layer Ventilation Window design offers high sound insulation as well as sufficient natural ventilation inside the residential unit installed with it. This window gives an additional sound reduction of 8 dBA compared with conventional windows.

This window type will be useful in residential estates where the noise level is very high, but the application of conventional mitigation measures has proved to be nonfeasible or insufficient for acoustical protection to the residents.

New Public Housing Estate of Housing Authority in San Po Kong
Ventilation window design is also adopted in the new public housing estate to be built in San Po Kong. The acoustical properties of this window are similar to that of the PolyU double layer ventilation window. The addition of sound absorption inside the window frame increases further the sound insulation.

城市噪音消減研究小組

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- 蔡逸思博士，助理教授，機械工程學系
- 梁志堅博士，副教授，電子及資訊工程學系
- 黃啟南博士，副教授，電子及資訊工程學系
- 全職研究員：1個博士後研究員，超過１５個博士研究生和相關研究人員。

校外合作夥伴

- 李啟明教授，美國普渡大學，機械工程系

研究目標

本研究小組的預期研究目標是發展創新的方法和技術，從而建成高密集城市可持續發展聲學環境研究的基本框架。研究小組的主要目標將集中在研究和發展有效的減輕噪聲的方法，聲音傳播的模型，人類噪聲滋擾感知模型以及創新性的方法解決聲學上的複雜問題。

主要研究領域

(i) 可通風高噪聲減弱設備

在人口稠密的城市像香港，創新性的噪聲衰減設備是十分需要的，例如聲音污染問題。有關建築樓宇安裝此類設備必須允許通風。在研究的深蹟理論層面上，它的設計難點主要歸結於聲音插入損耗和自然通風率兩大相互矛盾的地方。

(ii) 創新性的管道噪聲控制設備

小型管道消聲器配備帶寬及低靜壓損失十分重要，因為它可實現對空調噪聲更好的控制，與此同時它可減少大量的風機能量消耗。

(iii) 音景法和人類噪聲滋擾感知模型

音景法是新穎的可選擇的噪音控制方法。此概念的目標是通過控制聲音環境以減少人類對噪聲的煩惱而不是僅僅減少噪聲水平。重點是強調提高生命健康素質和提升城市人口的健康水平。

(iv) 創新性的目標識別技術幫助言語知覺能力提升

使用陣列式麥克風目標識別器的研究經以展開。此識別器的優點是獨立於不同的頻譜信號並不受干擾。聽眾可調節識別器到理想的方位和高蹟以測得干擾信號而不需要預先知道干擾源的任何信息。

(v) 對聲音生成進行數值模擬

對全新的一步到位計算機數值模擬方法的研究將繼續大力展開。使用數值模擬可計算聲音的生成和傳播特性，並得到可信賴的數據結果。特別是對於空氣聲學，環境聲音傳播和聲學主動控制方法。

主要的技術和使用的工具

- 雙層通風窗
- 守恆元方法應用於空氣聲學的數值模擬
- 小型薄板管道消聲器

應用實例

香港理工大學何文田學生宿舍

在住宅單位安裝雙層通風窗，此窗戶的設計可為居民提供高效的噪音阻隔並同時保持良好充足的自然通風。使用理大此類窗戶對比普通通風窗有效降低室外噪音多達8分貝（A級加權）。此類窗戶可適用於噪聲干擾非常嚴重的住宅樓宇。傳統使用的噪聲減弱方法已經被證明是不可行並且不能給住宅居民提供足夠有效的噪音保護。

香港房屋署新埔崗公共屋邨項目

新設計的通風窗同時被房屋署新埔崗公共屋邨項目所採用。此類窗戶的聲學屬性與理大使用雙層通風窗聲學屬性相似。另外此類窗戶的特色之一是其窗戶框架內部的吸噪音能力大大增強而不僅僅是噪音的阻隔，從而使其消聲性能進一步提高。

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Research Group for Urban Water and Wastewater Treatment

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. W. CHU, Professor, Department of Civil and Environmental Engineering (Group Leader)
- Dr W.H. LO, Thomas, Associate Professor, Department of Applied Biology & Chemical Technology
- Dr Huan-Feng Duan, Assistant Professor, Department of Civil and Environmental Engineering
- Dr P.H. LEE, Henry, Assistant Professor, Department of Civil and Environmental Engineering
- Dr S.Y. LEU, Ben, Assistant Professor, Department of Civil and Environmental Engineering

Objectives of Research

To develop new, effective, and green techniques for treatment and reuse of wastewater and water, and improve the existing treatment processes for sustainable urban development.

Main Research Areas

- Development of **advanced oxidation and adsorption processes** that targets the removal of less-biodegradable and/or toxic chemicals in the water and wastewater
- Use of **bioaugmentation** to generate specially acclimated biomass cultures to increase the degradation of the "target component(s)" in otherwise conventional activated sludge processes
- Development of **off-gas** monitoring technique to estimate aeration costs and nitrification efficiency in real-time
- Improvement of the existing wastewater treatment on energy efficiency, reduce carbon footprints and operation costs, process stability, and effluent quality (e.g. enhance nutrient removal and removal of emerging contaminants)
- Development of ecological-friendly approach for **decentralized** wastewater treatment
- Monitoring and simulation to improve the city's water quality control strategy and wastewater management
- Derive kinetic models for various processes to facilitate the wastewater treatment design

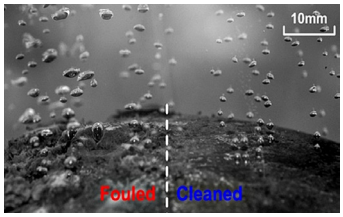
Major Achievements and Impact

- Many research findings of the team members have been published in top international journals such as *Environmental Science and Technology, Water Research*, and *Applied Catalysis B: Environmental*
- The processes developed by the team members have been implemented in engineering applications, i.e. off-gas monitoring technique for optimization of the activated sludge system

Real-Time Energy Monitoring in Wastewater Treatment Plant

Main Technologies and Application Tools

- **Membrane Separation**
  Investigating cost-efficient fouling control technologies and processes for reusing water permeated from wastewaters;
- **Energy Auditing, Greenhouse Gas Emissions & Carbon Footprint Analysis/Monitoring**
  Optimizing energy efficiencies for wastewater treatment facilities and applying carbon footprint analysis to evaluate the treatment alternatives for solid wastes.
- **Nutrient Removal**
  Developing energy-efficient or/and energy-producing nutrient removal processes as well as the consideration of its resource recovery, i.e. anammox process for nitrogen removal and crystallization for phosphorus recovery
- **Toxic Pollutant Removal**
  Developing novel, low-cost and effective adsorbent from biomass, industrial by-products and functional nanomaterials for removal of toxic metals and organics



Fouling of a fine-pore aeration diffuser

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城市用水及廢水處理研究小組

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- 李伯亨博士，助理教授，土木與環境工程學系
- 呂紹元博士，助理教授，土木與環境工程學系
- 段煥豐博士，助理教授，土木與環境工程學系

研究目標

研發有效而環保的新技術，以應用於用水/污水處理及回收方面，並改進現有的處理流程，以期達到可持續城市發展的目標。

主要研究領域

- 發展**高級氧化**與**吸附流程**以去除生活用水與污水中較難降解或有毒的化合物
- 應用**生物強化技術**培植特定菌種以提升活性污泥處理流程對**“特定污染物”**之降解效果
- 研發並應用污水處理**逸氣監測**系統進行曝氣成本與除氮效率之即時監測
- 改進污水處理以提升能源效益、操作穩定性及放流水質，並減低碳排放及營運成本 (如改進氮磷類有機物與新興污染物的去除方法等)
- 研發有利生態環境的**離散型污水處理技術**
- 透過監測與模擬，提升都市水質控制之策略發展與污水管理
- 研發不同污水處理流程之動力學模擬技術，並應用於污水處理之流程設計

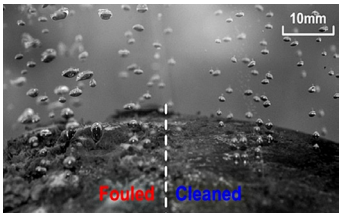
主要研究成果與學術影響

- 小組成員之研究成果已發表於國際知名的學術期刊，如 *Environmental Science and Technology, Water Research* 與 *Applied Catalysis B: Environmental*等
- 其他關鍵技術如逸氣分析系統與曝氣盤改進操作，已作實地測試並應用於活性污泥處理系統中 (如右圖所示)

即時曝氣監測現地操作

關鍵性技術及應用工具

- **薄膜分離技術**
  研發低成本高效率的控制技術與操作流程以降低薄膜堵塞速率並提升回收水之品質
- **能源審核，溫室氣體排放與碳足跡評估/監測**
  應用於優化污水處理廠之能源效益及評估固體廢棄物處理之替代方案等
- **去除氮磷類營養物**
  研發低耗能或產能之氮磷有機物去除流程，如厭氧氨氧化技術與磷系有機物之回收等
- **去除有毒污染物**
  以生物質、工業副產物與功能性納米材料為原料，研發低成本高效能的新型吸附材料，去除水中的有毒金屬與有機物



活性污泥曝氣盤氣孔堵塞分析

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Building Energy and Automation Research Group

Research Institute for Sustainable Urban Development 可持續城市發展研究院

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- Dr Fu Xiao, Associate Professor, Department of Building Services Engineering
- Dr Seung Hyun Cha, Assistant Professor, Department of Building Services Engineering
- Full-time Researchers:
  three post-doctoral fellows and ten PhD students

Objectives of Research

To develop methodologies and technologies to enhance the energy efficiency of buildings by "*building life-cycle diagnosis, commissioning and optimization*".

Main Research Areas

(i) Building HVAC&R system dynamic Simulation and Optimization

Concerning dynamic and realistic performance evaluation, online control and diagnosis, effective parameter identification based on few & low quality information, system optimization.

(ii) HVAC&R System Optimal and Energy-Efficient Control

Concerning poor quality of measurements, robustness and sensitivity, online optimization techniques, control of new HVAC systems.

(iii) Building Energy and HVAC&R System Diagnosis

Concerning limited and low quality data, sensor/control faults, building-level evaluation and diagnosis methods for information-poor and information-rich buildings.

(iv) IB/BA Integration and Management Technology

IB/BA integration and management technology, interactive building energy demand management for smart grid, optimization of net-zero energy buildings.

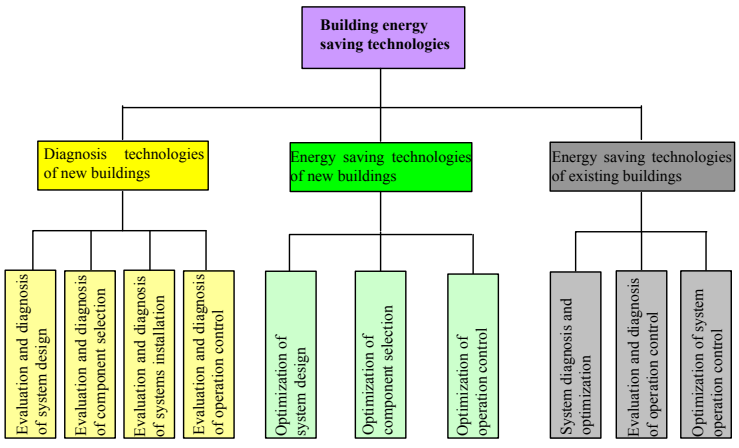

Fig.1 Energy Saving Technologies for Existing/New Buildings

External Collaborators

- Prof. Reinhard Radermacher, Minta Martin Professor of Engineering, University of Maryland
- Prof. James Braun, Herrick Professor of Engineering, Purdue University
- Dr Jin Wen, Associate Professor, Drexel University

Main Technologies and Application Tools

One set of systematic technologies and software tools are developed to support diagnosis, commissioning and optimization for new and existing buildings at different stages of their life-cycle as below. These were recognized with an Innovation Award at the China International Industry Fair 2011.

