ADAPTATION FUND

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Regular
Country/ies:	Malaysia
Title of Project/Programme:	Nature-based climate adaptation programme for the urban areas of Penang island
Type of Implementing Entity:	Multi-lateral implementing entity
Implementing Entity:	United Nations Human Settlements Programme (UN-Habitat)
Executing Entities:	Ministry of Environment and Water (KASA)[1]
	Majlis Bandaraya Pulau Pinang (MBPP), Jabatan Pengairan Dan Saliran (JPS) Think City
Amount of Financing Requested:	$US 10,000,000

Project Summary

The main goal of the programme is to enhance urban resilience and reduce human and ecosystem health vulnerability to climate change impacts and extreme weather events by implementing nature-based solutions (NBS) to reduce surface temperatures and storm water runoff. The programme also seeks to increase social resilience and build institutional capacity.

Supported by an extended collaboration between stakeholders at local, regional and national levels (including government agencies, scientific support institutions and civil society), the programme has a strong community-focused approach, engaging with the most vulnerable groups of society in order to assess their main vulnerabilities in a collaborative effort.

The programme will pioneer the use of NBS solutions in Malaysia. It is designed to be demonstrative / proof of concept with a strong knowledge codification component so that it can be scaled in Malaysia and elsewhere in the region. It is structured around the following components:

Component 1: Adaptation to the urban heat island effect through urban greening (USD 3,175,000)
Component 2: Built projects for storm water and flood management (USD 2,725,000)
Component 3: Comprehensive vulnerability / baseline assessment and action plans in targeted communities (USD 160,000)
Component 4: Strengthening social resilience programme (USD 975,000)
Component 5: Institutional capacity and knowledge transfer platform (USD 1,381,977)

[1] Renaming of **Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC)** to **Ministry of Environment and Water (KASA)** as the National Designated Authority. (changed from Concept proposal)

Project / Programme Background and Context

Introduction

Penang is a state located in north-western Malaysia, five degrees north of the equator. It has an area of 1,049 km^2 and comprises two local authorities – one covering Penang Island (Majlis Bandaraya Pulau Pinang) and the other the mainland (Majlis Bandaraya Seberang Peral). The former is one of the two major project partners. The state is further divided into five administrative districts which are further divided into mukims (sub-districts). Two urban mukims located on the island – George Town and Bayan Lepas – are the focus of a proposed nature-based solutions (NBS) climate adaptation programme (see Figure 1).

Image 1. View over George Town mukim and the UNESCO World Heritage Site.

Source: Image taken by Think City 2018

The goal of the adaptation programme for the urban areas of Penang Island is to use NBS to 1) reduce climate change impacts (increased temperature and stormwater) including threats to human life, infrastructure and property associated with extreme weather events; and 2) strengthen social resilience and institutional capacity. The programme includes a community-focused approach as well as a strong knowledge transfer component to ensure the methodology can be scaled and adopted in the near future by other cities in Malaysia and the region.

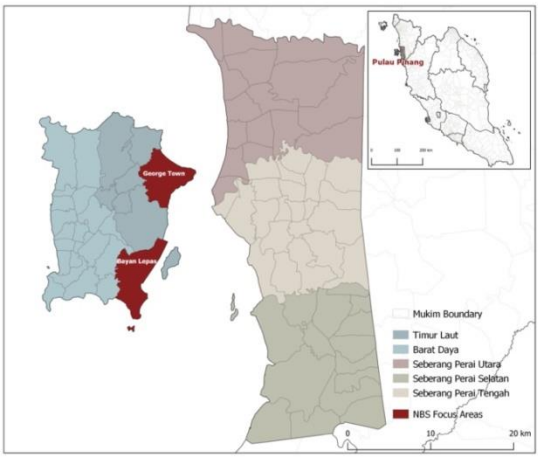


Figure 1: Penang State Administrative Regions and NBS Programme Focus Areas

Socio-economic context

Population

Penang state has an estimated population of 1,767,200, with 809,000 (46%) living on the island and 958,200 (54%) on the mainland, with densities of 26.9 people/ha and 12.8 people/ha respectively[2]. The Timur Laut district is the most densely populated with 45.9 people/ha.

