Urban Cooling Solutions

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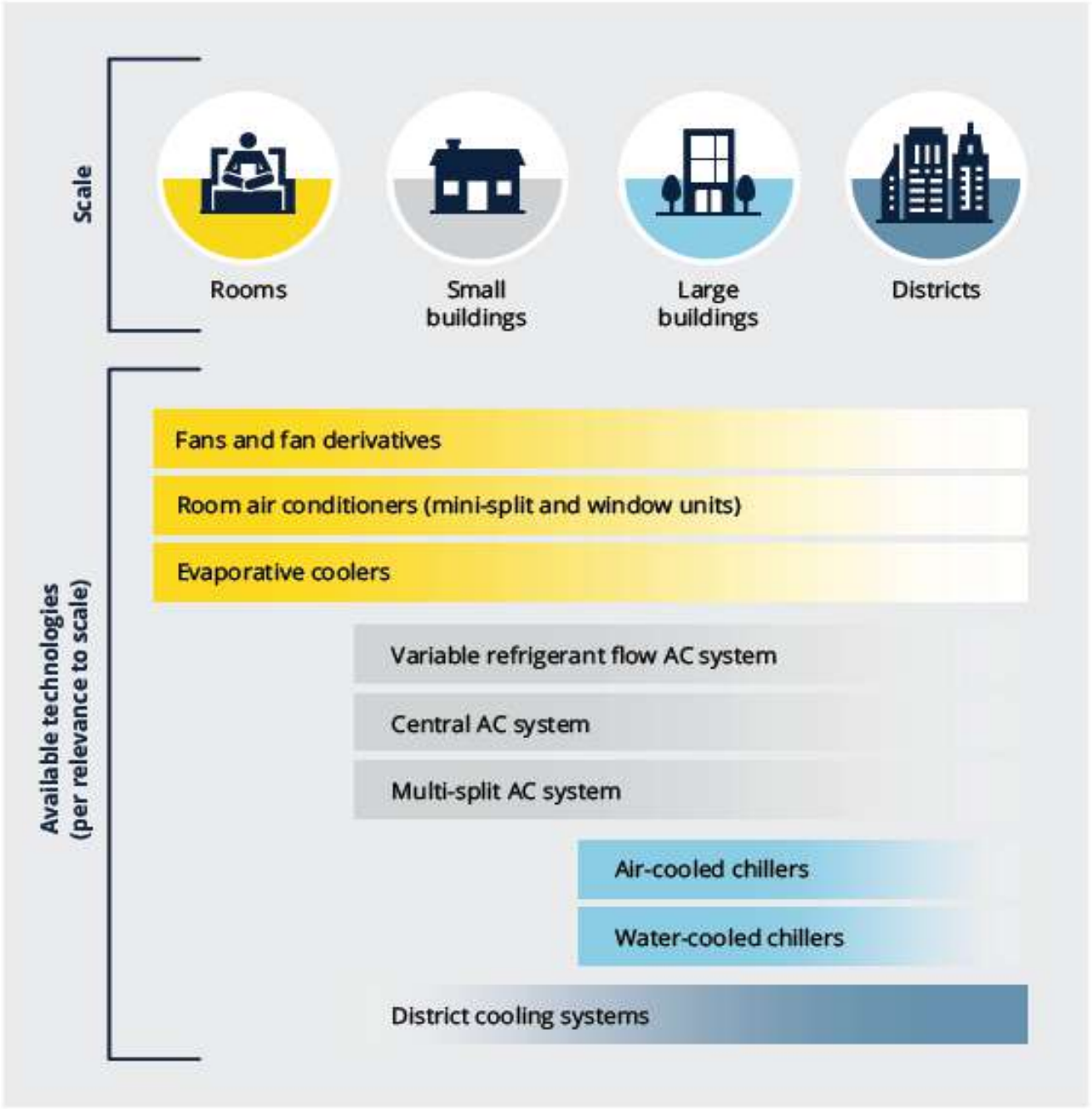
Integrated Urban Cooling Solutions

Active Cooling Solutions

- **Technology** (e.g. reducing human-induced heat)
- **AC**
- **District Cooling**



Source: Authors, composed by Rocky Mountain Institute.
Note: Shading represents each cooling equipment's applicability at the corresponding building scale.