- Building Performance Quick Evaluation and Diagnostic Tool
- Detailed Evaluation/Diagnostic Tool for A/C and BA systems
- Building System Online Performance Simulation Test Platform
- Existing Building Commissioning/Upgrading Assessment Tool
- Control and Diagnosis Strategy Online Test Platform
- Package of Online Optimal and Energy Efficient Control and Fault Diagnosis Strategies
- Intelligent Building Integration and management Platform-IBmanager

Examples of Application

- *International Commerce Centre (ICC)* (New building Development) - Supporting the system optimization and development of optimal strategies. Total annual energy savings: 7.0 million kWh per annum (15%).
- *Holiday Inn Express SOHO, Hong Kong* (New building Development) - to optimize the system design and development of energy efficient and optimal control strategies. Total energy savings: 17%.
- *Examples of Existing Building Diagnosis and Optimization*
  - Hong Kong International Airport, Buildings of Hong Kong Polytechnic University.

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建築節能及自動化研究小組

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- 車丞賢，博士，助理教授，屋宇設備工程學系
- 全職研究人員:
  3名博士後研究員，10名博士研究生

研究目標

本研究室旨在研發用於“*建築全生命週期診斷、校驗及優化*”的相關方法和技術，以提高建築能源利用效率。

主要研究領域

(i) 建築通風空調及製冷系統(HVAC&R)動態模擬及優化
主要包括動態和實際性能評估，在綫控制和診斷，系統參數有效識別(基於少量或低質量信息)，系統優化。

(ii) 通風空調及製冷系統(HVAC&R)優化及節能控制
考慮測量系統的誤差，對測量參數的敏感性分析，魯棒控制，在綫優化技術，新HVAC系統的控制 。

(iii) 建築節能及通風空調和製冷系統(HVAC&R)診斷
基於少量含有誤差的運行數據及存在傳感器或控制故障的情況下，對於信息匱乏以及信息富集的建築，分別研發建築整體節能性的評估和診斷方法。

(iv) 智能建築/建築自動化(IB/BA)集成及管理技術
IB/BA集成及管理技術，基於智能電網的交互建築能源需求管理，零能耗建築優化。

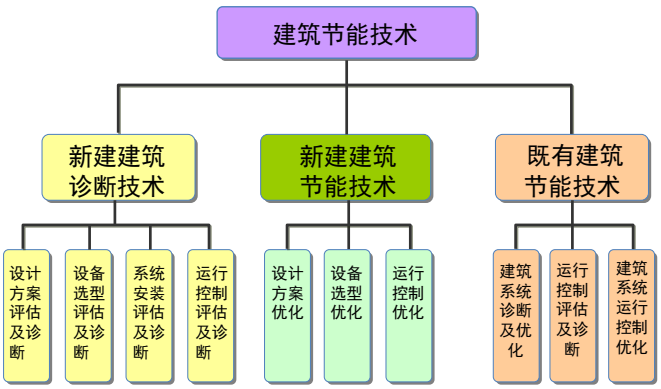

圖1建築節能技術(既有/新建建築)

校外合作夥伴

- Prof. Reinhard Radermacher, Minta Martin Professor of Engineering, University of Maryland (美國馬裏蘭大學)
- Prof. James Braun, Herrick Professor of Engineering, Purdue University (美國普渡大學)
- Dr Jin Wen, Associate Professor, Drexel University (美國德雷塞爾大學)

主要技術和應用工具

本研究室研發了一系列系統性的技術和軟件工具, 用以支持對新建或既有建築在生命周期的不同階段實施故障診斷、校驗和優化。這些成果獲得了2011年中國國際工業博覽會“創新奬”。

- 建築性能快速評估和診斷工具
- 空調和BA系統評估和診斷工具
- 建築系統實時性能仿真實驗平臺
- 既有建築調試和改進評估工具
- 控制和診斷策略實時測試平臺
- 實時節能優化控制和故障診斷策略系列
- 智能建築集成管理平臺(IBmanager)

應用實例

- 環球貿易廣場(ICC) (新建建築)
  – 為建築系統優化提供支持, 研發優化控制策略, 實現全年節能: 700萬度電(15%)。
- 香港蘇豪智選假日酒店(新建建築)
  – 優化系統設計, 研發節能和優化控制策略, 實現全年節能達17%。
- 既有建築診斷和優化實例
  – 香港國際機場、香港理工大學教學辦公樓等。

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Building Thermal Environment and Urban Climate Research Group

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

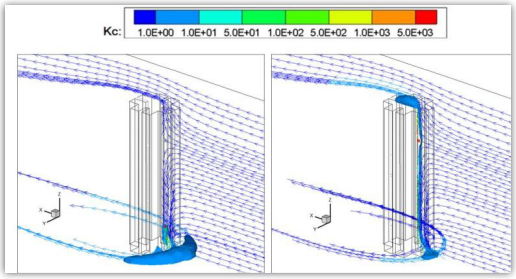
- Prof. NIU Jianlei, Professor,
  Department of Building Services Engineering (Group Leader)
- Prof. MAK Cheuk-ming, Professor,
  Department of Building Services Engineering
- Prof. KWOK Kenny Chung-sau, Visiting Chair Professor,
  Department of Building Services Engineering
- Other team members:
  Research Students and Postdoctoral Fellows

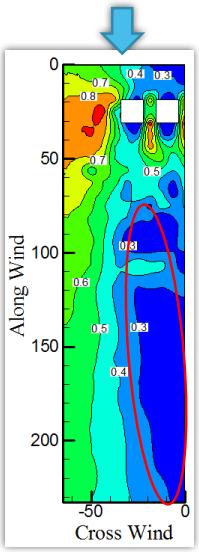
Objectives of Research

Development of computational fluid dynamics (CFD)/ numerical heat transfer (NHT) based analytical design tools to support innovative building and urban designs for comfortable, healthy, urban and indoor environment.

Main Research Areas

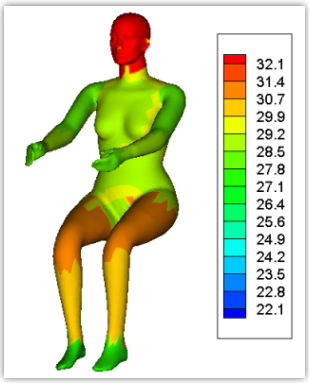
1. Advanced indoor air distribution design: stratified air distribution and personalized ventilation
2. Green architectural features that enhance natural ventilation: wing walls, balconies, sky gardens
3. Intra-building pollutant transmission and airborne infection risk assessment
4. Urban climate simulation analysis





Main Technologies and Application Tools

1. Award-winning patented ventilation technologies:
   Seat-integrated Personalized Ventilation
2. Advanced expertise in air flow turbulence modeling, CFD and NHT analysis
3. Virtual numerical thermal manikin for thermal comfort assessment

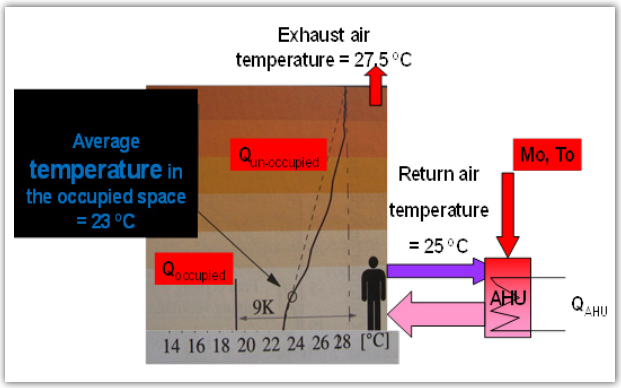


External Collaborators

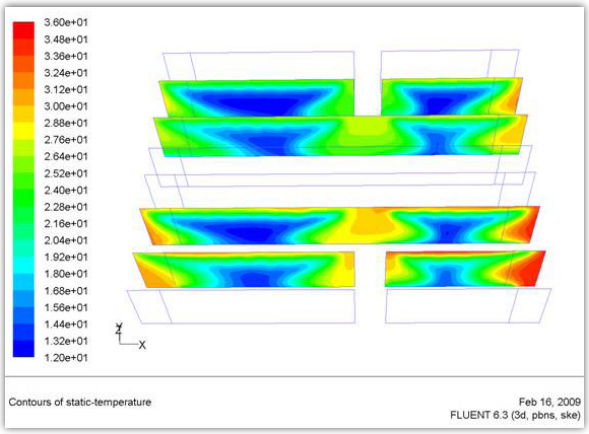
- Prof. Edward Arens, University of California, Berkeley
- Prof. Adrian Bejan, Duke University
- Prof. Y.K. Tung, Director of CLP wind/wave Tunnel Facilities
- Dr K.T. Tse, Assistant Professor, Hong Kong University of Science and Technology

Examples of Applications

1. HVAC design guide: Reduced space cooling load calculation methods selected by ASHRAE (American Society of Heating, Refrigerating and air-conditioning engineers) as distinguished lecture topics for world-wide dissemination.



2. Airborne infection management:
   - Recommendations endorsed by the Food, Health and Environment Bureau for the control of emerging infectious diseases in high-rise residential buildings
   - WHO Guide *"Natural Ventilation for Infection Control in Health-Care Settings"*
3. Data Center Cooling: CFD simulation of Cold and Hot Isle air distribution for Google Data Center (Asia) managed by PCCW



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建築與城市熱環境研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

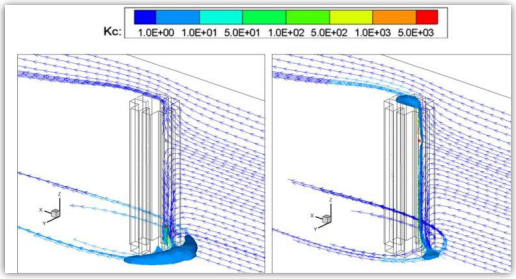
- 牛建磊教授，屋宇設備工程學系（組長）
- 麥卓明教授，屋宇設備工程學系
- 郭中秀教授，客座講座教授，屋宇設備工程學系
- 其他組員：研究生及博士後研究員

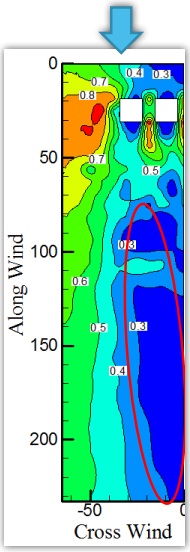
研究目標

發展以計算流體動力學及數值傳熱學為基礎的分析設計方法，支持城市及建築的創新性設計，以營造舒適、健康的城市和室內環境。

主要研究領域

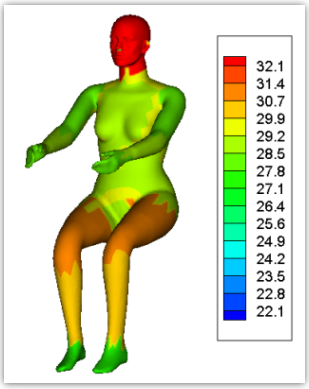
1. 先進的室內空氣分布設計：分層式空氣分布和個體送風方式研究
2. 有助於提升自然通風效率的綠色建築特徵研究：翼墻，陽臺，空中花園等
3. 建築內的污染物跨戶傳播研究，以及空氣傳播類傳染病的感染風險度評估
4. 城市小區建築群熱風環境的模擬分析研究





