At the Intersection: Smart Inclusive Cities in Southeast Asia

26 October 2022
9:00–11:30 a.m. (GMT+7)
via Zoom

Presentation outline

1. Introduction to the Nature-based climate adaptation programme for the urban areas of Penang Island

2. Inclusive strategies developed by the programme

3. Digital tools used in the development of the programme

4. Digital tools created by the programme

1. THE NATURE-BASED CLIMATE ADAPTATION PROGRAM FOR THE URBAN AREAS OF PENANG ISLAND

Designed by Think City in 2019, the program will be executed together with the City Council (MBPP) and the Department of Irrigation & Drainage.

Urban greening

Stormwater management

Social resilience

Institutional capacity

Centred around the goals of reducing human and ecosystem health vulnerability to climate change impacts and enhancing urban resilience, the programme will address the issues of heat stress and flooding whilst strengthening social resilience and institutional capacity.

GOALS: To use nature-based solutions to reduce climate impacts in Penang, reducing threats to human life, infrastructure and property.
APPROACH: Science-driven in design and results and seeking impact assessment

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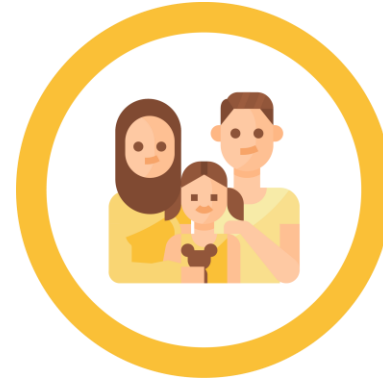
The challenges

HEAT STRESS

Penang is expected to experience a minimum temperature rise of 1.5ºC (up to 6ºC in heat waves) by 2030, compared to 2018

FLOODING

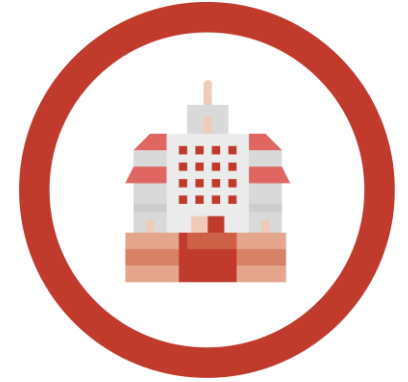15% increase in the volume of rainfall since 1980

In Nov '17, the heaviest rainfall registered in Penang's history led to flooding of urban areas, causing the loss of 7 lives and more than RM 1 billion in damages

SOCIAL

Vulnerable communities, women and girls are disproportionally impacted by climate change

Unengaged youth

INSTITUTIONAL

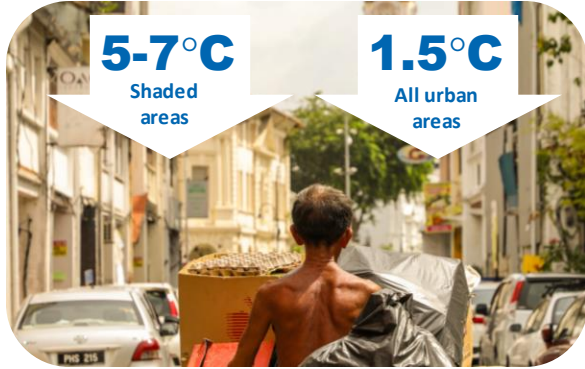Hospitals do not identify heat stress/stroke.

No municipality adaptation framework has been developed yet.

There is no centralised, holistic approach to climate change

Our proposal

COMPONENT 1

5-7°C
Shaded areas

1.5°C
All urban areas

To reduce temperatures and the UHI effect by strategic planting of trees and introducing different types of green spaces

COMPONENT 2

To reduce the number of flooding events by using **nature-based solutions:** upstream retention, blue-green corridors, swales and infiltration wells

COMPONENT 3

Strengthen social resilience among vulnerable communities, youth and women and girls. Reduced vulnerability asymmetries.