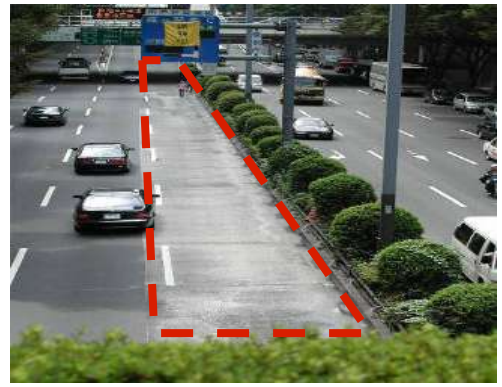
Passive Solutions – Nature Based Solutions

Solar reflective surface

Permeable surface

Spatial Planning/Urban design

- Wind flows
- Green/blue infrastructure/Shading



Architectural design

- Traditional architecture

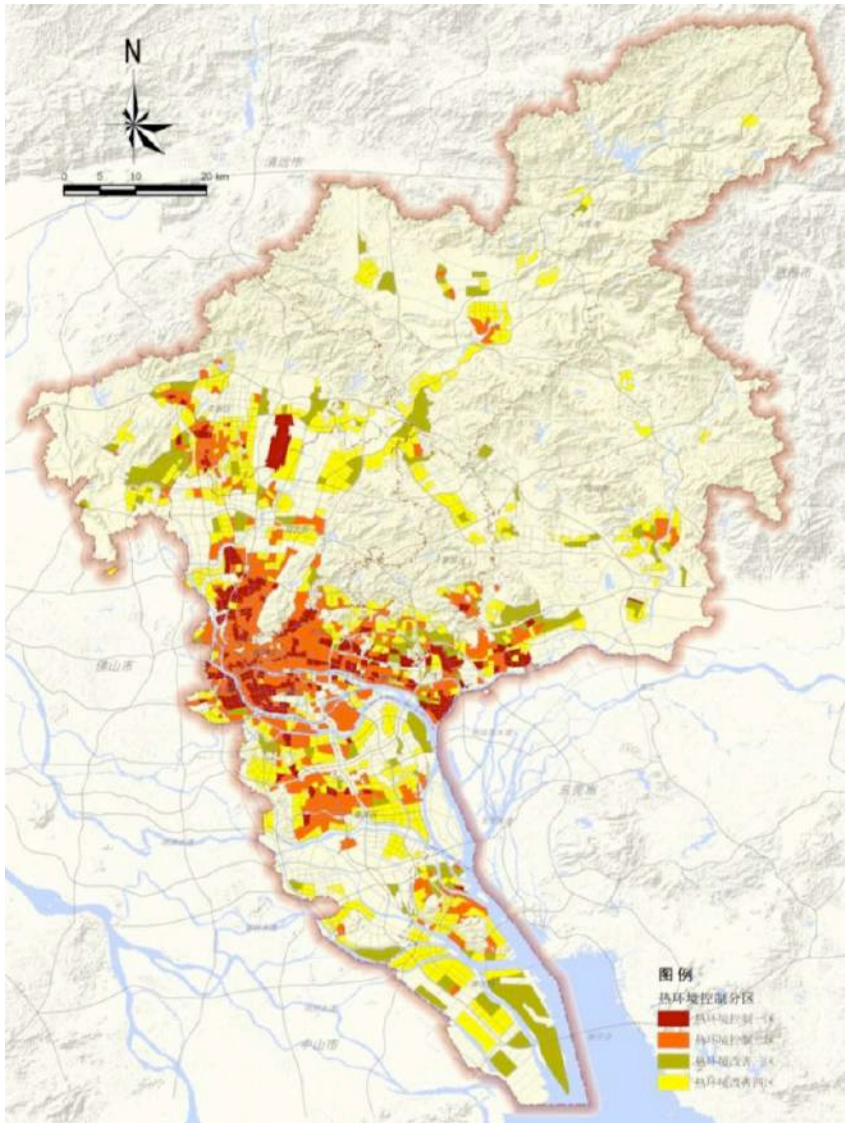
World Bank in collaboration
With City of Guangzhou, China