關鍵性技術及應用工具

1. 獲獎的專利化送風裝置：與座椅結合的個體送風技術
2. 空氣流動湍流模型，計算流體力學及數值傳熱學
3. 數值化虛擬暖體假人模型，可用於熱舒適度評估

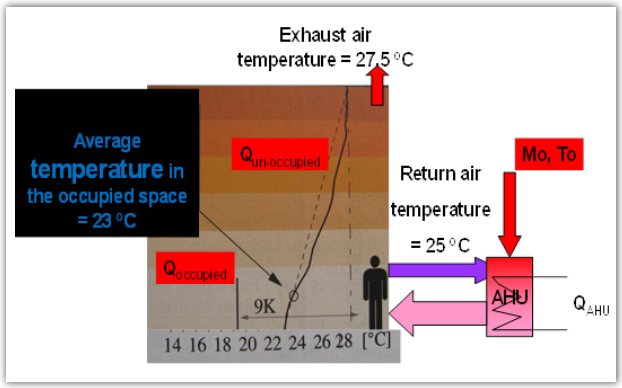


校外合作夥伴

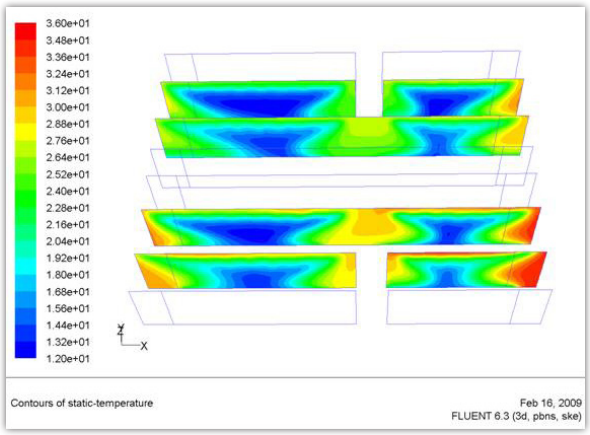
- Prof. Edward Arens，加州大學，伯克利分校
- Prof. Adrian Bejan，杜克大學
- 湯有光教授，中電(CLP)風洞實驗室主任
- 謝錦添博士，助理教授，香港科技大學

具體應用實例

1. 暖通空調設計指導：分層空調的冷負荷計算方法，獲頒美國暖通空調工程師協會 (ASHRAE) 傑出講座課題



2. 空氣傳播感染管理研究：
   - 提出了針對高層建築新型傳染病擴散的控制方法建議，被食物及衛生局采納並置於其網頁
   - 制訂世界衛生組織(WHO)“關於在醫院利用自然通風進行疾病傳播控制”的指南
3. 數據中心冷卻：針對PCCW旗下的 GOOGLE 亞洲數據中心，利用計算流體動力學方法研究冷熱通道的氣流組織分佈情況



Research Group for Environmental and Energy Economics

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Dr David Broadstock, Assistant Professor, School of Accounting and Finance (Group Leader)
- Dr Yue Cheong Chan, Associate Professor, School of Accounting and Finance
- Prof. C.S. Agnes Cheng, Chair Professor of Accounting, School of Accounting and Finance
- Prof. Louis Cheng, Professor, School of Accounting and Finance
- Dr Andy Chui, Associate Professor, School of Accounting and Finance
- Dr Mike Fung, Associate Professor, School of Accounting and Finance
- Dr Haitian Lu, Associate Professor, School of Accounting and Finance
- Dr Alice Shiu, Assistant Professor, School of Accounting and Finance
- Dr Sunny Sun, Assistant Professor, School of Accounting and Finance
- Dr Jimmy Jin, Assistant Professor, School of Accounting and Finance
- Dr Peng Zhang, Assistant Professor, School of Accounting and Finance
- Dr Raymond Li, Teaching Fellow, School of Accounting and Finance

Objectives of Research

- To understand the economic relationship and interaction between energy production, consumption and the environment.
- To formulate and suggest economically-viable energy and environmental policies for the government to improve the living standard of Hong Kong.
- To study and analyze developments in the energy markets and environmental related regulation and their impacts on the economy.

Main Research Areas

1. **Climate change economics**
   Climate change is one of the most significant issues ever to be faced collectively by humankind. Economic analysis can shed light on the potential effects of climate change and alternative means to address the problem.
2. **Economic growth and energy**
   The relationship between economic growth and energy becomes ever more important as economies around the world struggle to maintain sustainable growth and to develop energy resources in sustainable ways.
3. **Energy supply and price**
   Energy is vital for human life and indispensable to the functioning of modern economies. Adequacy of supply and stability in prices of energy resources are two of the main concerns in modern societies.
4. **Energy efficiency**
   Energy efficiency is viewed as an inexpensive way to reduce energy consumption and drive reductions in global emissions of greenhouse gases. The governments of different countries have developed various energy efficiency policies. The focus on efficiency is particularly important in the world's emerging economies. Improving energy efficiency is seen as a key path to both sustainable growth and reduced climate risk.
5. **Waste management**
   Expanding economic activities and a growing population are generating increasing amounts of municipal solid waste (MSW) in Hong Kong. If the waste load continues to increase, our existing landfills will be exhausted within the next decade and we will face the critical situation of having no place to dispose of our waste. We need to develop a sustainable waste management plan to conserve resources and reduce waste.
6. **Law, accounting and environment**
   The regulation of environmental issues has an impact on the behavior of commercial firms and financial markets. Understanding these impacts helps us to evaluate the appropriateness of such regulation.

Examples of Current Research Projects

- Energy's contribution to Asian economic growth
- The impact of the "Chinese Factor" on world crude oil prices
- Do land transaction prices reflect the impact of air pollution?
  Evidence from the opening and closure of coal-fired power plants in China
- Disclosures of weather changes and the market's perceived risk
- Technology gaps, energy efficiency gaps and competitiveness
- Temperature effects on productivity and factor reallocation: Evidence from a half million Chinese manufacturing plants
- A study on climate risk disclosures and SEC FR-82

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環境及能源經濟研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- Dr David Broadstock，會計及金融學院助理教授 （組長）
- 陳裕昌博士，會計及金融學院副教授
- 鄭振興教授，會計及金融學院會計學講座教授
- 鄭子云教授，會計及金融學院教授
- 徐振偉博士，會計及金融學院副教授
- 馮競暉博士，會計及金融學院副教授
- 陸海天博士，會計及金融學院副教授
- 蕭雅麗博士，會計及金融學院助理教授
- 孫咏菁博士，會計及金融學院助理教授
- 金涌博士，會計及金融學院助理教授
- 張鵬博士，會計及金融學院助理教授
- 李懷文博士，會計及金融學院專任導師

研究目標

- 瞭解能源生產、消耗與環境之間的經濟關係和互動。
- 為政府構思並提供經濟上可行的能源與環境政策，以助提高香港的生活水平。
- 研究分析能源市場的發展和與環境相關的管制及其對經濟的影響。

主要研究範疇

1. **氣候轉變經濟學**
   氣候轉變是全人類均須正視歷來最重要的問題之一。經濟學分析有助社會瞭解氣候轉變的潛在影響，以及另類解決途徑的效應。
2. **經濟增長與能源**
   由於世界各國致力維持經濟增長，並開發可持續的能源資源，使經濟增長與能源之間的關係日形重要。
3. **能源供應與價格**
   能源是人類生活的必需品，是現代經濟運行不可缺少的元素。能源資源的供應是否充足、價格是否穩定，是現代社會兩大關注問題。
4. **能源效益**
   能源效益是減少能源消耗、促使全球溫室氣體排放下降的廉宜方法。各國政府已制定各項能源效益政策。對新興經濟體而言，能源效益尤其重要，因為提升能源效益被視為維持經濟增長及減低氣候風險的主要途徑。
5. **廢物管理**
   經濟活動擴張、人口增長，使香港的都市固體廢物日益增加。若廢物負荷持續增加，現有的堆填區將在未來十年飽和，香港將要面對無處棄置廢物的嚴重情況。因此，我們需要發展可持續的廢物管理計劃，以保育資源、減少廢物。
6. **法律，會計與環境**
   與環境相關的管制會對商業機構和金融市場行為構成影響，理解這些影響有助我們評估管制是否適當。

近期相關研究項目例子

- 能源對亞洲經濟增長的貢獻
- 「中國因素」對全球原油價格的影響
- 土地成交價是否反映空氣污染的影響？來自中國燃煤發電廠開設與關閉的證據
- 天氣轉變披露與市場認知風險
- 技術差距、能源效率差距和競爭力
- 溫度對生產率和要素分配的影響：基於50萬個中國製造業企業的證據
- 基於證券交易委員會政策的氣候風險披露研究

Research Group for Indoor Air Quality

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Shuncheng Lee, Department of Civil and Environmental Engineering (Group Leader)
- Dr Hai Guo, Associate Professor, Department of Civil and Environmental Engineering
- Full-time Researchers:
  two post-doctoral fellows, eight research assistants and three PhD students

Objectives of Research

The research group endeavors to develop methodologies and technologies to monitor and assess indoor air quality, and control indoor air pollution, in order to provide a baseline database and insight for indoor air quality management.

Main Research Areas

(i) Indoor Air Pollutants Monitoring and Analysis

Indoor air quality monitoring and evaluation by different advanced instruments; collecting samples from different emission sources and characterizing the sources by conducting full quantitative determination.

(ii) Indoor Air Chemistry

Studying on the formation chemistry and mechanism of indoor air pollutants, such as VOC and PM using environmental chambers; developing and validating indoor air quality models for precise prediction.

(iii) Indoor Air Pollution Control Technology Development

Research and development of advanced and efficient technologies for indoor air pollution control.

(iv) Indoor Odour Pollution Study

Indoor odour determination, analysis and evalutation based on the European standard (EN 13725: 2003).

Fig. 1 Instruments for indoor air quality monitoring

Fig. 2 Analytical instruments for indoor air pollutants

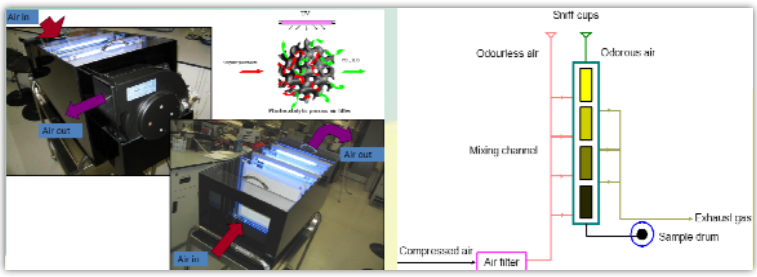


Fig. 3 System for Indoor air pollution control and odour analysis

External Collaborators

- Prof. Ralf Zimmermann, Helmholtz Zentrum Munchen - German Research Centre for Environmental Health (GmbH), Institute of Ecological Chemistry
- Prof. Don Blake, University of California Irvine, USA

Main Technologies and Application Tools

Systematic sampling, measuring and analyzing technologies and instruments for characterization and evaluation of indoor air quality, and air pollution control of different sources and materials as follow.