Economy and labour force

Penang's gross domestic product (GDP) in 2018 was RM91.18 million (USD ~21.88 million), contributing 6.7%

[2] Department of Statistics Malaysia (2019) *My Local Stats Pulau Pinang*. Putrajaya.

of national GDP[3]. Annual GDP growth of Penang was 5.1% while GDP per capita was RM52,937 (USD ~12,703). The economy (Table 1) is driven by an advanced manufacturing sector (including semiconductor, electrical & electronic and medical devices) and services (mainly cultural activities and tourism).

Table 1: Penang's GDP by type of economic activity at constant 2015 prices[4]

	RM million				% share to GDP			
Type of economic activity	**2015**	**2016**	**2017**	**2018**	**2015**	**2016**	**2017**	**2018**
Agriculture	2,084	1,988	2,032	1,968	2.7	2.4	2.3	2.2
Mining and quarrying	124	135	144	151	0.2	0.2	0.2	0.2
Manufacturing	33,597	35,411	37,426	39,460	43.0	42.9	43.1	43.3
Construction	2,712	2,984	2,689	2,586	3.5	3.6	3.1	2.8
Services	38,917	41,167	43,430	46,115	49.8	49.9	50.1	50.6
Utility, transport & storage and information & communication	8,617	9,468	10,168	10,967	11.0	11.5	11.7	12.0
Wholesale and retail trade, food & beverage and accommodation	12,356	13,061	13,906	14,976	15.8	15.8	16.0	16.4
Finance and insurance, real estate and business services	7,872	8,121	8,395	8,742	10.1	9.8	9.7	9.6
Other services	4,695	4,894	5,118	5,356	6.0	5.9	5.9	5.9
Government services	5,378	5,622	5,844	6,074	6.9	6.8	6.7	6.7
Import duties	712	808	1,017	894	0.9	1.0	1.2	1.0
GDP at purchasers' prices	78,146	82,493	86,738	91,175	100.0	100.0	100.0	100.0

Source: Department of Statistics Malaysia (2019) My Local Stats Pulau Pinang. Putrajaya

Penang's labour force is 849,400 people, with a participation rate of 67.7% (79.5% for men and 55.9% for women) and an unemployment rate of 2.2%[5]. The majority of jobs (95.7%) are located in urban areas. Reflecting GDP contributions, services accounts for 57.0% of jobs, followed by manufacturing 34.5%, construction 6.8%, agriculture, forestry and fishing 1.6%, and mining and quarrying 0.1%.

Income, poverty and vulnerability

The 2016 median monthly household income in Penang was RM5,409 (~USD1,296), 3.5% higher than the national median of RM5,228. There is an urban-rural divide with the median rural household income at 79.6% of urban households (i.e. RM4,365 versus RM5,477). Households on the island earn more than those in the mainland. Penang's Gini co-efficient was 0.356 versus 0.399 nationally.

Penang's households spent the largest proportion of total monthly expenditure on housing, water, electricity, gas and other fuels (RM1,232), amounting to nearly 30% of total expenses. This is followed by food and non-alcoholic beverages (15.9%; RM667.78).

Although Penang has nominal extreme poverty (0.1%), an estimated 10-20% of households are below the World Bank's upper middle-income International Poverty Line set at US$5.50 per day[6]. These households will bear the brunt of climate change impacts as they experience more severe exposure (e.g. working as labourers outdoors) and at the same time have the least capacity to protect themselves from overheating, food shortage and natural hazards such as flooding and drought.

There are several vulnerable communities in Penang island: a) communities living in areas that are flood prone and coincide with the highest concentration of elderly in Penang; b) Low income groups with no

[3] Department of Statistics Malaysia (2019) *My Local Stats Pulau Pinang*. Putrajaya.
[4] Department of Statistics Malaysia (2019) *My Local Stats Pulau Pinang*. Putrajaya.
[5] Department of Statistics Malaysia (2019) *My Local Stats Pulau Pinang*. Putrajaya.
[6] Estimated from Department of Statistics Malaysia (2017) *Household Income and Basic Amenities Survey Report by State and Administrative District, Pulau Pinang 2016.* Putrajaya using the World Bank's upper middle-income International Poverty Line.

access to air conditioning; c) Women and girls (women are the primary caregivers, which is demonstrated by their low labour force participation rate (59%).