Piloting Nature Based Passive Cooling Solutions

Mapping Urban Heat

- **Temperature increase:**
  From 1996 to 2014, 0.14C to 1.53C

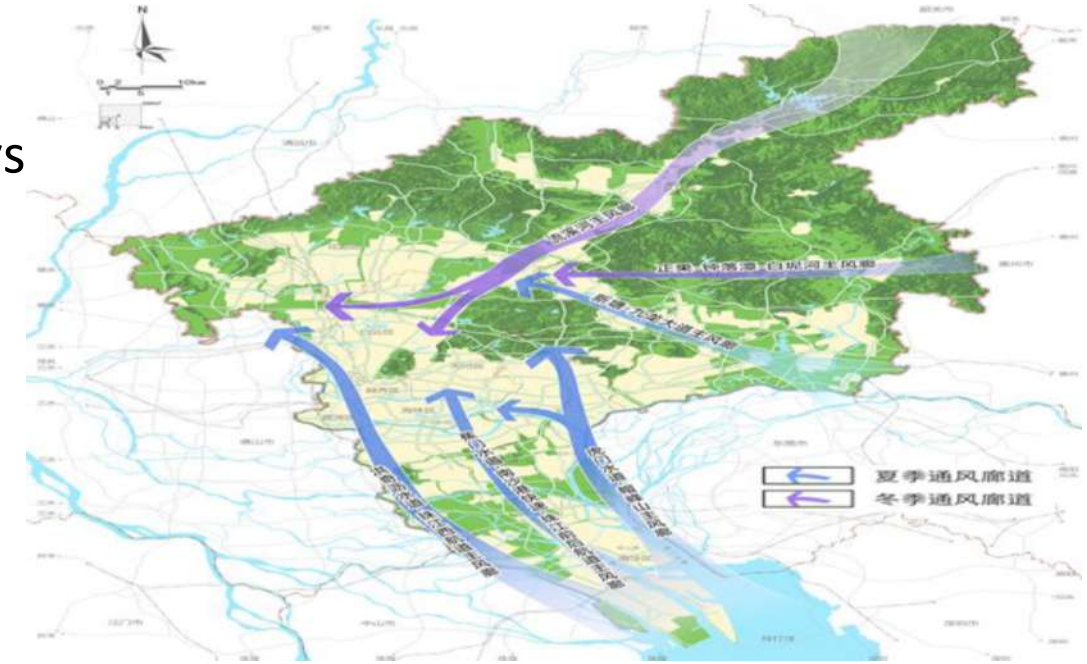
- **UHI concentrates on old down areas** with high population density