- Samplers (BS, AP, TSP, PM, PUF, etc.)
- Particles Analysis tools (TEOM, SD, PC, etc.)
- Analyzers for Criteria Gaseous Pollutants (CO, SO_2, NH_3, NO-NO_2-NO_X NO_X, O_3, etc.)
- Indoor Air Quality Monitors (PM, VOC, HCHO, Radon, etc.)
- Analytical Instruments (GC--MSD, OC/EC, IC, PTR-MS, SOA, NMHC, etc.)
- Environmental Chambers (in different sizes)
- Modern Forced-choice Dynamic Olfactometer & Electronic Nose (E-nose)

Examples of Applications

- Study on Indoor Air Pollutants in Emperor Qin's Terra-cotta and Han Yang Mausoleum Museums
- Study on Air Pollutant Emission from Incense Burning by Using Large Environmental Chambers
- Study on Cooking Fumes in Hong Kong (Residential vs Commercial)
- Study on Indoor Odorous Pollutants

Fig. 4 Study on indoor air pollutants in museums

Fig. 5 Study on air pollutant emissions from incense burning and formation mechanism for secondary pollutants using environmental chambers

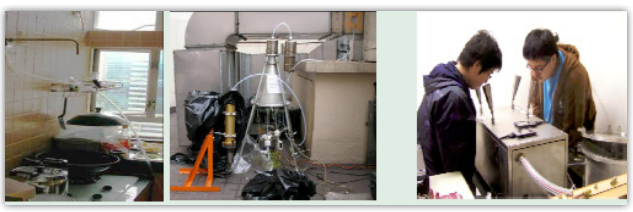


Fig. 6 Study on air pollutants from cooking fumes and indoor oudour

室內空氣質素研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 李順誠教授，土木及環境工程學系 (組長)
- 郭海博士，副教授，土木及環境工程學系
- 全職研究人員：
  博士後 (2人)、 助理研究員 (8人)、博士生 (3人)

研究目標

研究小組致力於開發大氣污染監測方法和控制技術，通過分析與評價室內空氣的質量，並建立相應模型進行研究，獲得基礎數據，為室內空氣質量管理提供參考。

主要研究領域

(i) 室內空氣污染物監測和分析
利用先進儀器進行室內空氣質量監測和分析評價;採集不同排放源的氣體樣品，通過全定量分析表徵不同的排放源。

(ii) 室內空氣化學
通過環境模擬研究室內空氣污染物，如VOC和PM的成分及形成機理；開發模型用於準確預測室內空氣質量。

(iii) 室內空氣污染控制技術開發
研究和開發先進的、有效的室內空氣污染控制技術。

(iv) 室內臭氣污染研究
采用歐盟標準 (EN13725:2003) 進行室內臭氣的檢測分析和評價。

圖1室內空氣質量監測設備

圖2室內空氣污染物分析設備

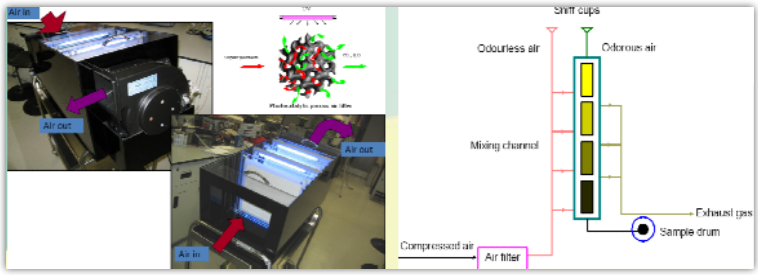


圖3室內空氣污染物控制技術與惡臭分析系統

校外合作夥伴

- Prof. Ralf Zimmermann, Helmholtz Zentrum Munchen - German Research Centre for Environmental Health (GmbH), Institute of Ecological Chemistry
- Prof. Don Blake, University of California Irvine, USA

主要技術及應用工具

可用於室內氣體質量表徵評價以及不同來源空氣污染控制的系統性進行氣體樣品采集、測量、分析技術和儀器如下：

- 采樣器 (BS, AP, TSP, PM, PUF, etc.)
- 粒子分析工具(TEOM, SD, PC, etc.)
- 標準氣體污染物分析儀 (CO, SO_2, NH_3, NO-NO_2-NO_X NO_X, O_3, etc.)
- 室內空氣質量測試儀(PM, VOC, HCHO, Radon, etc.)
- 分析儀器(GC--MSD, OC/EC, IC, PTR-MS, SOA, NMHC, etc.)
- 環境模擬室 (不同大小)
- 强迫性選擇動態嗅覺計、電子鼻

應用實例

- 西安秦始皇兵馬俑和漢陽陵博物館的室內空氣污染物研究
- 利用大型環境模擬室研究室內焚香污染的主要污染物及形成機制
- 廚房油煙研究
- 室內臭氣污染物研究

圖4博物館及古陵墓室內空氣污染分析與研究

圖5室內環境模擬研究焚香污染的主要污染物及二次污染物 形成機制

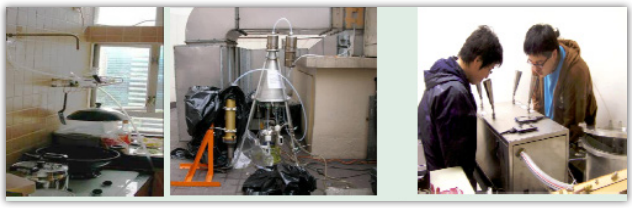


圖6廚房油煙及室內惡臭污染研究

Research Group for LED Based Energy Efficient Communication Systems

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. C. Lu, Professor, Department of Electronic and Information Engineering (Group Leader)
- Dr Alan P. T. Lau, Associate Professor, Department of Electrical Engineering
- Prof. Alexander P. K. Wai, Chair Professor, Department of Electronic and Information Engineering

Objectives of Research

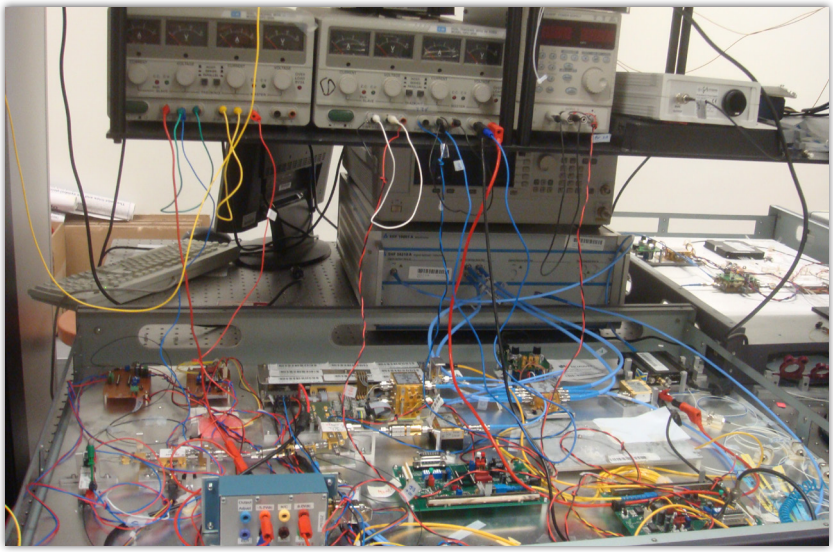
As an energy efficient light source, LED has been used more and more for lighting and display systems. In this research group, we will explore its additional functionality as a communication and localization device. Its applications in energy efficient communication for transportation systems and intelligent homes will be studied.

Main Research Areas

- Visible light-based communication systems
- Visible light-based indoor localization systems
- Two dimensional optical communication system design
- Modulation and equalization techniques for two dimensional communication systems

Current Research Projects

- Coherent free space optical communication systems, Research Grants Council of Hong Kong SAR (PolyU 152109/14E).



Experimental facility for optical communication system performance study

可見光節能通訊系統研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 呂超教授，教授，電子及資訊工程學系（組長）
- 劉伯濤博士，副教授，電機工程學系
- 衛炳江教授，講座教授，電子及資訊工程學系

研究目標

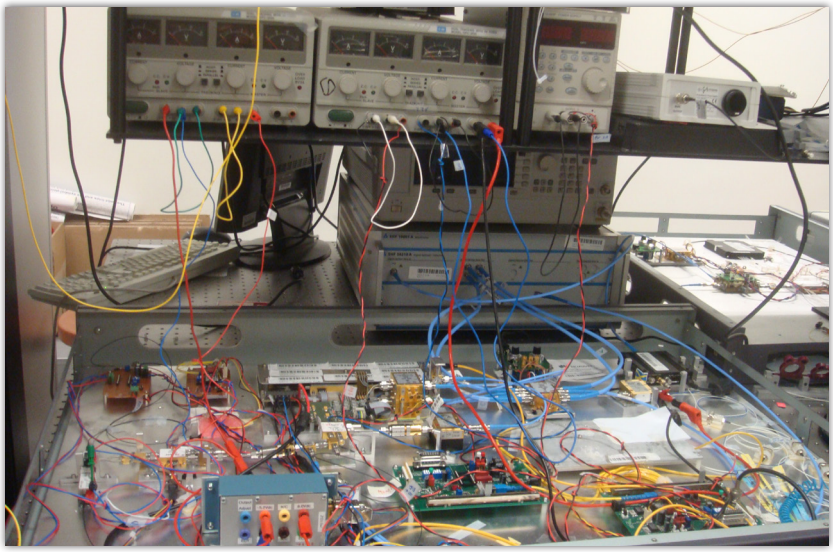
由於其良好的節能特性，發光二極管被越來越多的用於照明及顯示系統。本研究小組將致力於研究其在通訊及定位系統中的應用。並將探討其在交通及智能家居節能通訊系統中的應用。

主要研究領域

- 可見光通訊系統；
- 可見光室內定位系統；
- 二維光通訊系統設計；
- 二維光通訊系統中的調製及均衡技術；

近期相關研究項目

- 香港教資會研究資助局項目“相干空间光通訊系统”（PolyU 152109/14E）



光通訊實驗測試系統

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

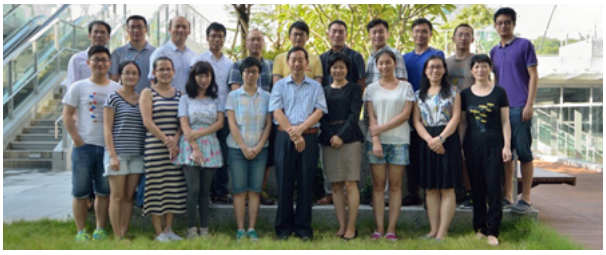
電郵: risud@polyu.edu.hk 網頁: www.polyu.edu.hk/risud

Renewable Energy Research Group

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Hongxing YANG, Professor, Department of Building Services Engineering (Group Leader)
- Dr Lin LU, Associate Professor, Department of Building Services Engineering
- Full-time researchers:
  5 postdoctoral research fellows, 13 PhD students
  and 3 research assistants



Objectives of Research

The RERG's research objectives are to develop and promote advanced methodologies and technologies of renewable energy applications focusing on solar energy, wind energy and geothermal energy resources.