COMPONENT 4

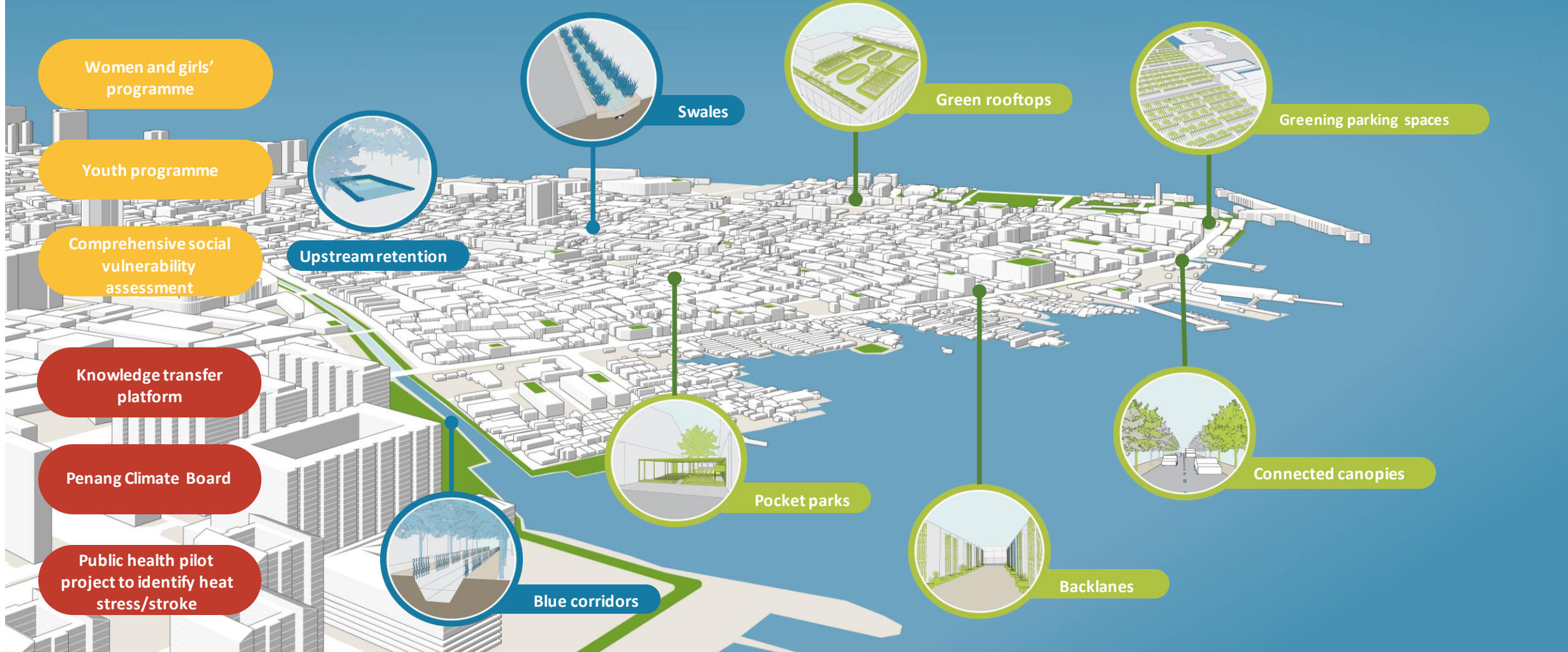Institutional capacity in public health sector reinforced

Creation of the Penang Climate Board

Knowledge transfer platform created to mainstream the knowledge to all cities in Malaysia and in the Southeast Asian region

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Visualisation of the programme for George Town

SOLUTIONS

HEAT STRESS   FLOODING   SOCIAL   INSTITUTIONAL

Women and girls' programme

Youth programme

Comprehensive social vulnerability assessment

Knowledge transfer platform

Penang Climate Board

Public health pilot project to identify heat stress/stroke

Swales

Upstream retention

Green rooftops

Greening parking spaces

Connected canopies

Pocket parks

Backlanes

Blue corridors

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Proposed nature-based solutions