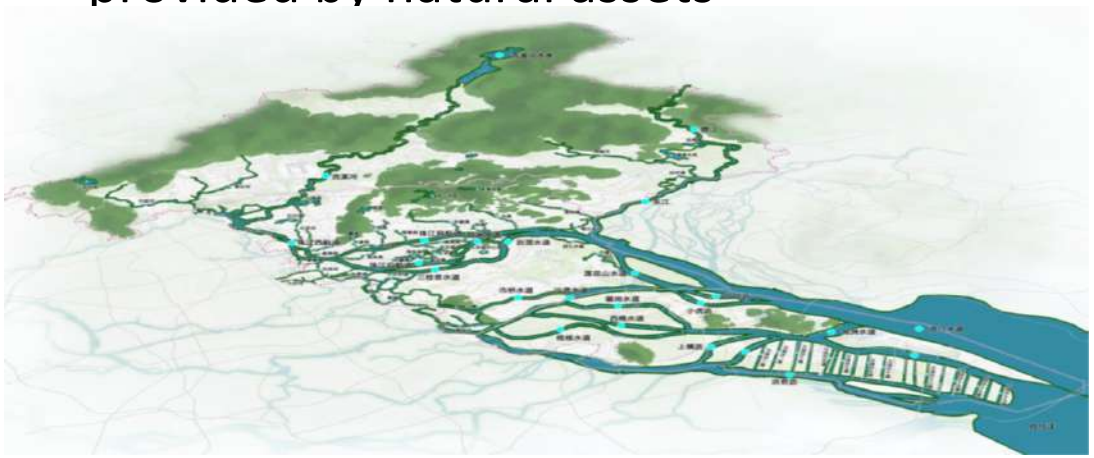
Spatial Planning

- **Wind flows – Managing ventilation corridors**
  - Analyze the urban wind environment
  - Combining urban planning control methods to facilitate the formation of cooler air flow pathways

Guangzhou: six wind corridors across the city



- **Ecological Planning**
  - A network of green/blue urban infrastructure (green/ blue corridors) to maximize cooling effects
  - Using modeling tool to assess ecosystem services provided by natural assets



Using a modeling tool to assess cooling and ecosystem services provided by natural assets:

- Urban cooling effect
- Health benefits
- Carbon sequestration
- Recreation

Guangzhou Haizhu urban wetland: ***located in the urban core area of 200,000 people***

The modeling was conducted by Natural Capital Project

Incorporating UHI Solutions to New Town Development

Guangzhou – Singapore knowledge city

Current status

Future

Integrating cooling options into new town development

Jiulong Lake area at Guangzhou Singapore Knowledge City

The lake area is 12.8 km^2 and has a population of approximately 34,000. It will be developed to accommodate 140,000 people

