

Assessment of the Potential Green Roof Area for the Mitigation of Urban Environmental Problem: A Case Study of Yau Tsim Mong District



FAN Ka Ming

Supervised by Prof. HUANG Bo

1 Background

- Hong Kong is well-recognized as the most densely populated megacity suffering from **severe UHI effects**
- The **overcrowded population** has prompted **ferocious land competition**
- **Vertical development of urban greenery** for mitigating environmental challenges due to climate change has been in the spotlight
- Green roof introduction is viewed as a pragmatic approach to **achieving sustainable development** that can balance human development and urban greening without sacrificing horizontal space for development

3 Research Significance

- The increasing adoption of green roofs among nations has become a prevalent trend, whereas **insufficient resources and attention** are invested in Hong Kong
- Hong Kong is **lagging behind the global trend** with **declining competitiveness** in the green roof industry
- **Direction and implications** on the existing promotion or policies of greening are concluded
- Also solves the problem of insufficient analysis concerning the **opportunities and challenges** of imposing green roof technology and **arouse attention to the green roof industry** in Hong Kong.

5 Methodology

- Examining LST & NDVI
- DATA: Landsat 8 OLI/TIRS images
- Remote sensing technology

- Examining air temperature
- DATA: Weather station (HKO)
- GIS: IDW interpolation

- Examining potential green roof
- DATA: LiDAR, meteorological data
- GIS: Multi-criteria analysis

- Examining UHI effect mitigation
- DATA: Weather station (HKO), selection result of potential green roof
- ENVI-met (Weather simulation)

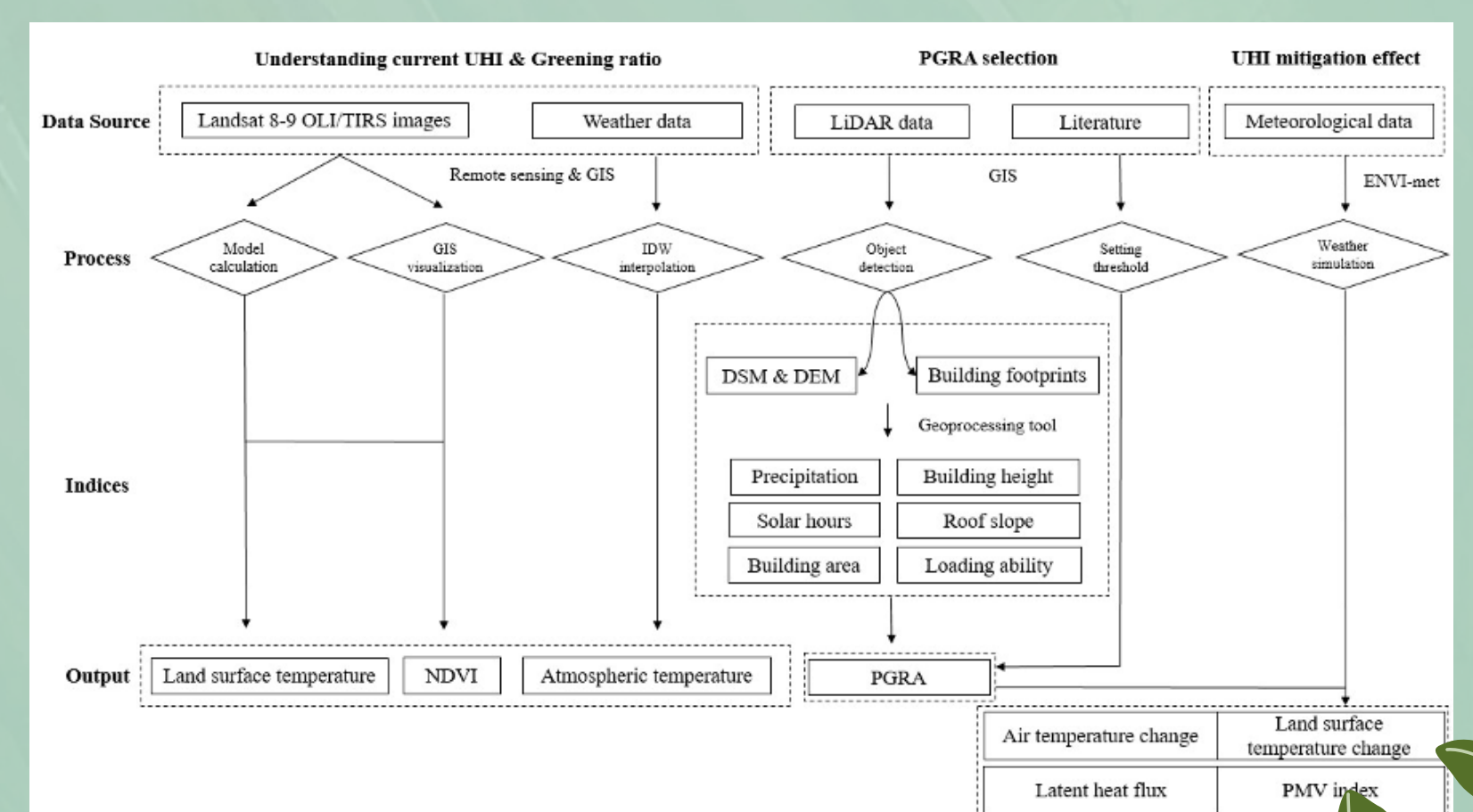
7 Discussion

- 1) Land surface temperature was not positively related to air temperature
 - Positive correlation was found only between land surface temperature and vegetation coverage
 - Existence of UCI & seasonal effect
- 2) Despite the high percentage of PGRA, most of them merely passed the marginal threshold
 - Solar illumination and building height are the major limiting factors
- 3) The cooling effect was brought by the reduction of land surface temperature
 - Seasonal and daily fluctuation of air cooling brought by green roof was discovered