Landuse and environment

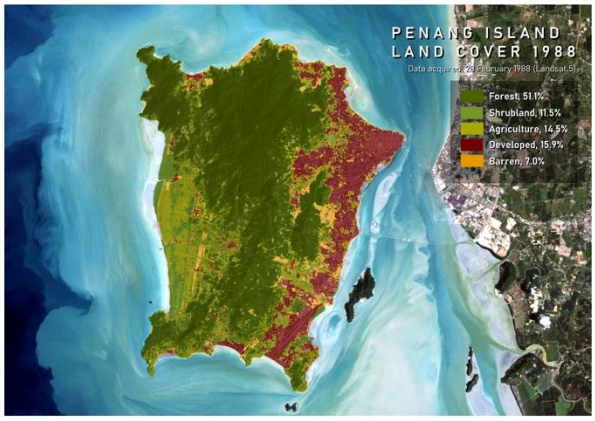
Broadly, Penang island has an urban east coast, rural west coast and central green spine. Based on official data from the Department of Town and Country Planning, agriculture has the highest state landuse followed by forest and residential. There are marked differences between island and mainland, with the island being significantly more urbanised, but also having a higher proportion of forest (see Table 2).

Table 2: Penang's Landuse

	Island		Mainland		Total	
Land Use	Hectares	Percentage	Hectares	Percentage	Hectares	Percentage
Water Body	976.7	3.2	4,990.8	6.6	5,970.7	5.6
Forest	13,394.2	43.9	3,625.1	4.8	17,063.2	16.0
Industry	637.0	2.1	3,452.1	4.6	4,091.2	3.8
Infrastructure and Utility	130.0	0.4	771.6	1	902	0.8
Institution and Public Facilities	1,481.4	4.9	3,167.4	4.2	4,653.7	4.4
Commercial	585.1	1.9	1,323.5	1.7	1,910.5	1.8
Beach	18.0	0.1	-	0	18.0	<0.1
Mixed Development	1.7	<0.1	0.2	<0.1	1.9	<0.1
Transport	2,742.8	9.0	6,103.7	8.0	8,855.5	8.3
Agriculture	4,039.7	13.2	32,910.2	43.3	36,963.1	34.7
Residential	4,176.2	13.7	10,979.3	14.5	15,169.2	14.2
Vacant Lot	1,920.9	6.3	7,574.9	10	9,502.1	8.9
Open Space and Recreational Area	417.0	1.4	1,030.5	1.4	1,448.9	1.4
Total Area (Hectare)	3,0520.7	100	75,929.4	100	10,6550.1	100

Source: Department of Town and Country Planning

Images 2a and 2b. Remote sensing (Landsat 8) on land cover for Penang Island shows that in 2019 forest remains the highest (49.1%) though it has declined from 1988 (51.1%). Developed areas have increased from 15.9% in 1988 to 25.8% in 2019. The percentage of agriculture land remains steady at 14.5%, while shrubland and barren land have declined (11.5% to 8.7%; and 7.0% to 2.0% respectively). The significant increase of infrastructure development in Penang island since 1988 has substantially increased paved areas, reducing storm water natural onsite infiltration and contributing to runoff leading to flooding.



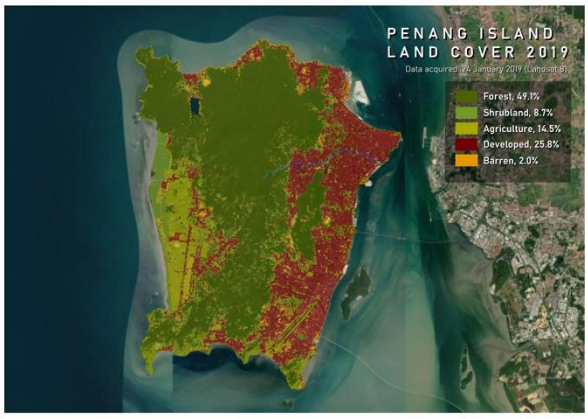
Source: Developed by Think City.

Penang state has 1,447 hectares of gazetted open spaces and recreational areas. Based on population figures for 2017, this equates to 8.3m^2 per capita, well short of the national standard 20m^2 per capita.[7] Based on this standard, the existing spaces are only enough for a population of 723,770 – less than half of Penang's current population. This is equivalent to a deficit of 1,204 ha of green and open space on the island, and 842 ha on the mainland.