Main Research Areas

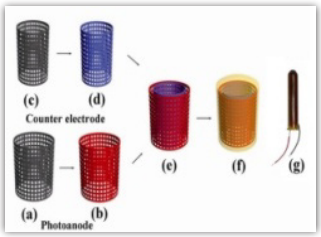
- **Solar energy material and solar cells** including development of dye sensitized solar cells and related materials
- **Building integrated photovoltaic (BIPV)** concerning the optimal design and environmental effects of BIPV claddings and development of advanced BIPV claddings
- **Wind Power Application** including wind power potential simulation of wind fields in urban and offshore areas and building-integrated wind turbine development
- **Solar assisted air conditioning system** developing the heat and mass transfer in solar assisted liquid desiccant dehumidification and regeneration systems
- **Ground coupled heat pumps** concerning the heat and mass transfer of vertical and inclined borehole ground heat exchangers and building pile foundation heat exchangers, and system simulation of ground coupled heat pumps for application in hot weather areas

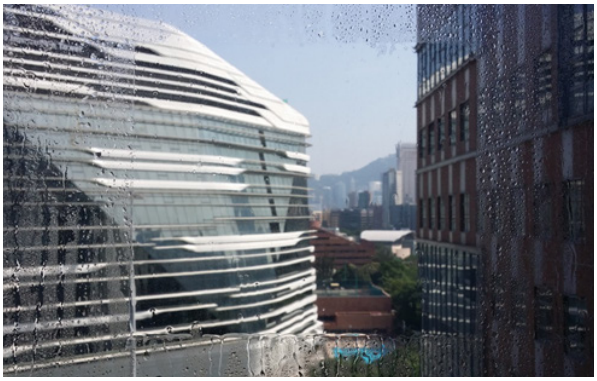
Awards

- 2016 the 44th International Exhibition of Inventions of Geneva Special Merit Award and Gold Medal: Highly Dispersed Nanocomposite paste for self-cleaning Solar Panels
- 2016 Prof. Hongxing Yang was selected as highly cited researcher according to Scopus database
- 2016 WSSET Innovation Award: in-building hydro power generation system
- 2014 Green Building Award (Merit Award): Highly Dispersed Screen-Printable Nanocomposite paste for self-cleaning curtain walls
- 2013 Hong Kong Awards for Environmental Excellence – Green Innovations Awards (Certificate of Merit): An Inline Hydroelectric Generating System in Confined Condition for Urban Water Pipelines
- 2013 Silver Medal of the 40th International Exhibition of Inventions of Geneva and the merit of the Innovation Award for the Engineering Industry: A novel inline hydropower system for power generation from water pipelines

Main research outputs

- Development of the first BIPV experimental system in Hong Kong in 1999
- Development of a number of advanced BIPV claddings
- Development of hybrid solar-wind systems
- Development of highly efficient novel structured dye-sensitized solar cells
- Heat and transfer models of solar dehumidification cooling system
- Magnetic supported vertical axis wind turbines
- Pipeline water turbines
- Glass self-cleaning materials





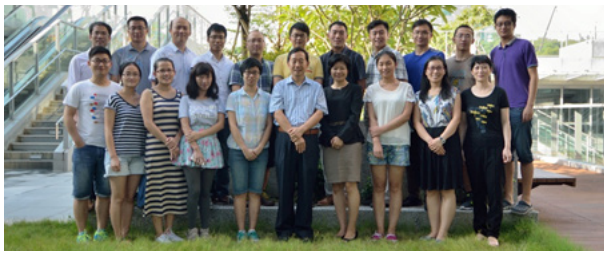
Email: risud@polyu.edu.hk Website: www.polyu.edu.hk/risud

可再生能源研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 楊洪興教授，屋宇設備工程學系（組長）
- 呂琳博士，副教授，屋宇設備工程學系
- 全職研究員:
  包括5名博士後，13名在讀博士生以及兩名研究助理



研究目標

本研究小組的研究目標為研發先進的可再生能源技術，包括基礎研究和應用研究，為在城市建築上推廣應用太陽能，風能及地熱能等可再生能源的應用，為城市建築可持續發展做出貢獻。

主要研究領域

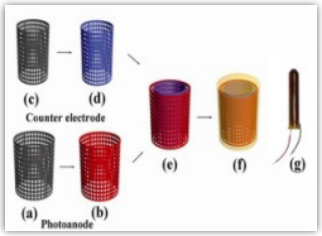
- **太陽能電池材料和光伏器件：**包括納米複合半導體材料的合成及高效光伏器件的研發
- **建築一體化太陽能光伏系統：**建築一體化光伏系統優化設計, 熱性能和發電性能模擬計算, 氣象因素對其發電性能的影響研究, 以及光伏系統能量輸出模擬和實驗研究
- **太陽能輔助空調系統:**對於太陽能輔助溶液除濕及再生系統中流動及傳熱傳質的研究
- **風能研究：**香港風能潛力評估，香港海上風場優化，風光互補系統優化，磁懸浮垂直軸風力發電機氣動優等研究課題
- **地源熱泵技術：**豎直及傾斜鑽孔地熱換熱器傳熱模型，冷却塔及地源熱泵複合系統的運行工況，及樁基地熱換熱器的研究

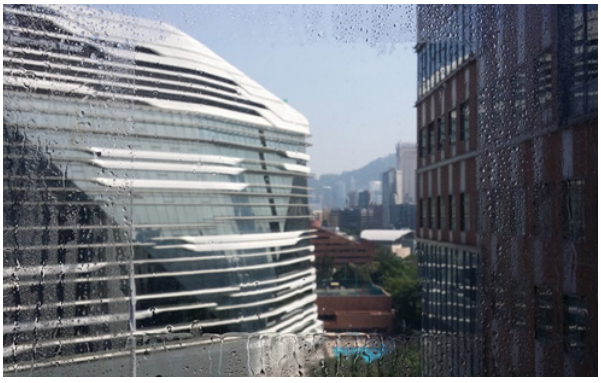
獎項

- 2016年第44屆日內瓦國際發明展特別優異獎及金獎：高分散太陽能光伏板自動清潔納米塗料
- 2016年楊洪興教授入選全球土木工程學科高被引學者
- 2016年首屆世界可持續能源技術協會創新獎：大廈內水力發電系統
- 2014年環保建築大獎（優異獎）：一種用於製作自清潔玻璃幕牆的高分散可絲網印刷型納米塗料
- 2013年「香港環保卓越計劃」環保創意優異獎：內聯閉式輸水管水力發電系統
- 2013年第40屆日內瓦國際發明展銀獎及香港工程師學會工程創意優異獎2012/2013:水管內新型內聯式垂直軸水輪發電機的研發

主要研發成果

- 於1999年建成香港首座太陽能光伏建築實驗**電**站
- 開發多種新型光伏建築構件和計算模型
- 開發風光互補發電技術
- 開發高效新結構染料敏化太陽電池
- 研發太陽除濕空調技術
- 研發升力型磁懸浮垂直軸風力發電機
- 開發地下水管發電裝置
- 提出地源熱泵地埋管換熱器傳熱傳質分析解
- 開發自清潔玻璃漿料





Research Group for Geo-spatial Technology in Urban Development

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Wenzhong Shi, Professor in GIS and remote sensing, Department of Land Surveying and Geo-Informatics (Group Leader)
- Prof. Janet Nichol, Professor, Department of Land Surveying and Geo-Informatics
- Dr Lilian Pun, Associate Professor, Department of Land Surveying and Geo-Informatics
- Dr Eric Guilbert, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Dr Charles Wong, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Dr Bo Wu, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Dr Geoffrey Shea, Senior Lecturer, Department of Land Surveying and Geo-Informatics
- Full-time researchers: 1 Postdoctoral Fellow and 10 PhD students

Objectives of Research

- To develop geo-spatial solutions for sustainable urbanization research
- To apply geographic information system and remote sensing technologies for urban studies

Main Research Areas

Smart City & Decision Support

Services of geo-spatial information

- New LBS models and framework for massive spatio-temporal data
- Effective mechanisms for the integration of multi-source data in LBS
- Dynamic urban facility inquiry and management
- Decision-making for sustainable urban planning & development

Geographic Information Science

Processing, management & analysis of geo-spatial information

Basic theories of spatial data quality

- Fundamental theories of spatial data uncertainty
- Core techniques and methods for spatial data quality control
- Essential technologies for spatial data quality checking and control platform

Uncertainty-based spatial data mining

- Identifying and modelling uncertain factors in spatial data mining
- Quantitative evaluation on error sensitivity of spatial data mining methods
- Spatial data mining quality standard independent from internal data patterns
- Uncertainty-based spatial data mining for "smart city" applications

Remote Sensing & Photogrammetry

Acquisition of geo-spatial data

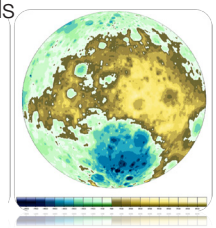
- Remote sensing of urban atmospheric and thermal environment
- 3D urban building extraction and modelling
- 3D change detection for geological disaster aided with prior knowledge
- Real-time photogrammetry

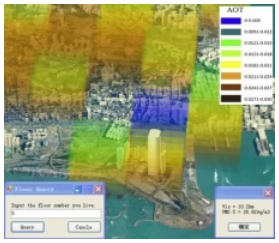
Research Achievements & Awards

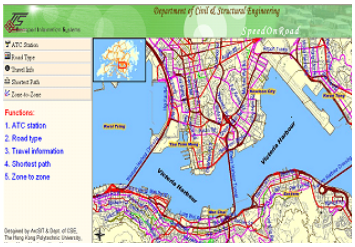
- Principles of modeling uncertainties in spatial data and analyses
- Spatial data quality evaluation and control
- Spatial analyses and remote sensing image processing methods with enhanced performance through handling uncertainties
- New methods for improving the spatial resolution and accuracy of thermal infrared remote sensing images
- Natural Science Award by the State Council of P.R. China (2007)
- Wang Zhizhuo Award by International Society for Photogrammetry and Remote Sensing (2012)

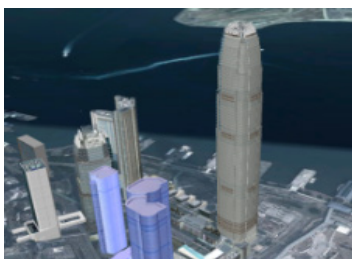
Application Examples

- Lunar & Mars mapping
- Spatial data quality models & standards
- Dynamic traffic inquiry & management
- 3D city modeling
- Light pollution study in urban areas
- Urban environmental remote sensing









地球空間技術及應用研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 史文中教授，GIS和遙感領域教授，土地測量及地理資訊學系（組長）
- 李真教授，土地測量及地理資訊學系
- 潘鄭淑貞博士，副教授，土地測量及地理資訊學系
- Dr Eric Guilbert，助理教授，土地測量及地理資訊學系
- 黃文聲博士，助理教授，土地測量及地理資訊學系
- 吳波博士，助理教授，土地測量及地理資訊學系
- 佘裕佳博士，高級講師，土地測量及地理資訊學系
- 全職研究人員：1個博士後研究員和10個博士研究生

研究目標

- 為城市可持續發展研究提供地球空間技術的解決方案
- 將地理信息系統和遙感技術應用於城市問題研究

主要研究領域

智慧城市與決策支持

地球空間信息服務

- 城市設施的動態查詢與管理
- 城市可持續發展規劃的決策支持

地理信息科學

地球空間信息的處理，管理與分析

空間數據質量基礎理論

- 空間數據不確定性基礎理論
- 空間數據質量控制的核心技術與方法
- 空間數據質量檢查與質量控制平臺關鍵技術

不確定性空間數據挖掘

- 空間數據挖掘中不確定性因素及其建模理論
- 空間數據挖掘方法的誤差敏感度量化理論
- 獨立于數據內部規律的空間數據挖掘質量標準
- 不確定性空間數據挖掘在智慧城市研究中的應用

遙感與攝影測量

地球空間數據的獲取

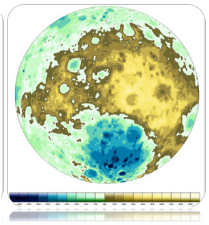
- 城市大氣與熱環境遙感監測
- 城市建築物自動提取及三維建模
- 先驗知識引導下的城市地質災害三維變化檢測
- 實時攝影測量