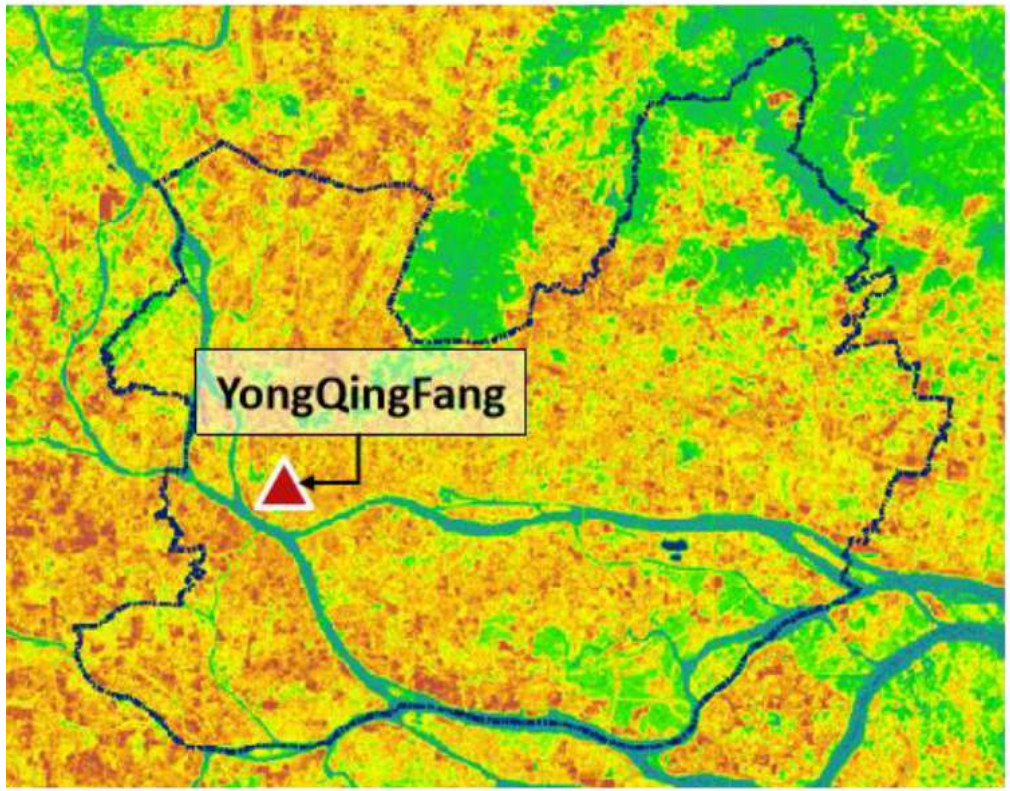
Key measures

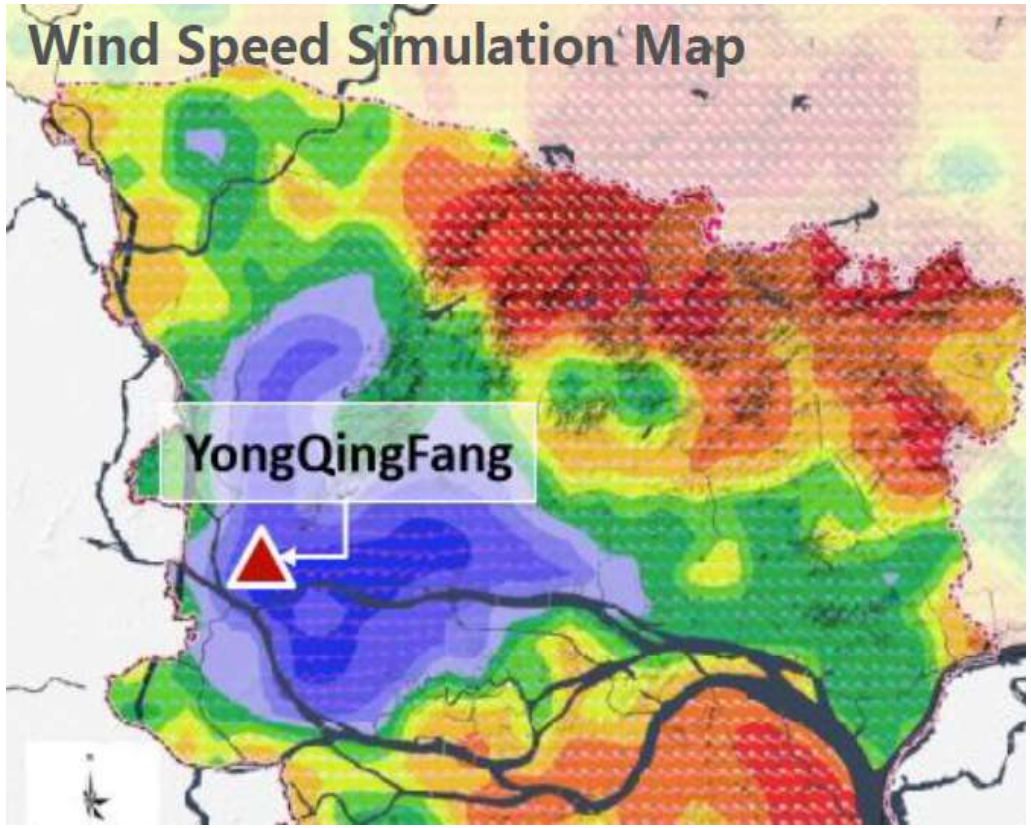
- Maximizing site ventilation
- Minimize solar radiation
- Use water and greenery cooling
- Provide sun and rain protection
- Recommend building topology with cooling consideration