Climate change impacts in Penang

Southeast Asia is one of the three regions in the world which will be hardest hit by climate change.[8] The main impacts in Malaysia will be increasing temperatures, increasingly frequent and severe extreme weather events as well as sea level rise.[9] Therefore, the project design and adaptation plans will take into consideration temperature changes and meanwhile the storm water management will consider the climate change and sea level rise in the implementation of the project.

Increasing temperatures will severely impact Malaysia, a country with a tropical rainforest climate and uniformly high temperatures and humidity throughout the year. According to the World Health Organisation, in 2050 the country will experience 200 days per year with heatwaves (in a scenario of a 3°C increase by 2100),[10] compared with 20 days in the 1980s.[11] The impact of temperature rise in Malaysia will be most felt in cities, due to the urban heat island (UHI) effect, which can increase urban temperatures up to 8°C compared to the surrounding natural or rural areas. While the impacts on public health will be high, hospitals in the country currently do not systematically identify (and code accordingly) heat stress or heat stroke, instead registering these health impacts as being of respiratory or cardiac natures.



Changes in weather patterns are already manifesting. The estimates for climate change impact on the Malaysian economy are a 12% reduction of GDP/year in the long term (in a scenario of a 3°C increase by

[7] Think City (2018) Pulau Pinang Green and Open Space Network Study
[8] IPCC (2018) 'Special Report on Global Warming of 1.5°C'
[9] NAHRIM (2017) Impact of Climate Change: Sea Level Rise Projections For Malaysia.
[10] An approximate increase of 3°C by 2100 is the current estimation if all unconditional NDCs are implemented, according to the United in Science (2019) *High-level synthesis report of the latest climate science information convened by the Science Advisory Group of the UN Climate Action Summit 2019*.
[11] WHO (2015) 'Climate and Health Country profile for Malaysia'

2100).[12] The same study estimates for Australia a reduction of 1% GDP/year in the long term, 0.6% for the USA and 0.2% for Canada. Consequently, the divide between Malaysia and developed countries' economies will increase. Another study suggests that changes in temperature and rainfall patterns are estimated to lead to a crop yield reduction of between 10 and 15%.[13] This will likely lead to an increase in food costs, which tend to impact disproportionately more vulnerable communities. This programme introduces concrete adaptation strategies and projects in order to reduce these impacts, as well as to increase social resilience and build institutional capacity.

The programme will also set the foundation for future complementary climate adaptation strategies in a wider context. For example, to build upon the body of work of this proposal, an in-depth study of the impacts of sea-level rise in Penang state as well as the opportunities of ecosystem-based adaptation can be pursued to complement this programme. A parallel and/or subsequent funding application to the Global EbA Fund for impact assessments and vulnerability studies to guide appropriate adaptation measures is being developed.

Temperatures

Table 3 shows the magnitude of changes of annual and monthly mean temperatures at Bayan Lepas climate station during the 1951-2018 period. A significant increasing trend was found in both the annual and monthly mean temperatures from 1951 to 2018 at 95% confidence level, with magnitudes ranging from 0.18 to 0.27 °C/decade. The mean temperature (°C) increase from 1951 to 2018 is 1.50°C.

Table 3: Changes in mean temperature from 1951 to 2018 at Bayan Lepas station (trend at a 95% significance level)

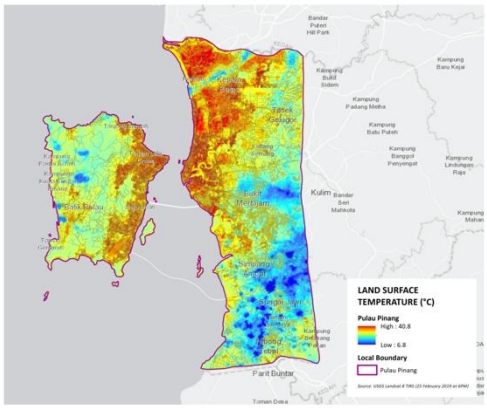
	Mean Temp Change (°C)
Jan	**1.53**
Feb	**1.50**
Mar	**1.66**
Apr	**1.24**
May	**1.45**
Jun	**1.71**
Jul	**1.86**
Aug	**1.52**
Sep	**1.38**
Oct	**1.34**
Nov	**1.50**
Dec	**1.34**
Annual	**1.50**

Source: Produced by the USM's Climatology department, 2019

Image 3. Remote sensing (Landsat 8) for surface temperatures in Penang island. Urban areas are significantly higher than neighbouring natural or rural areas by approximately 8°C due to the urban heat island effect.