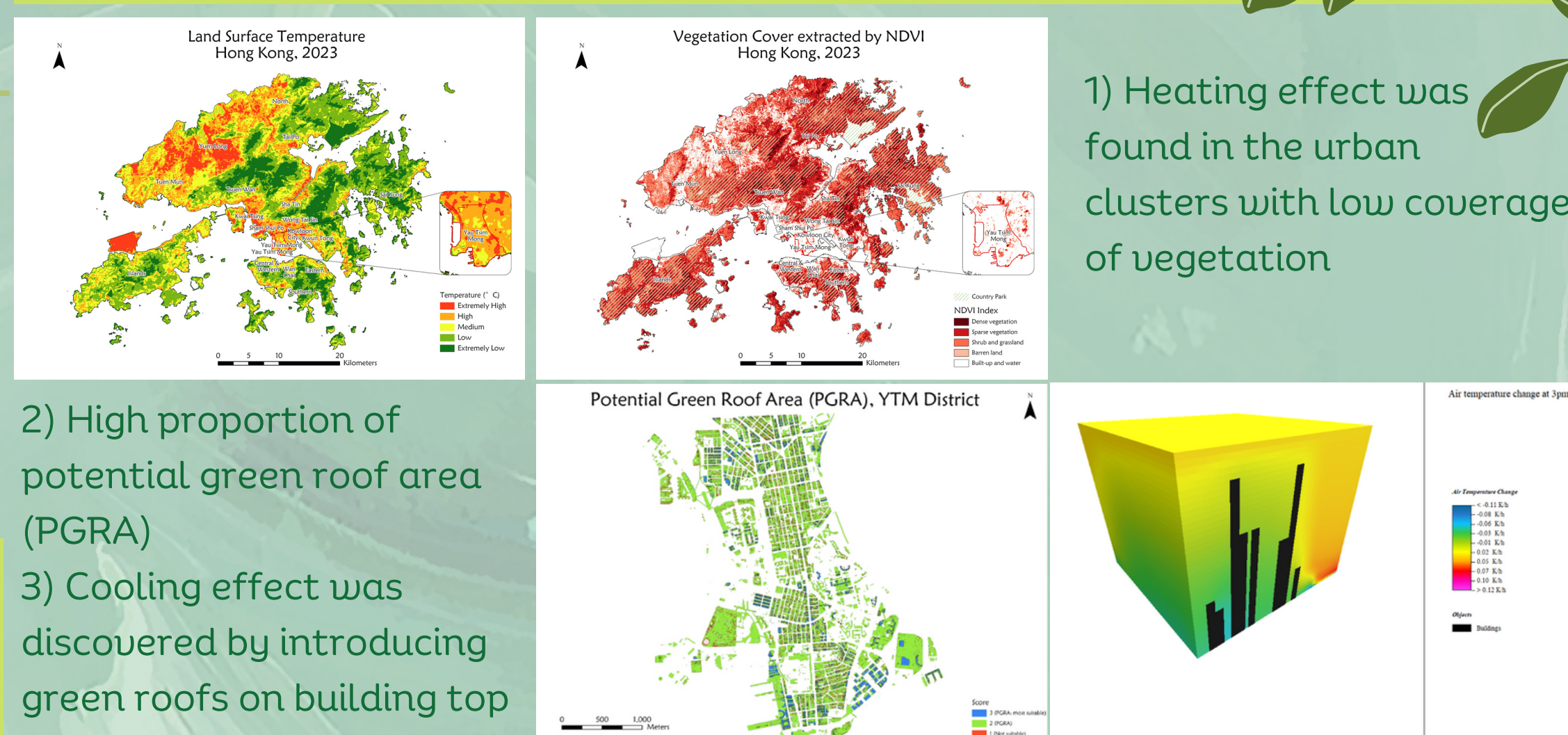
2 Research Objectives

- 1) To examine the current heating problem & greening ratio
- 2) To investigate the potential green roof area in the study area
- 3) To simulate the thermal performance and the effects of green roofs on UHI effect mitigation
- 4) To scrutinize the constraints of green roof construction, limitations and solutions

4 Conceptual Framework



6 Major Findings



8 Implication and Recommendation

- The high vulnerability of Hong Kong to climate change contributes to the increasing **urgency of establishing effective means** to increase city resilience
- **Green roof installation is an effective method** for urban greening
- Despite the existence of constraints, the **possibility of green roof development** in Hong Kong still presents, which **should not be neglected**
- **Support from the government** is essential to drive the green roof development
- **Collaboration** between government departments, including but not limited to conservation, planning, and construction department, is significant to establish a comprehensive method