URBAN GREENING
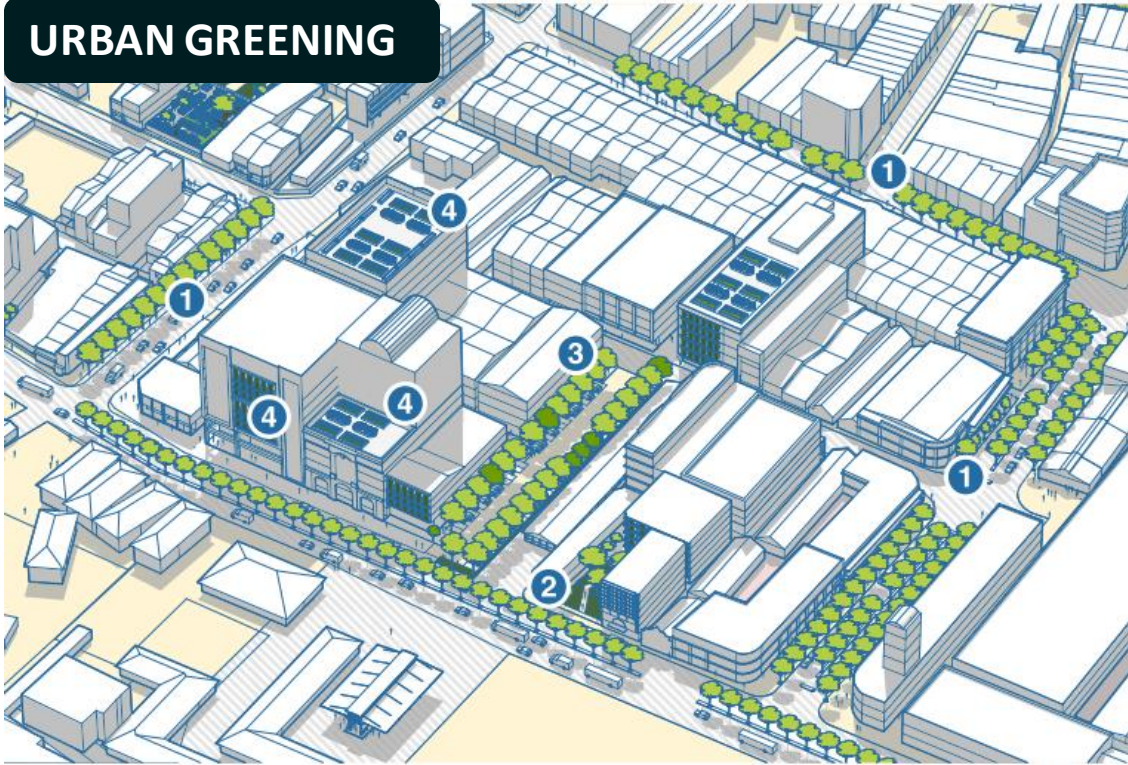
1. **Tree-lined streets**
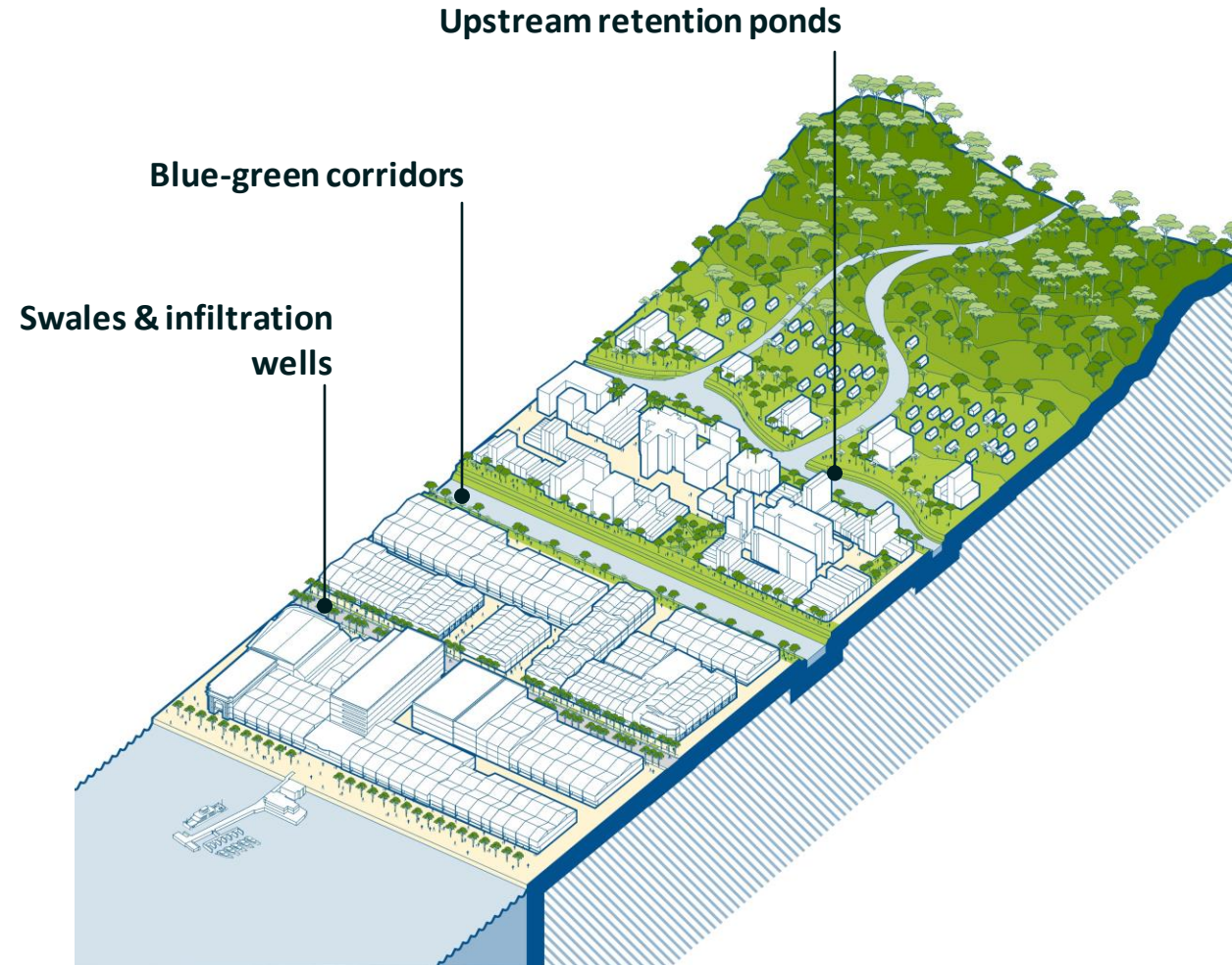2. **Pocket parks**
3. **Greening carparks**
4. **Built structures**
   - **Rooftop gardens**
   - **Green facades**
5. **Urban agriculture**

STORMWATER MANAGEMENT

Upstream retention ponds

Blue-green corridors

Swales & infiltration wells

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Current status of the programme

JANUARY 2020

Winner of the Climathon Global Cities Award 2020

eit Climate-KIC

- Salvador, Brazil
- Dublin, Ireland
- **Penang, Malaysia**
- Karthoum, Sudan
- Miami, USA