Incorporating UHI Solutions to Old Town Regeneration

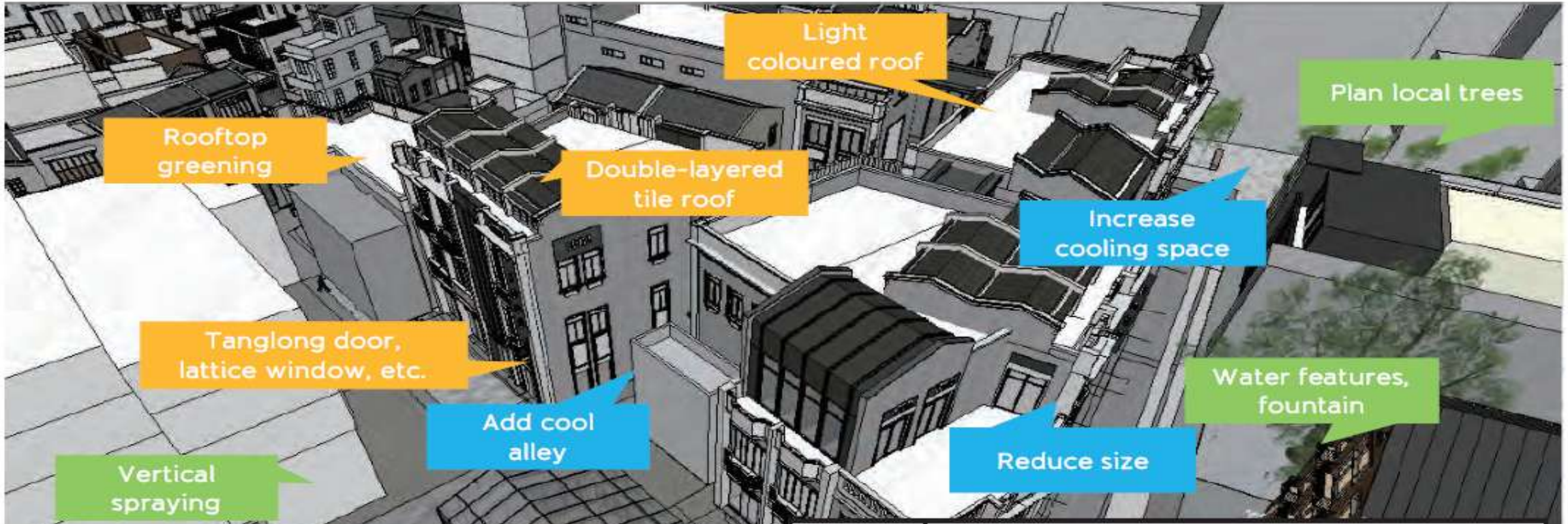
Located at urban core – with 50% of building density

Land Surface Temperature Map





Strategy



Site level	• Increase cool alleys and increase cooling spaces • Dissect the size of buildings and use bamboo-tube houses • Widen the streets
Building level	• Consider using tradition double-layered tiles on rooftops • Use light color coatings and rooftop greening • Cavity wall insulation • Create vertical greening in part of the west-facing areas as part of the landscape design
Landscape	• Plant local trees to increase evapotranspiration cooling and create a comfortable shaded area;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Piloting Nature-based Solutions for Urban Cooling

OVERVIEW

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ESMAP

Piloting Nature-based Urban Cooling Solutions for Urban Regeneration and New Town Development in Guangzhou, China

BUILDING A COOLER GUANGZHOU

Guidelines on Integrating Nature-based Passive Cooling Options into Urban Planning and Design

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ESMA

Assessment of Key Ecosystem Services Provided by the Haizhu National Wetland Park in Guangzhou, China

Prepared by: Chris Nootenboom, Eric Lonsdorf, Roy Remme, Rob Griffin, Baolong Han, Tong Wu, and Anne Guerry