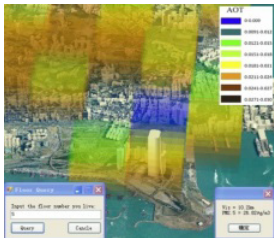
研究成果與獎勵

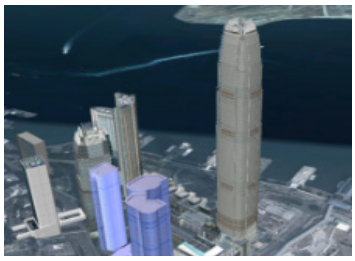
- 空間數據與空間分析的不確定性原理
- 通過空間數據不確定性的控制提升了空間分析和遙感影像處理方法的效果
- 提出了新的改進熱紅外遙感影像空間分辨率和精度的方法
- 獲得國家自然科學二等獎（2007）
- 獲得國際攝影測量與遙感學會“王之卓獎”（2012）

應用實例

- 月球與火星表面製圖
- 空間數據質量建模及標準
- 交通流量的動態查詢與管理
- 三維城市建模
- 城市光污染研究
- 城市環境遙感







Research Group for Management of Underground Utilities

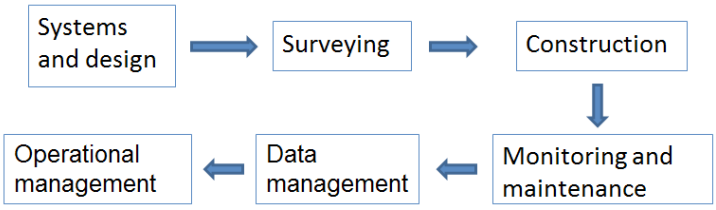
Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Wu Chen, Professor, Department of Land Surveying and Geo-Informatics (Group Leader)
- Dr Bruce King, Associate Professor, Department of Land Surveying and Geo-Informatics
- Dr Lilian Pun, Associate Professor, Department of Land Surveying and Geo-Informatics
- Ir Dr Wallace Wai-Lok Lai, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Dr Bo Wu, Assistant Professor, Department of Land Surveying and Geo-Informatics

Objectives of Research

The research group aims to study the rapid growth and increasingly complex underground networks of utilities such as water supply, drainage, sewerage, power, gas, telecommunication pipes and cables. This relatively new scope extends the land surveying discipline from above ground to characterizations of underground or subsurface areas.



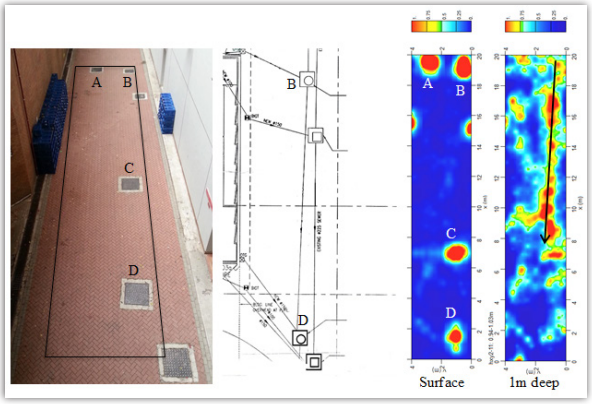
This research group strives to provide solutions that help to solve a range of underground utility problems at different stages, from (1) initial systems and design, to (2) intermediate surveying and construction, to (3) long term monitoring and maintenance, data, operational and asset management.

Main Research Areas

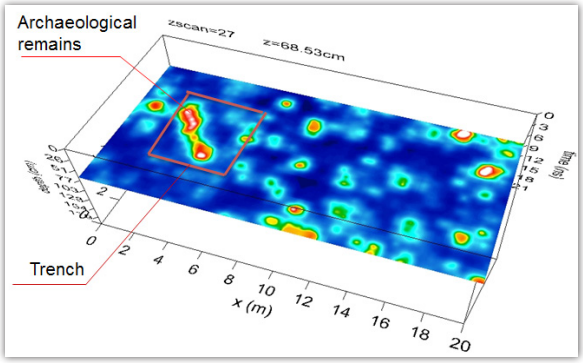
- Multi-dimensional mapping and subsurface imaging of underground utilities, archaeology, and tree roots by electromagnetic radar penetrating the ground and precise positioning by total station and GPS.
- Detection and monitoring of water leaks in pressurized water supply pipes by acoustic correlation of leaks and noise
- Integration of digitized record drawings of different types of underground utilities using GIS tools and database to establish a unified platform
- Operational and asset management: For every type of utility, there is an unprecedented demand for pipeline networks due to urbanization. The issues of operational and asset management require an ever-increasing strategic input of resources, technologies and expertise.

Examples of Applications

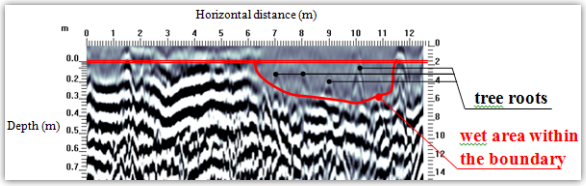
(i) Locating pipelines 3-dimensionally



(ii) Discovery of buried archaeological treasures



(iii) Detection of tree roots



(iv) Detection of water leakages

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地下管線管理研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 陳武教授，土地測量及地理資訊學系（組長）
- 金博思博士，副教授，土地測量及地理資訊學系
- 潘鄭淑珍博士，助理教授，土地測量及地理資訊學系
- 賴緯樂博士，助理教授，土地測量及地理資訊學系
- 吳波博士，助理教授，土地測量及地理資訊學系

研究目標

隨著城市化的迅速發展，如何有效的管理日趨複雜的各類地下管綫（如供水管，排污管道，煤氣管綫，通訊綫路等）是現代化城市管理的重要組成部分。本研究小組致力研究地下管綫的三維定位成像技術，管綫質量評估與維護技術，漏水檢測技術，以及分佈式網絡的資產管理方案。

主要技術與研究工具

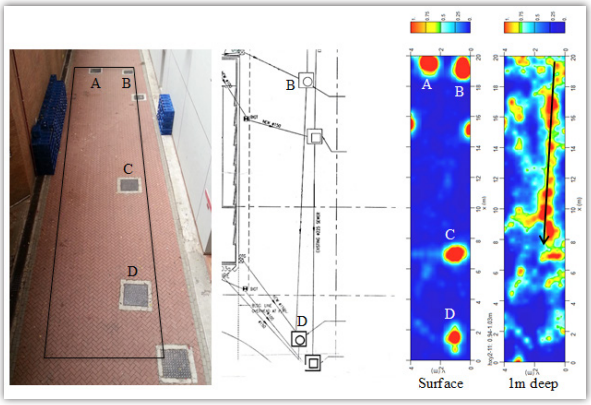
- 探底雷達技術；
- 相關漏水檢測技術；
- CCVT技術；
- 管綫電磁測量技術；
- 管綫GIS管理系統；
- 管綫資產管理系統。

主要研究領域

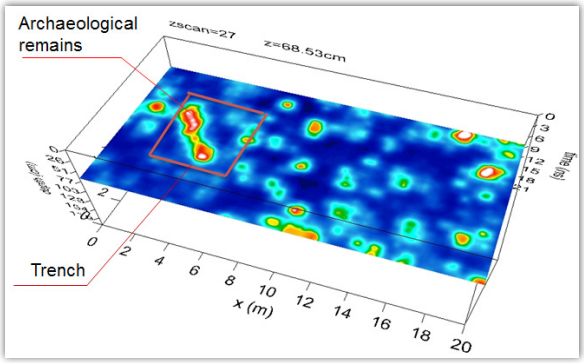
- 地下管綫，古代遺址等地下設施的三維成像與製圖；
- 利用多種手段的管綫監測與測漏技術；
- 管綫測量與質量評估技術；
- 管綫數據庫的建立與維護；
- 管綫資產管理。

應用實例

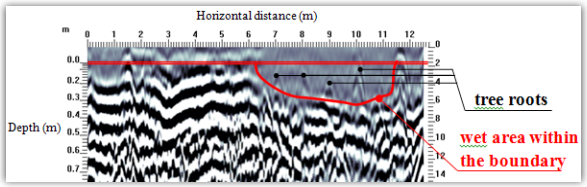
(i) 三維管綫定位



(ii) 考古勘查



(iii) 樹根檢測



(iv) 漏水檢測

Research Group for Internet Service Monitoring and Diagnostics

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- Dr Rocky K. C. Chang, Associate Professor, Department of Computing (Group Leader)
- Dr Wei Lou, Associate Professor, Department of Computing
- Dr Allen Au, Assistant Professor, Department of Computing
- Dr Yixin Cao, Assistant Professor, Department of Computing
- Prof. William H.K. Lam, Chair Professor of Civil & Transportation
- Dr Ivan Wang-Hei Ho, Research Assistant Professor, Department of Electronic and Information Engineering

External Collaborator

- Prof. Kimberly Claffy, CAIDA, University of California at San Diego

Why This Research Group?

An important characteristic of a smart city is a free flow of data and information which enable business and individuals to promptly make smart and prudent decisions. Nowadays, almost all the information is transmitted electronically to users and organizations. However, unlike other critical infrastructures, such as power and transportation, monitoring network quality and diagnosing its problems is inherently very difficult.

What Are We Here For?

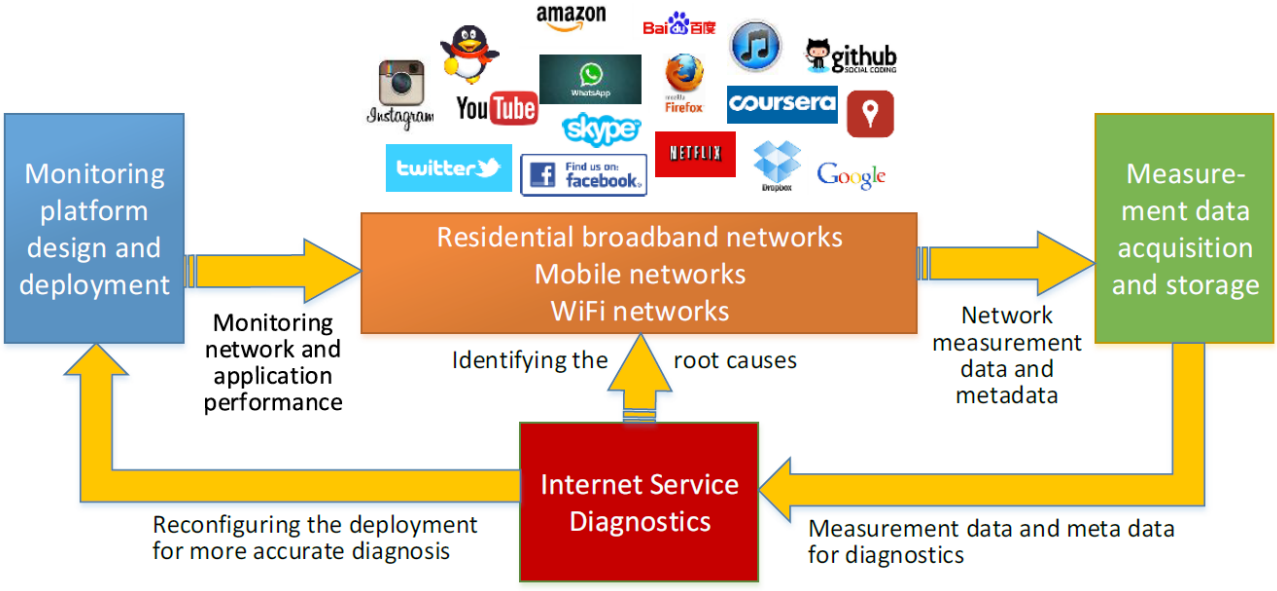
The vision of this research program is to advance Hong Kong (and then other cities) to become a smarter city by developing and deploying advanced network service monitoring and diagnostics platforms. There is no such infrastructure in Hong Kong right now. Even in the US, the effort of measuring the ISPs' performance started just four years ago.