[12] Kompas, T., Pham, V. H., & Che, T. N.(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,6, 1153–1173. https://doi.org/10.1029/2018EF000922

[13] Firdaus, R.B., Latiff, I.A., Borkotoky, P. (2012) 'The impact of climate change towards Malaysian paddy farmers', *Journal of Development and Agricultural Economics,* 5(2), pp. 57-66 doi: 10.5897/JDAE12.105



Source: Image retrieved by Think City, 2019

Rainfall and flooding

Rainfall has been increasing and is predicted to increase further for all peninsular Malaysia. [14]

Table 4. Observed and projected rainfall in Malaysia

Parameter	Observed (1970 - 2000)	Projected for 2030	Projected for 2050
Average Annual Rainfall			
Peninsular Malaysia	1891 – 2619 mm	1998 – 2663 mm (1 to 6 % increase)	2068 – 2805 mm (7 to 11 % increase)

Source: Malaysia Third National Communication and Second Biennial Update Report to the UNFCCC (2018)

With an average annual rainfall for the past decade of 2,434mm, flooding is a major issue in Penang. In the past decade the average annual rainfall from 2010 to 2018 has seen an unusual high increase of 29.6% (Table 5) above NAHRIM's projections.

A combination of increased urbanisation, heavy rain and high tide inevitably results in floods as storm waters are unable to discharge into the sea or infiltrate into the ground table. These two factors, expanding built areas resulting in reduced stormwater absorption capacity and increased volume of rain combined with yet a third factor, decaying infrastructure, inevitably lead Penang island to become increasingly exposed and sensitive to flooding.

Table 5. Average annual rainfall for Penang island (2010-2018) showing an increasing trend.

Year	Average Annual Rainfall (mm)
2010	2088.65
2011	2260.38
2012	2359.86
2013	2519.10
2014	2389.98
2015	2453.13
2016	2493.41
2017	2642.25
2018	2706.76

Source: Data provided by JPS.

Increased rainfall and changes in patterns are already causing significant damage in Penang. In 2016, 47 cases of floods, many of them flash floods, were reported, with the most urbanised districts - Seberang Perai Tengah (mainland) and Timur Laut (island) - reporting the highest occurrence (19 and 12 cases respectively).[15] This is evidence that the capacity of drainage infrastructure in urban areas is unable to cope with

[14] Ministry of Energy, Environment, Science, Technology and Climate Change (2018) *Malaysia Third National Communication and Second Biennial Update Report to the UNFCCCs*

[15] Jabatan Pengairan dan Saliran Malaysia (2018) *Laporan Banjir Tahunan Bagi Tahun 2016/2017* [online]. Available at: http://h2o.water.gov.my/man_hp1/Banjir_Tahun1617.pdf (Accessed: 7 November 2019)

increasing rain intensity and putting human life, property and the economy at risk.

In November 2017 Penang was hit by its worst recorded floods, with 7 lives lost and half of urban areas submerged. A total of 159 areas reported being affected by floods, 68 of had never previously flooded.[16] Losses to manufacturing were estimated at RM200 million and RM300 million (~USD 48 to 72 million).[17] It also impacted 2,626 farmers and 3,464 hectares of agricultural land, with a total economic loss estimated of approximately RM5.7 million (~USD 1.37 million) . In the fisheries sector, the estimated losses were of approximately RM57.5 million (~USD 13.8 million).[18]

Public health

The consequences of rising temperatures and more extreme weather associated with climate change now have immediate health consequences.[19] [20] [21] In Malaysia, this includes heat-stress related illness, injury from floods and storms, impacts on mental health due to loss of property and life, increased allergies due to weather changes, increased vector and water-borne diseases and potential malnutrition due to related to food insecurity.

There is research in Malaysia showing the impact of climate change on heat-related illnesses[22] and the growing threat of vector or water-borne diseases such as dengue, leptospirosis,[23] chikungunya and others.[24] A 2016 study revealed a potential increase of malarial cases by 15% with the rise in ambient temperature by 1.5°C in 2050 and positive correlation between rainfall and dengue and postulated that increased rainfall and surface temperature favoured the propagation and spread of dengue[25]. In Penang there has been a notable increase in dengue cases in recent years (Table 6) which supports that under current climate predictions the incidence of dengue and other vector or water-borne diseases is extremely likely to increase.