OCTOBER 2021

Endorsed to receive US$10 million from the Adaptation fund for execution

ADAPTATION FUND

SEPTEMBER 2022

Initiation of execution: Inception workshop took place on September 6th

UN@HABITAT
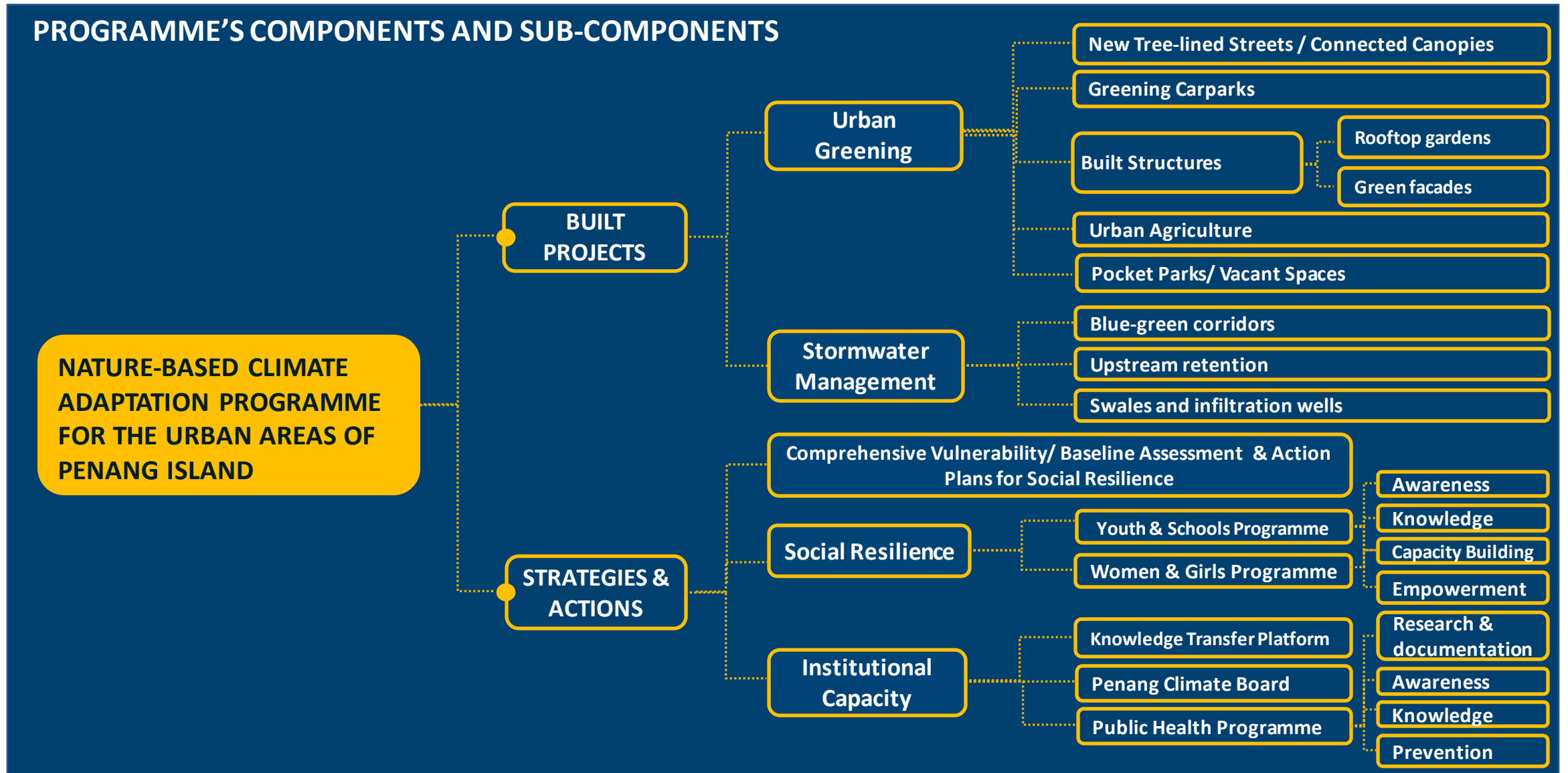
Inception workshop included 25+ stakeholders attending

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PROGRAMME'S COMPONENTS AND SUB-COMPONENTS

NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND

BUILT PROJECTS

Urban Greening
- New Tree-lined Streets / Connected Canopies
- Greening Carparks
- Built Structures
  - Rooftop gardens
  - Green facades
- Urban Agriculture
- Pocket Parks/ Vacant Spaces

Stormwater Management
- Blue-green corridors
- Upstream retention
- Swales and infiltration wells

STRATEGIES & ACTIONS

- Comprehensive Vulnerability/ Baseline Assessment & Action Plans for Social Resilience

Social Resilience
- Youth & Schools Programme
- Women & Girls Programme
  - Awareness
  - Knowledge
  - Capacity Building
  - Empowerment

Institutional Capacity
- Knowledge Transfer Platform
- Penang Climate Board
- Public Health Programme
  - Research & documentation
  - Awareness
  - Knowledge
  - Prevention

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COMMUNITY OUTREACH, JUNE - AUGUST 2020