How Will We Contribute to Building a Smart City?

We will develop and deploy platforms for monitoring performance of residential broadband networks, mobile broadband networks, and enterprise WiFi networks. These platforms will serve all the stakeholders, including end users, content providers, Internet service providers, and regulators (i.e., OFCA).

What Is Our Research Expertise?

Our team members have research expertise and practical experience on Internet measurement methodology and platform, quality of experience measurement, mobile and wireless networks, big data analytics, data privacy and visualization, graph and scheduling algorithms, and transportation science.



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互聯網務監診小組

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- 操宜新博士，助理教授，電子計算學系
- 林興強教授，土木及交通工程講座教授，土木及環境工程學系
- 何宏禧博士，助理教授(研究)，電子及資訊工程學系

校外合作夥伴

- Prof. Kimberly Claffy, CAIDA, University of California at San Diego

網絡質量的重要性

作為智慧城市的重要特徵之一，數據和信息的自由流通使得企業和個人能迅速的做出智慧和理性的決定。現在幾乎所有信息都是通過電子方式在用戶與組織間傳輸。然而，與電力、運輸等其它關鍵基礎設施不同的是，網絡質量監控及故障診治有很多特殊的內在困難。

我們研發的方向

我們這個研究項目的願景是通過研發和部署高端網路監控及診治平台，促進香港（以及其它城市）變成更加智慧的城市。目前香港還沒有這樣的基礎設施。即使在美國，度量網絡服務提供商的服務性能的努力也只是四年前才開始出現。

我們研發的手段

我們將研發和部署家用寬頻網路、移動寬頻網路和企業無線網路的性能監控平台。這些平台將服務於所有利益相關者，包括最終用戶，內容提供商，網路服務提供商，以及監管機構（例如OFCA）。

我們研發的能力

我們的成員在以下領域有豐富的研究專長及實踐經驗：網路測量、用戶體驗質量、移動及無線網路、大數據分析、數據隱私和可視化、 圖論和調度算法以及交通科學。

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Research Group for Unmanned Airborne System for Urban Monitoring

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Research Group Members

- Prof. Chih-Yung WEN, Professor, Department of Mechanical Engineering (Group Leader)
- Prof. Xiaoli DING, Chair Professor of Geomatics, Department of Land Surveying and Geo-Informatics
- Prof. Wu CHEN, Professor, Department of Land Surveying and Geo-Informatics
- Dr Bruce Anthony KING, Associate Professor, Department of Land Surveying and Geo-Informatics
- Dr George LIU, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Dr Charles Wong, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Jingxuan SUN, Postgraduate student, Department of Mechanical Engineering
- Rui CHEN, Postgraduate student, Department of Mechanical Engineering
- Zhu Rui, Postgraduate student, Department of Land Surveying and Geo-Informatics
- Full-time Researchers: around 10 PhD students, Research Assistants and Postdoctoral Researchers

Objectives of Research

The objectives are to develop the UAV systems for urban monitoring, transport logistics and development for smart cities.

Main Research Areas

(i) UAV for spatial information acquisition

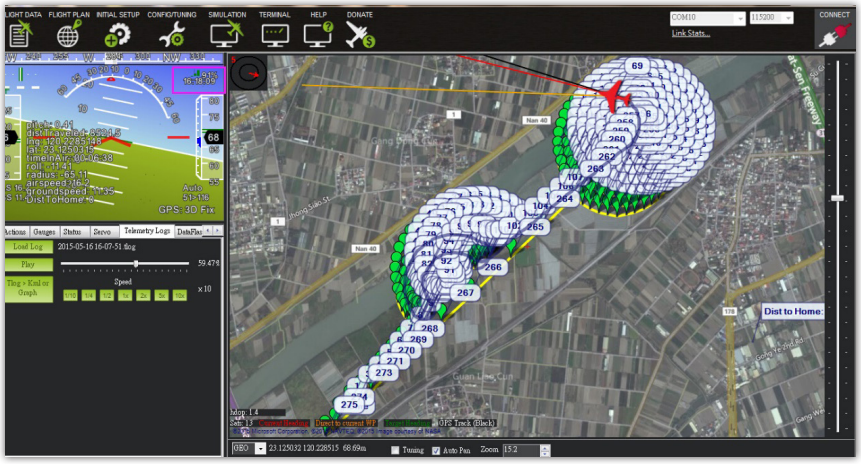
Development of UAVs which is capable of autonomous exploration in urban environments. The LiDAR, which is widely used as a range finder, can be equipped into a UAVs to conduct the mission of building 3D terrain.

(ii) UAV for environmental monitoring

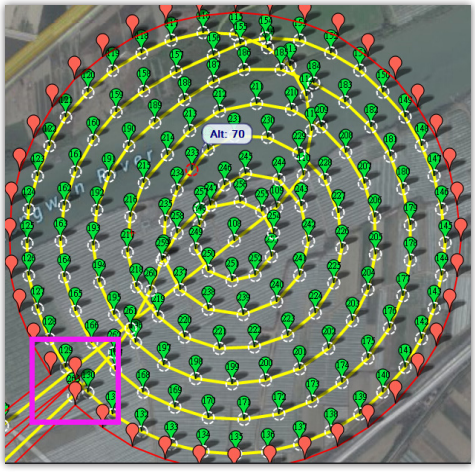
Development of UAVs equipped with small thermal Lasers or spectral sensors, providing a promising alternative for assisting modelling, mapping and monitoring applications in rangelands, forest and agricultural environments.

Main Technologies Area

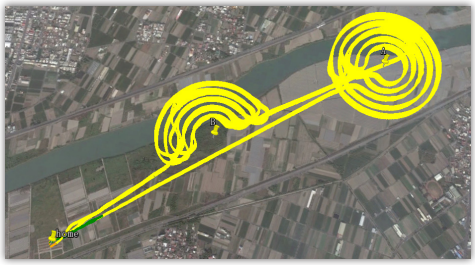
- Technologies for integrating the UAV system
- Technologies for wireless communication with UAVs
- Technologies for UAV navigation
- Technologies for autopilot control
- Technologies for 'Fail-safe'
- Technologies for data gathering



UAV Path design and ground station software



UAV flight path design



Flight log

Mapping in TKO

無人機系統在城市監控中的應用研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

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- 丁曉利教授，講座教授，土地測量及地理資訊學系
- 陳武教授，土地測量及地理資訊學系
- Bruce Anthony KING 博士，副教授，土地測量及地理資訊學系
- 劉志趙博士，助理教授，土地測量及地理資訊學系
- 黃文聲博士，助理教授，土地測量及地理資訊學系
- 孫靖萱，研究生，機械工程學系
- 陳瑞，研究生，機械工程學系
- ZHU Rui，研究生，土地測量及地理資訊學系
- 全職研究人員：約10名研究生、研究助理及博士後

研究目標

發展為市區監測、物流及智慧城市服務的無人機系統技術。

主要研究領域

(i) 應用於空間信息採集的無人機系統

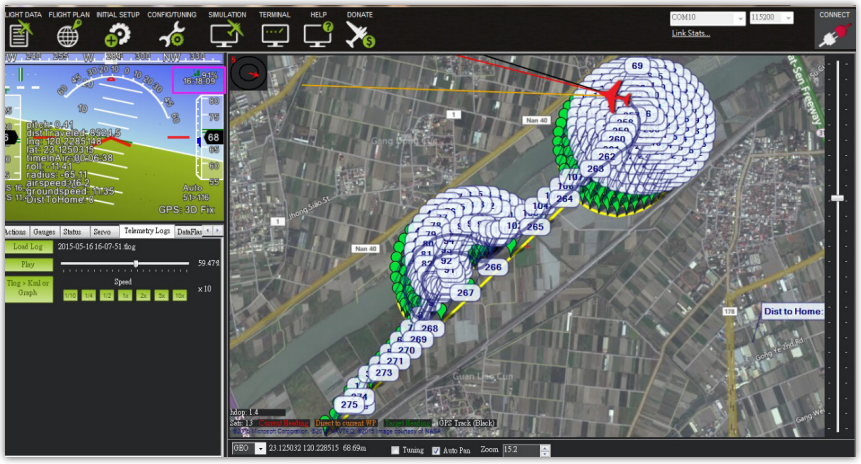
研究市區環境下具有自主導航能力和完成空間測量飛行任務的無人機系統。

(ii) 應用於環境監測的無人機系統

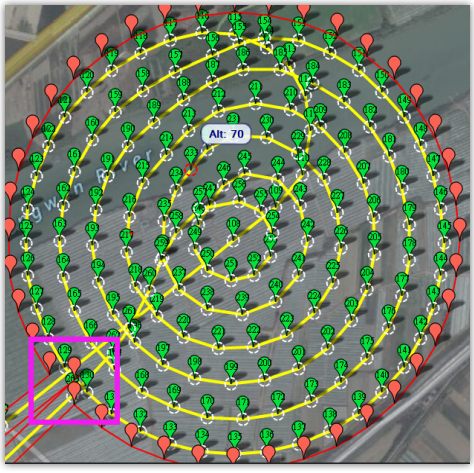
研究在牧場、森林及農耕環境下具有輔助建模、土地測量和監測能力的無人機系統。

主要技術及工具

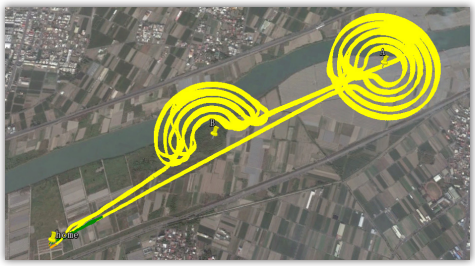
- 無人機系統整合技術
- 無人機無線通訊技術
- 無人機導航技術
- 不同無人機平台的自動駕駛控制技術
- 無人機通訊失效安全技術
- 空間信息採集技術



無人機導航路徑設計及地面站



無人機導航路徑設計



無人機路徑記錄

將軍澳小區域地圖

Research Group for Urban Big Data Computing and Wireless Networking

Research Institute for Sustainable Urban Development 可持續城市發展研究院

Research Group Members

- Prof. Jiannong Cao, Chair Professor, Department of Computing (Group Leader)
- Prof. Shengwei Wang, Chair Professor, Department of Building Services Engineering
- Prof. Yiqing Ni, Professor, Department of Civil and Environmental Engineering
- Dr Dan Wang, Associate Professor, Department of Computing
- Dr Bin Xiao, Associate Professor, Department of Computing
- Dr Lei Yang, Research Assistant Professor, Department of Computing
- Dr Qixin Wang, Assistant Professor, Department of Computing
- Five full-time research personnel and twenty research students (including PhD and MPhil students of both full-time and part-time modes)

External Collaborator

- Prof. Lu Chenyang, Washington Univ. at St. Louis, USA

Objectives of Research

The UBDWN research group aims to foster a synergy between computer science and civil/environment engineering to address the compelling challenges in rapid urbanization, especially by exploiting the vast opportunities brought forth by recent advances in big data computing and wireless networking technologies.

Main Research Areas

- Wireless Sensing and Networking for Data Collection – how to search and collect large-scale, fine-grained, cross-discipline data in a fast, cheap, and automatic way.
- Smart Phones and Human-Computer Interaction – how to enhance smart phones to better understand and respond to human needs in today's mega-cities.
- Cyber-Physical Joint Understanding – how to integrate computing, civil, and environmental engineering cross-disciplinary knowledge to better understand and hence utilize the collected data.
- Big Data Storage and Analysis – how to store, index, compute, migrate, and interpret the exploding volume of data made available by today's sensing, networking, and computing powers.