Table 6: Number of cases for major communicable diseases reported in Penang, 2012-2016.

Disease	2012	2013	2014	2015	2016
Dengue fever/Dengue hemorrhagic fever	791	1,053	3,141	5,830	2,756
Tuberculosis (all forms)	1,245	1,230	1,252	1,283	1,385
Measles	245	153	53	11	7
HIV infections (all forms)	137	111	110	103	105
Food poisoning	360	556	2,227	497	609
Hepatitis B	40	21	13	33	20
Syphilis (all forms)	87	95	57	63	57
Malaria	37	39	37	17	3
Hand, foot and mouth disease	1,579	1,205	1,449	758	3,019
Typhoid and paratyphoid fever	2	6	6	8	4
Leptospirosis	128	98	192	140	43
Influenza	216	785	380	642	-

Source: 2016 Annual Report, Penang State Health Department, Malaysia

[16] Penang Institute & Economic Planning Division, Penang (2019) *Penang Economic and Development Report 2017/2018.* George Town, Penang: Penang Institute.
[17] Federation of Malaysian Manufacturers Penang, cited in The Star (2019) '1,000 companies lose RM300mil to Penang floods', *The Star*, 10 November 2017 [online]. Available at: https://www.thestar.com.my/business/business-news/2017/11/10/1000-companies-lose-rm300mil-to-penang-floods (Accessed: 7 November 2019)
[18] Penang Institute & Economic Planning Division, Penang (2019) *Penang Economic and Development Report 2017/2018.* George Town, Penang: Penang Institute.
[19] Watts, N., Adger, W.N., Agnolucci, P., et al. (2015) "Health and climate change: policy responses to protect public health", The Lancet, Vol. 386 pp.1861-914 accessed on https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(15)60854-6.pdf
[20] Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Belesova, K., Boykoff, M., Byass, P., et al. (2019), "The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate", *The Lancet*, Vol. 394 No. 10211, pp. 1836–1878.
[21] Beggs, P.J., Zhang, Y., Bambrick, H., Berry, H.L., Linnenluecke, M.K., Trueck, S., Bi, P., et al. (2019), "The 2019 report of the MJA Lancet Countdown on health and climate change: a turbulent year with mixed progress", *Medical Journal of Australia*, p. mja2.50405.
[22] Mansor, Z. Ismail, N.H., Ismail, R., Hashim, J.H. (2019), "Thirst as the threshold symptom to prevent worsening heat-related illness", *Medical Journal of Malaysia*, Vol. 74 No. 1, accessed online http://www.e-mjm.org/2019/v74n1/heat-related-illness.pdf
[23] Garba, B., Bahaman, A.R., Bejo, S.K., Zakaria, Z., Mutalib, A.R. and Bande, F. (2018), "Major epidemiological factors associated with leptospirosis in Malaysia", *Acta Tropica*, Elsevier, Vol. 178 No. September 2017, pp. 242–247.
[24] Servadio, J.L., Rosenthal, S.R., Carlson, L. and Bauer, C. (2018), "Climate patterns and mosquito-borne disease outbreaks in South and Southeast Asia", *Journal of Infection and Public Health*, King Saud Bin Abdulaziz University for Health Sciences, Vol. 11 No. 4, pp. 566–571.
[25] Tang, K.H.D. (2019), "Climate change in Malaysia: Trends, contributors, impacts, mitigation and adaptations", *Science of the Total Environment*, Elsevier B.V., Vol. 650 No. September, pp. 1858–1871.

The severity of the health impact is not just determined by the level of exposure (e.g. larger mosquito population) but also the sensitivity and adaptive capacity of the individuals or the community.[26] An outdoor worker (high exposure) with diabetes (higher sensitivity) who does not have the financial resources for air conditioning at her home or pay for higher medical bills (low adaptive capacity) would experience a very high vulnerability of her health due to climate change.

Despite the evidence, there is very limited awareness among the community and health practitioners.[27] As a result, climate related illnesses are not systematically diagnosed as such or wrongly coded. As a result, less accurate statistics severely limits the preparedness of the health system. Additional research and capacity building is therefore required to fill the large knowledge gaps in the Malaysian public health system.

Rationale for the selection of focus areas

Two sub-districts or mukims have been selected as focus for the first phase of the nature-based climate adaptation programme for the urban areas of Penang island. They have been selected based on a combination of their likely climate change impacts, land use and community vulnerabilities.

