Penang

Strategic tree placement and a people-friendly streetscape

THE CHALLENGE

Penang is in the Malacca Strait in Northwestern Malaysia, just five degrees north of the equator. The island is particularly vulnerable to climate impacts due to its location and stage of development.

Southeast Asia is one of the three regions in the world which will be hit hardest by climate change[1]. **The main impacts in Malaysia will be an increase in temperatures, extreme weather events and sea level rise.** The country is now facing uniformly high temperatures and humidity throughout the year.

The impact of temperature rise in Malaysia will be felt most in cities like Penang because of the urban heat island effect. This will have a knock-on effect for public health but **in Malaysia impacts cannot yet be quantified because hospitals do not identify heat stress or heat stroke.** These health impacts are instead registered as being of a respiratory or cardiac nature.

Changes in weather patterns are already taking place. There has been an increase of 15% in the total volume of rainfall in the past 40 years. **In November 2017, the heaviest rainfall registered in Penang's history led to flooding of urban areas, causing the loss of 7 lives and more than 1 billion RM in damages.** Increased rainfall combined with higher temperatures is also expected to increase cases of vector borne diseases such as dengue.

KEY FACTS & FIGURES

- Penang Population: 1,766,800.[2]
- In 2050, Malaysia will experience 200 days with heatwaves per year, compared with 20 days in the 1980s.[3]
- The estimates for climate change impact on the Malaysian economy are of 12% reduction of GDP/year in the long term (in a scenario of a 3°C increase by 2100)[4].
- The mean annual temperature of Malaysia is projected to rise by almost 4°C on average from 1990 to 2100.[5]

[1] IPCC, 2018, Special Report on Global Warming of 1.5 °C
[2] Department of Statistics of Malaysia, Current Population Estimates Malaysia, 2018", July 2018.
[3] WHO, 2015, 'Climate and Health Country Profile for Malaysia'
[4] Kompas, 2018, 'The Effects of Climate Change on GDP by Country and the Global Economic Gains From Complying With the Paris Climate Accord'. Earth's Future.
[5] WHO, 2015, 'Climate and Health Country Profile for Malaysia'

- **Under a high emissions scenario, without large investments in adaptation, an annual average of 234,500 people in Malaysia are projected to be affected by flooding due to sea level rise between 2070 and 2100.[6]**

THE SOLUTION

Street trees, rooftop gardens, pocket parks and blue-green corridors

The Penang project aims to reduce climate change impacts on infrastructure and property, and threats to human life, while strengthening social and institutional resilience. To meet these targets, it will develop solutions in the following key areas:

Heat stress: A range of green elements, **such as street trees, rooftop gardens, pocket parks and blue-green corridors,** will be introduced to help reduce the urban heat island effect. The programme also includes a pilot project in a local hospital to identify and code heat stress and heat stroke.

A study will also be carried out on climate-resilient urban tree species for Malaysia in collaboration with the National Landscape Institute and local experts. The goal is to select a range of street tree species that will be able to withstand the coming climate, and hopefully thrive in it.

Flooding: The programme will implement nature-based solutions that reduce surface temperatures and stormwater runoff. Upstream areas that are more heavily pressured hydrologically will be identified and converted into spaces that store water. Swales and infiltration wells will be introduced to reduce the impacts of increased rainfall.

The Smart Flood Management System project, the winners of the Climathon Penang 2019, will be tested as a pilot project in the programme.

Social Resilience: A women and girls programme will also aim to reduce gender vulnerability. Women and girls will be given specific tools to overcome the challenges of being family caregivers of both children and the elderly in case of extreme weather events. **The programme will also promote women's participation in decision-making processes.**

THE BENEFITS

Impacts of the project include reduced energy consumption due to air conditioning needs, carbon sequestration due to nature-based solutions and an improved microclimate which contributes to an increased uptake of cycling and

[6] WHO, 2015, 'Climate and Health Country Profile for Malaysia'

walking over driving. There is also expected to be a reduced impact on human health (heat stress and vector borne diseases), crop yields, ecosystem health, strengthened social resilience and reduced vulnerability asymmetries within communities.

The project will be assessed through remote sensing of surface temperatures and data collection via local meteorology stations, all made available online via the remote knowledge transfer platform. It will be supplemented by studies on public health.

The goal is that after 6-8 years of completion (planned for 2025), temperatures are reduced by approximately 1.5 C in all urban areas and 5-7°C in shaded areas. Stormwater management will also be improved, substantially reducing flood risks.

The programme's comprehensive approach, in which a diversified set of components (i.e. urban greening, urban agriculture, public health) is implemented in Penang's urban areas acknowledges the complexity and interrelation of the multiple coexisting environmental and social dimensions of climate change. **It is meant to be developed as a pilot project which can be scaled in other cities in Malaysia.**

PROJECT LEADERS

The programme is co-organised by the City Council of Penang island and by Think City, a social-purpose organisation focused on addressing urban challenges funded by the Malaysian sovereign fund.

There will be collaboration between stakeholders at local and national levels (including government agencies, scientific support institutions and civil society). The programme also has a community focused approach, where the local community actively takes ownership of strategies and processes. Priority projects have been identified through focus groups and workshops with local, regional and national stakeholders.

To reduce flooding impacts, the team will partner with the National Hydrological Institute (NAHRIM) and local university (Universiti Sains Malaysia) experts. To reduce the impacts of heat stress, the leaders will partner with the National Landscape Institute and local experts to carry out a study on climate-resilient trees.

CLIMATHON AWARDS

Run by Europe's Largest public-private partnership, EIT Climate KIC in partnership with Crowther Lab, the Climathon Global Awards called for cities around the world to engage in climate action and find new systems level solutions to tackle the worsening climate crisis.

With a vision to transform 100 cities into carbon neutral areas by 2030, the awards challenged cities with tackling major issues including air pollution, efficiency mobility and energy systems, and creating sustainable local

economies. With a strong focus on ‘systemic innovation’, the most successful solutions must encompass both domestic and international governance, policy and the financial and market structures that influence behaviour.

The most visionary innovators have been chosen to attend the Climathon Global Awards Ceremony on 31 January in Paris during the ChangeNOW summit, where all finalists have the chance to win funding and expert support to make their ideas a reality.