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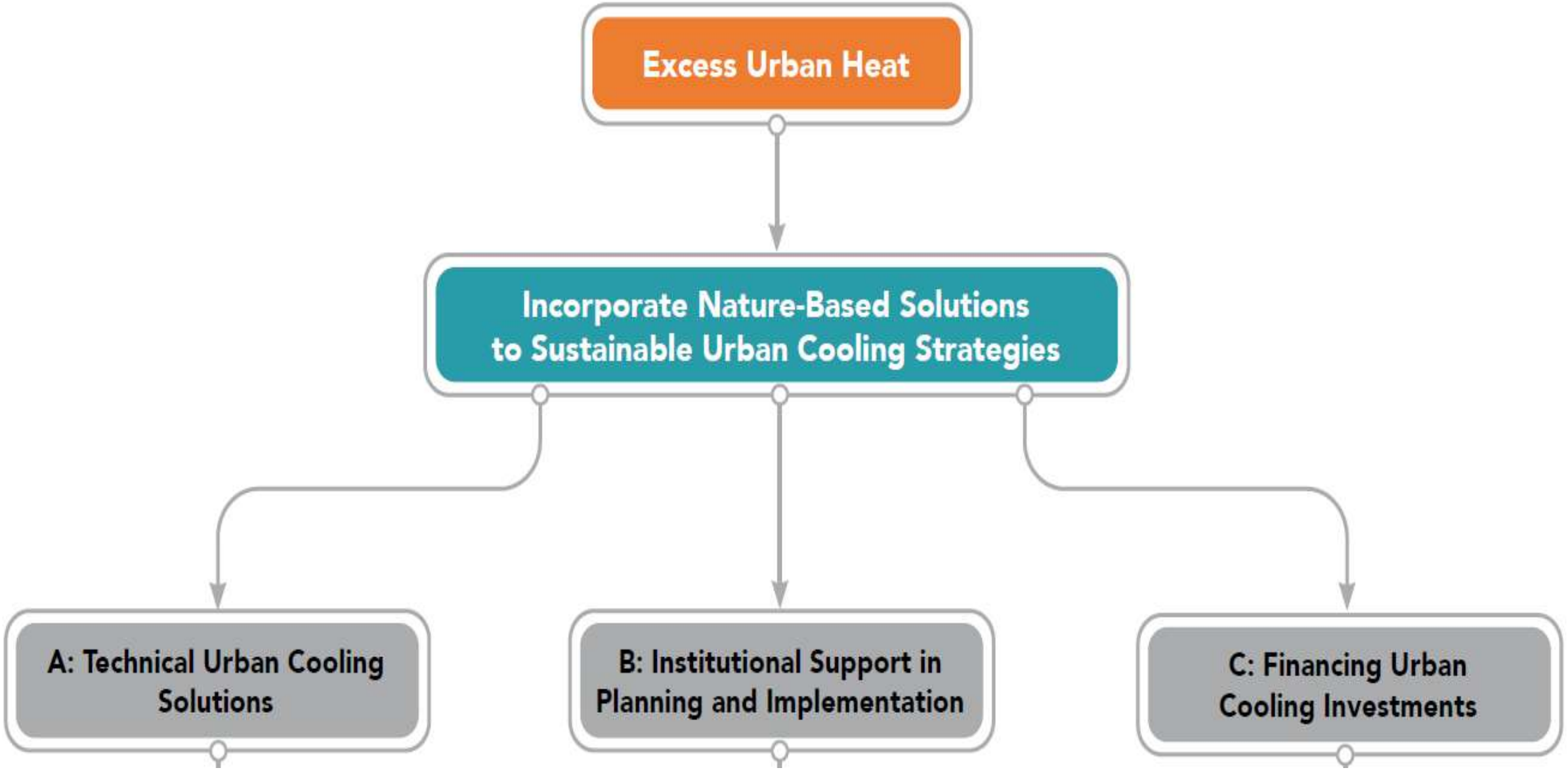
ESMAP

Urban Cooling Implementation Framework



Key Recommendations

- **Cities must take early action to prepare for a much warmer world**
  - Urban heat has huge implications on health infrastructures and natural resources
- **Nature-based passive cooling solutions complement mechanical active cooling solutions** (e.g AC) – building a breathable city
  - Wind flows
  - Integrated and connected green/blue infrastructure
  - Architectural designs: recovering traditional architectural design
  - Solar reflective urban roofs and walls

Passive solutions reduce indoor air temperatures by an average of 3–5°C, reducing energy demand by 20%

Key Recommendations

- **Developing policy and regulatory frameworks (codes & standards) are critical for the implementation**
  - Urban cooling is a cross-cutting issue, requiring strong institutional coordination
  - Technical measures and guidelines need to be translated into “code” and “standards” to ensure implementation
- **Incentivizing the private sector and identifying innovative practical solutions**

Building a Cool and Breathable City