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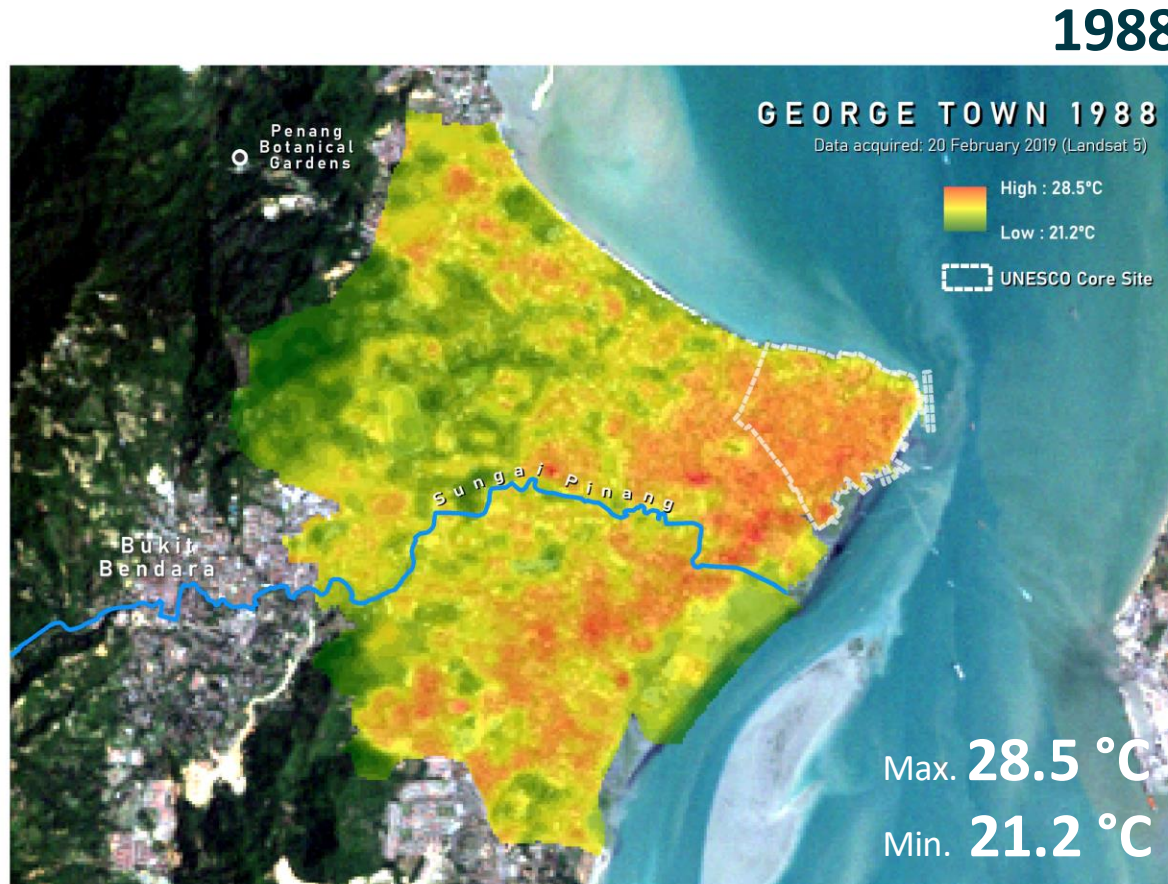Smart Inclusive Cities in Southeast Asia

# 3. DIGITAL TOOLS USED IN THE DEVELOPMENT OF THE PROGRAMME

GEORGE TOWN

Increase of temperature in the last 32 years
(verified by remote sensing data on surface temperatures - Landsat 8)

↑↑ **Max. 8.7°C**
↑↑ **Min. 2.4°C**

1988

2019

GEORGE TOWN 1988
Data acquired: 20 February 2019 (Landsat 5)
High : 28.5°C
Low : 21.2°C
UNESCO Core Site

Penang Botanical Gardens

Sungai Pinang

Bukit Bendara

Max. **28.5 °C**
Min. **21.2 °C**

GEORGE TOWN 2019
Data acquired: 5 March 2019 (Landsat 7)
High : 37.2°C
Low : 23.6°C
UNESCO Core Site