Main Technologies

- Wireless Sensor Networks – Reliable and fault-tolerant of data collection by wireless sensor networks
- Internet-of-Things – RFID and wireless sensing technologies are broadly used in an Internet-of-things system. Based on these two technologies, surveillance, security, healthcare, food safety and other applications have emerged to save cost.
- Smart Phone Sensing – Collaborative collection of data about people and environment using smart phones and via wireless networks, and cloud-based data processing and analysis for decision-making.
- Mobile and Cloud Computing – Mobile and cloud computing includes both the mobile computing technology and the cloud computing technology, which can form a new network to benefit mobile users, network operators and cloud providers.
- Hybrid Modeling – hybrid modeling is a tool to formally specify and analyze the integrated systems of computers and civil/environmental engineering; it provides a cross-domain language to connect computer engineers and civil/environmental engineers.
- Interdisciplinary Co-Design and Co-Analysis Methodologies – such methodologies shall greatly reduce the interdisciplinary design/analysis difficulty, the key barrier toward creating synergy between computing and civil/environmental engineering.
- MapReduce – large scale distributed computing methodology that parallelizes computation automatically

Examples of Applications

- Guangzhou and Beijing CCTV New TV Towers – From stable data communication and data collection, cyber-physical co-design and fault tolerant techniques to structural health monitoring and diagnosis of TV Towers in an efficient and effective manner.
- Green and Smart Buildings – Wireless and smart building management systems to support all kinds of top-up services and energy conservation opportunities
- Online Hybrid Modeling and Analysis of Traffic Congestion Big Data – Traffic congestion control is a typical non-linear problem, which has few good offline models. In the big data context, the problem becomes even more challenging. To tackle this challenge, we can use real-time hybrid modeling to linearize this problem in an online fashion. This will make both the data and problem manageable.

城市大數據計算和無線網絡研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

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- 倪一清教授，教授，土木及環境工程學系
- 肖斌博士，副教授，電子計算學系
- 楊磊博士，助理教授(研究)，電子計算學系
- 王丹博士，助理教授，電子計算學系
- 王啟新博士，助理教授，電子計算學系
- 5名全職研究人員和20名研究生
  （包括全職/兼職的博士和碩士學生）

校外合作夥伴

- 呂晨陽教授，美國華盛頓大學聖路易斯分校教授

研究目標

UBDWN研究小組旨在促進計算機科學與土木/環境工程之間的協同，解決當前城市化快速發展所帶來的緊迫挑戰，尤其是利用最近在大數據計算和無線網絡技術上的進步來解決上述挑戰。

主要研究領域

- 用於數據采集的無線感知和網絡化 – 如何用快速、廉價、自動的方式搜索和采集大規模、細粒度、跨學科的數據。
- 智能手機和人機交互 – 如何利用大量的智能手機快速地理解並響應今天大城市中人類的需求。
- 網絡-現實聯合理解 – 如何整合計算學、土木工程和環境工程的跨學科知識從而更好地理解並利用采集到的數據。
- 大數據存儲和分析 – 如何存儲、索引、計算、遷移和解釋當前由於感知、網絡化和計算能力增強而帶來的爆炸性增長的數據

主要技術

- 無線傳感器網絡 – 使用無線傳感器網絡可靠地、可容錯地採集數據。
- 物聯網 – RFID和無線感知技術已經被廣泛運用於物聯網系統中。基於這兩種技術，監控、安防、醫療、食品安全和其他應用程序不斷湧現，可大量地節約生產成本。
- 智能手機感知 – 使用智能手機和無線網絡，合作式地採集人與環境的數據，並基於雲計算進行數據處理、分析和決策。
- 跨學科聯合設計和聯合分析方法學 – 此方法學大大降低了跨學科設計/分析的困難，解決了計算機科學和土木/環境工程協同工作的關鍵障礙。
- 移動和雲計算 – 移動和雲計算包括移動計算技術和雲計算技術。該技術形成一個新的網絡，使得移動用戶、網絡運營商和雲提供商一起受益。
- 混合建模 – 混合建模是一種對計算機和土木/環境工程集成系統進行正規地描述和分析的工具。它提供跨領域的語言，從而便利了計算機工程師和土木/環境工程師之間的的交流和聯繫。
- MapReduce – 一種將計算自動並行化的大規模分佈式計算方法學。

應用舉例

- 廣州與北京CCTV新電視塔 – 實現了新電視塔的穩定數據通信和數據採集，以及網絡-現實協同設計與容錯技術，並使用高效和有效的方式對其進行結構健康監測和診斷。
- 綠色和智能建築 – 設計無線和智能樓宇管理系統，以支持各類頂級服務和能源節約。
- 交通擁擠大數據的在線混合建模與分析 – 交通擁塞控制是一個典型的非線性問題，對其很少有好的離線模型。在大數據的背景下，這個問題變得更具挑戰性。為了應對這一挑戰，我們可以使用實時混合建模來在線地線性化這個問題。這既解決了大數據量的問題，也使得交通擁擠可被管理。爆炸性增長的數據

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Research Group for Urban Navigation and Mobility

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- Prof. Wu Chen, Professor, Department of Land Surveying and Geo-Informatics
- Prof. Mei-po Kwan, Visiting Chair Professor, Department of Land Surveying and Geo-Informatics
- Prof. Zhilin Li, Professor, Department of Land Surveying and Geo-Informatics
- Dr George Liu, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Prof. Esmond Mok, Professor, Department of Land Surveying and Geo-Informatics
- Dr Lilian Pun, Associate Professor, Department of Land Surveying and Geo-Informatics
- Dr Geoffrey Shea, Senior Lecturer, Department of Land Surveying and Geo-Informatics
- Prof. John Shi, Professor, Department of Land Surveying and Geo-Informatics
- Dr Charles Wong, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Dr Bo Wu, Assistant Professor, Department of Land Surveying and Geo-Informatics
- Dr Lei Zhang, Research Assistant Professor, Department of Land Surveying and Geo-Informatics
- Full-time researchers:
  about 30 full-time researchers including postdoctoral fellows, research associates and research students

Objectives of Research

The objectives are to develop seamless positioning, navigation, tracking and analytical technologies for urban navigation, monitoring, transport logistics and development of smart cities.

Main Research Areas

(i) Technologies for Seamless Positioning in Urban Environments
Development of positioning and navigation technologies for both indoor and outdoor environments; Legal issues in positioning and tracking.

(ii) Urban Monitoring, Analysis, Services and Management
Urban remote sensing and monitoring; Spatial and temporal patterns, structures and dynamics of urban political, social, demographic, economical, environmental, transport and health data and phenomena; Urban mobility; Optimal urban planning and design; Asset Management; Urban management; Emergency management; Transport logistics; Transport security; Location-based services.

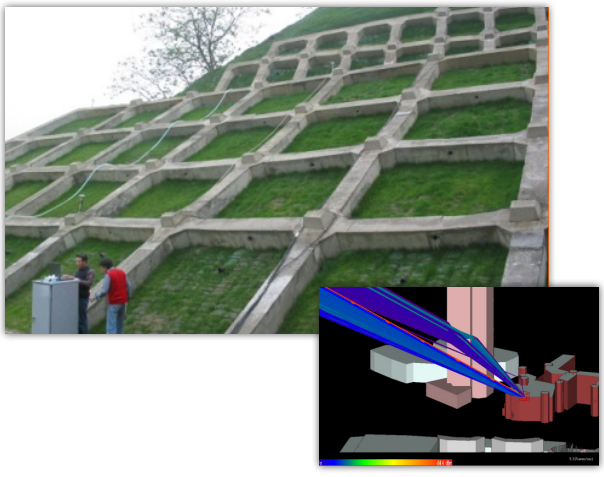
Main Technologies and Application Tools

- Technologies for seamless indoor and outdoor positioning;
- Technologies for tracking of mobile subjects;
- Technologies for urban remote sensing and monitoring;
- Technologies for spatial information management and visualization on different platforms;
- Methodology for spatial analysis and modeling.

Examples of Application

- **Public Transport Enquiry System**
  The award-winning public transport enquiry system has been jointly developed and maintained with the Transport Department of the Hong Kong Government for public use in Hong Kong since 2008.

- **GPS Technology for Monitoring Structural Deformations**
  GPS technologies have been developed for monitoring structural deformations of buildings and slopes. The technologies include specialized data processing algorithms, software and hardware, which have been used widely.



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城市導航及流動性研究小組

Research Institute for Sustainable Urban Development 可持續城市發展研究院

研究小組成員

- 丁曉利教授，講座教授，土地測量及地理資訊學系（組長）
- 陳武教授，土地測量及地理資訊學系
- 關美寶，訪問講座教授，土地測量及地理資訊學系
- 李志林教授，土地測量及地理資訊學系
- 劉志超博士，助理教授，土地測量及地理資訊學系
- 莫志明教授，土地測量及地理資訊學系
- 潘鄭淑珍博士，副教授，土地測量及地理資訊學系
- 佘裕佳博士，高級講師，土地測量及地理資訊學系
- 史文中教授，土地測量及地理資訊學系
- 黃文聲博士，助理教授，土地測量及地理資訊學系
- 吳波博士，助理教授，土地測量及地理資訊學系
- 張磊博士，助理教授(研究)，土地測量及地理資訊學系
- 全職研究人員：約30名研究生、研究助理及博士後

研究目標

發展為市區導航、監測、物流及為智慧城市服務的無縫定位、導航、跟踪及分析技術。

主要研究領域

(i) 城市環境下無縫定位技術

室內、室外定位及導航技術；定位及跟踪中的法律問題。

(ii) 城市監測、分析、服務及管理

城市遙感及監測；市區政治、社會、人口、經濟、環境、交通及健康數據及現象的時間、空間模式、結構及動態特性；市區流動性；城市規劃及設計優化；資產管理；城市管理；緊急事件應對；物流管理；運輸安全；位置服務。

主要技術及應用工具

- 室內、室外無縫定位技術;
- 移動目標跟踪技術;
- 市區遙感及監測技術;
- 不同應用平臺上的空間信息管理及可視化技術;
- 空間分析及建模方法。

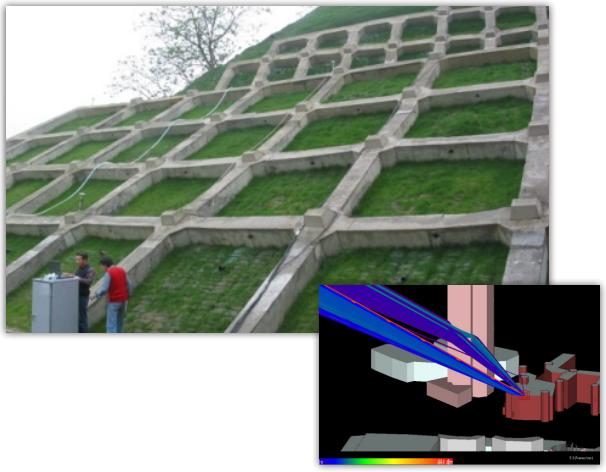
應用實例

- **公共交通查詢系統**

  與香港政府運輸署聯合開發的、獲得多項獎項的香港公共交通查詢系統自2008年起已經開放給公眾使用。

- **基於GPS的結構變形監測技術**

  所開發的基於GPS的變形監測技術可用於監測邊坡及建築物的結構變形。該技術包括特殊的數據處理算法、軟件及硬件，已經被廣泛應用。



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