Penang Botanical Gardens

Sungai Pinang

Bukit Bendara

Max. **37.2 °C**
Min. **23.6 °C**

George Town - Land Surface Temperature, 1988

George Town - Land Surface Temperature, 2019

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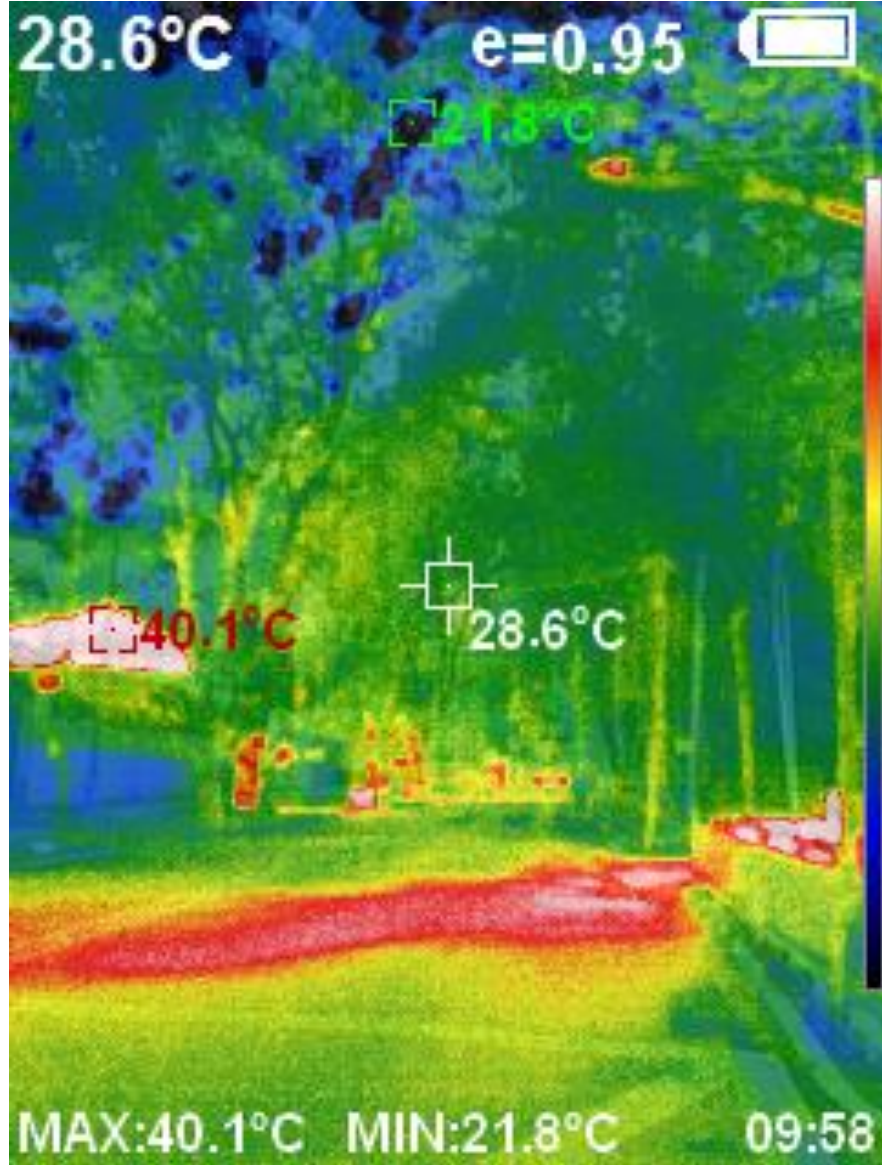**Smart Inclusive Cities in Southeast Asia**
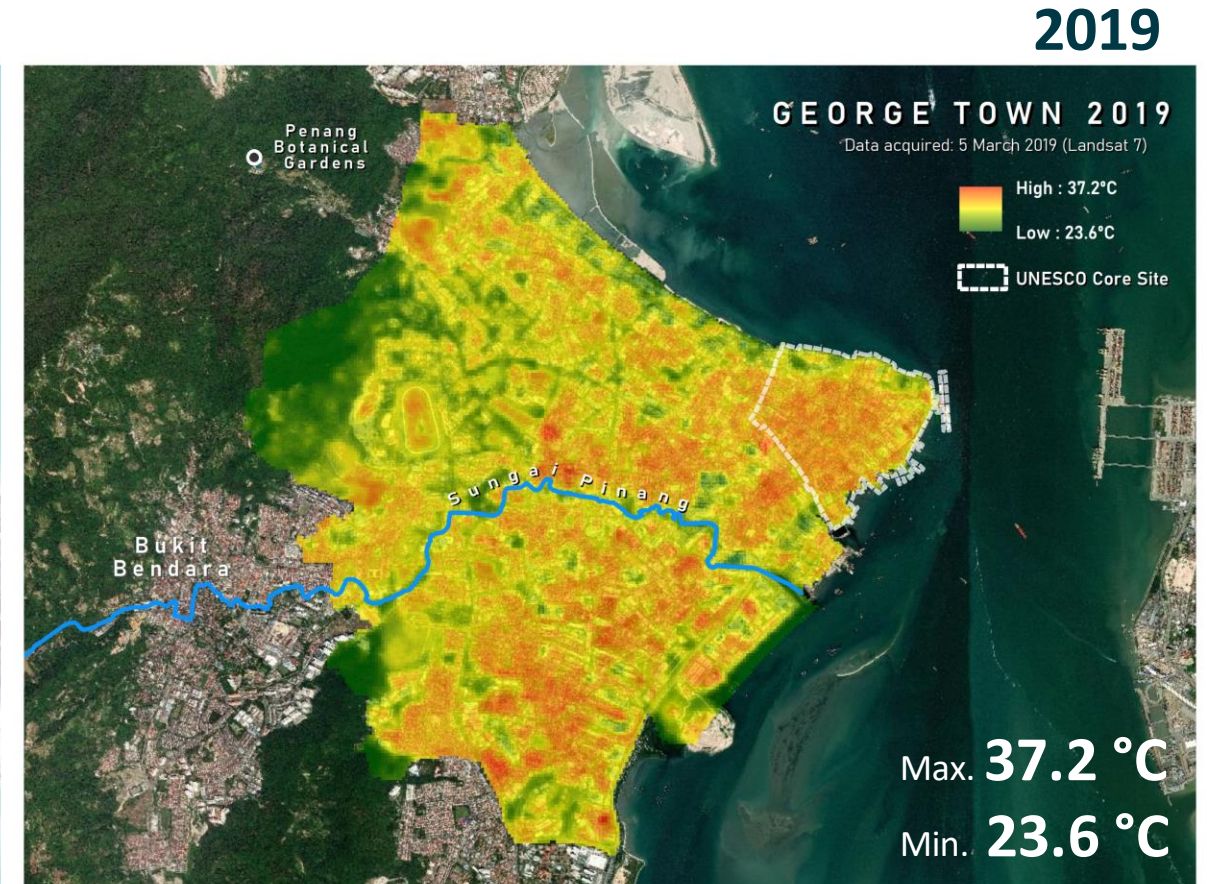
Penang Botanical Gardens

Tree-lined streets significantly reduce temperatures and the UHI effect: the North and West parts of the city are significantly cooler than the UNESCO Core site

Sungai Pinang

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28.6°C e=0.95
21.8°C
40.1°C
28.6°C
MAX:40.1°C   MIN:21.8°C   09:58

Thermal images reveal surface temperatures: the shade of trees substantially reduces temperatures, improving microclimate comfort
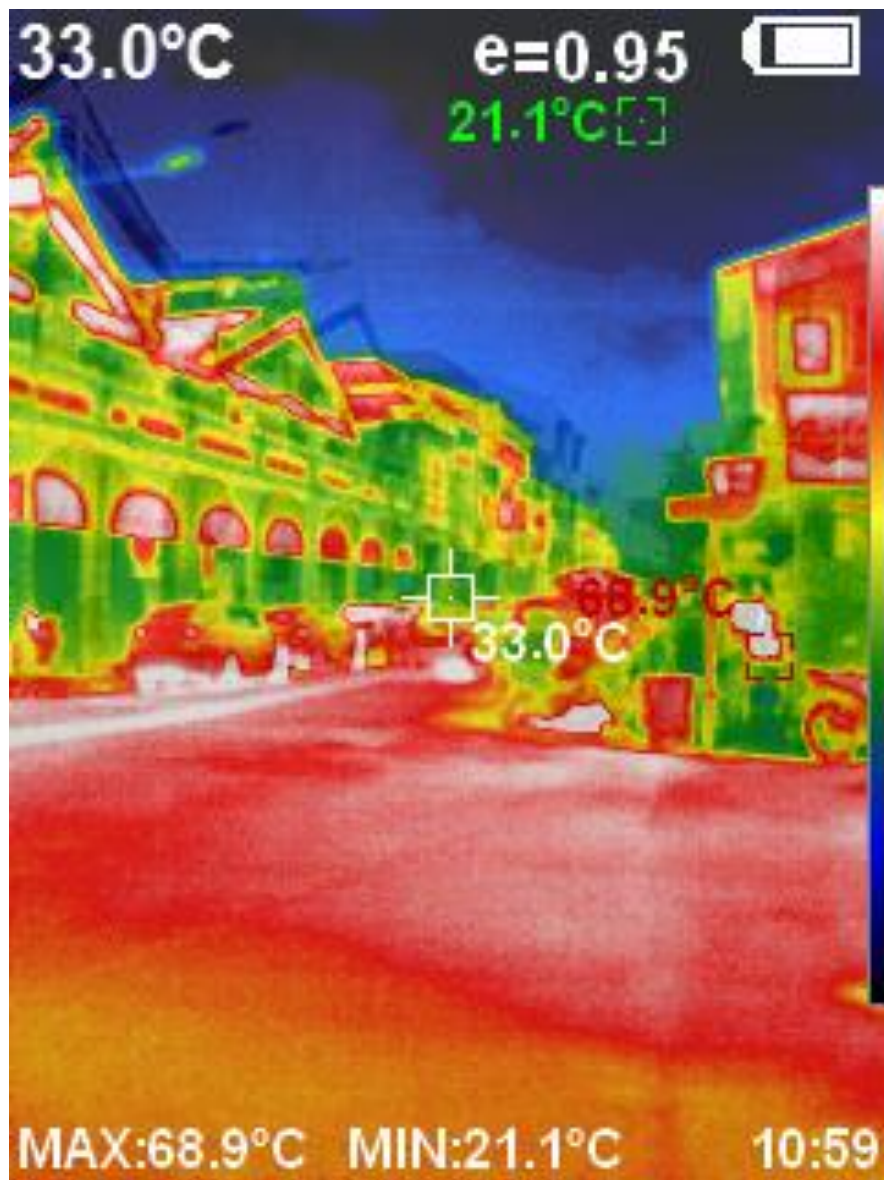
JALAN BROWN

12th July 2019   **9.58 am**

Source: Produced by Think City with Perfect Prime IR0006 Thermal Imager Camera.

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33.0°C   e=0.95
21.1°C
68.9°C
33.0°C
MAX:68.9°C   MIN:21.1°C   10:59

The urban heat island (UHI) effect: the more densely built areas show an increase of almost **30°C** in surface temperatures

LEBUH GEREJA

12th July 2019   10.59 am

Source: Produced by Think City with Perfect Prime IR0006 Thermal Imager Camera.

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4. DIGITAL TOOLS CREATED BY THE PROGRAMME

a **Atlas of climate-resilient urban tree species**

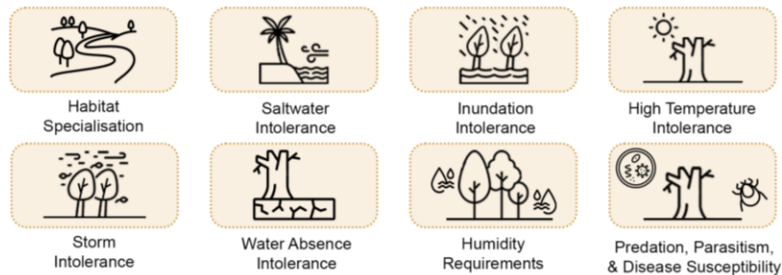**b** **Climate APP**

c **Knowledge Transfer Platform**

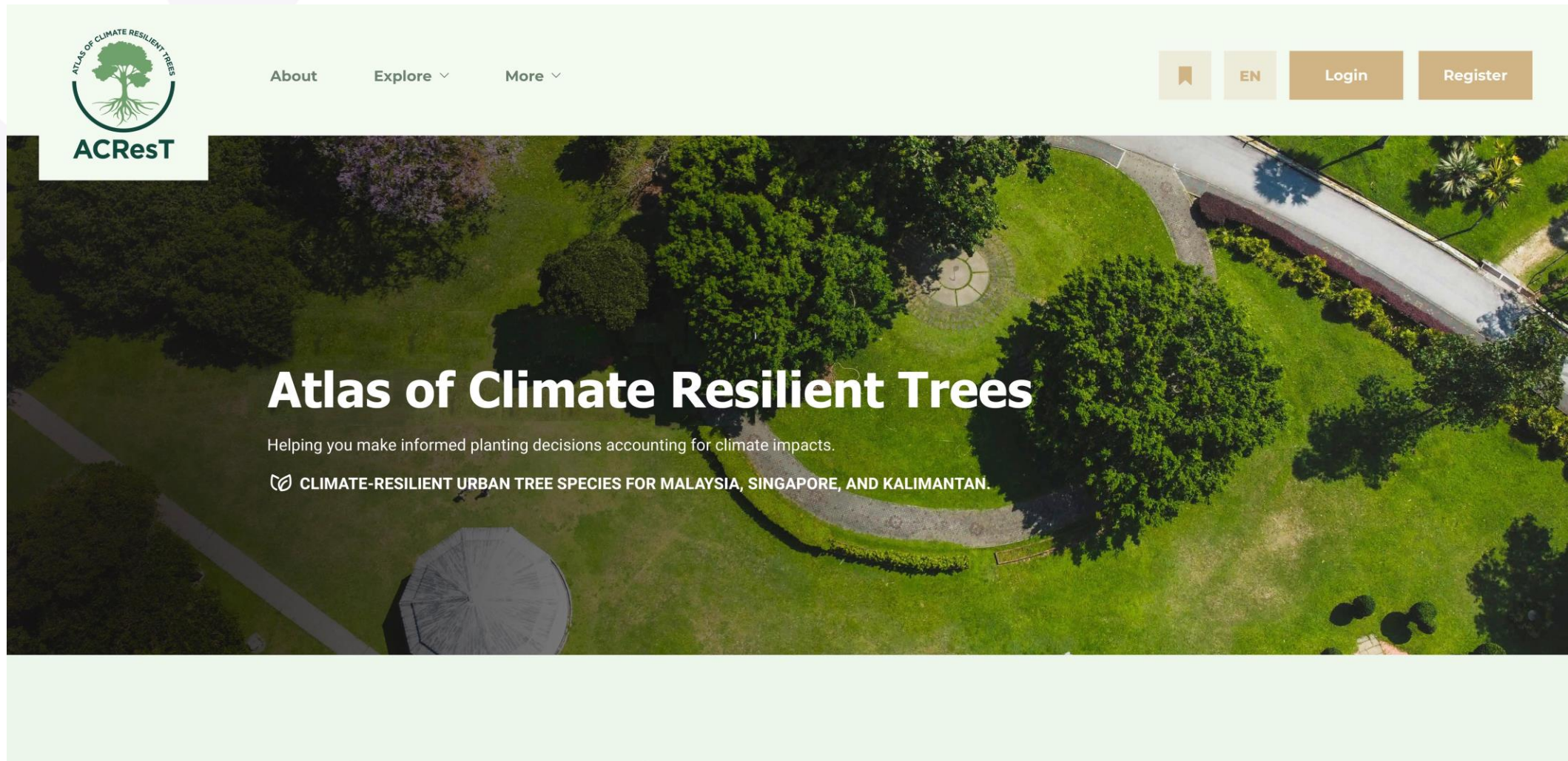**Climate-resilient urban tree species study for Malaysia.**

Graphical abstract

73,300 tree species globally

2,830 tree flora in Peninsular Malaysia

220 tree species assessed

Landscape Typologies Considered

Urban Streets • Small Urban Green Spaces • Blue-Green Corridors • Coastal Fronts

Climate Resilience / Vulnerability Criteria

Habitat Specialisation · Saltwater Intolerance · Inundation Intolerance · High Temperature Intolerance

Storm Intolerance · Water Absence Intolerance · Humidity Requirements · Predation, Parasitism, & Disease Susceptibility

Atlas of Climate-Resilient Urban Tree Species – Home Page Design

Atlas of Climate-Resilient Urban Tree Species – Home Page Design

What is the **ACResT?**

The Atlas of Climate Resilient Trees seeks to become the most comprehensive information source on the climate resilience, urban suitability, and the biodiversity, cultural and economic value of tree species in Malaysia, Singapore, and Kalimantan. It is designed to function as a powerful tool for informing planting decisions, sourcing tree species, and catalysing action for policy change and the ex-situ conservation of tree species.

Learn More

Atlas of Climate-Resilient Urban Tree Species

Conclusion(s)

1. Vulnerable communities must be the focus of adaptation projects

- Not only because they will be the most impacted but also because they are more aware of impacts already taking place.

2. Digital tools can be crucial but merely in a supporting role

- The climate and biodiversity crises require urgent action, with the most important task ahead being restoring and protecting life-supporting systems. Digital tools can be essential in supporting this goal, particularly in knowledge dissemination.

Thank you!

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