- **George Town** is the state's capital. The total area is 2,501 ha. As of the last census (2010) it had a population of 198,298, the equivalent of 79 people / ha. Land uses comprise a combination of residential, commercial and mixed-use shop lots. UNESCO listed the historical centre of George Town as a World Heritage Site in 2008. It is highly vulnerable to both increasing heat and flooding. George Town mukim is particular vulnerable due to having a significant flood-prone area coinciding with a high concentration of population of elderly people of 21% (41,000), which is above national average (14%) .
- **Bayan Lepas** is a larger area (2,898 ha) comprising Penang's airport and a large manufacturing zone. As of the last census it had a population of 122,654, the equivalent of 42 people / ha. As evident in Images 2a and 2b (page 7), the mukim has significantly urbanized in the last decade. While not as prone to severe flooding, it suffers from increased urban heat island effect, as verified by remote sensing surface temperatures. The presence of global electronic firms offers an opportunity for co-investment in greening the industrial estate.

Table 7: George Town and Bayan Lepas Mukim Population Data (2010)

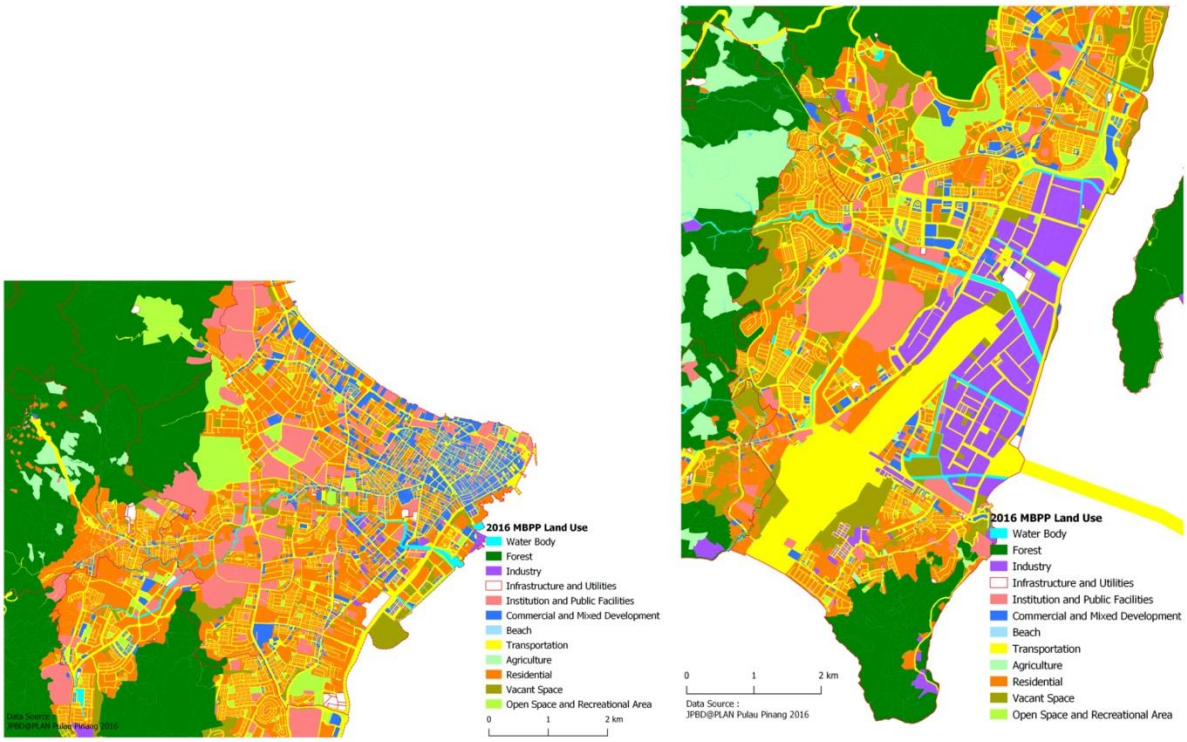
2010 population	0-14 years		15-64 years		65 years plus		Total
Penang State	352,975	23%	1,074,902	70%	98,447	6%	1,526,324
George Town Mukim	35,515	18%	143,700	72%	19,083	10%	198,298
Bayan Lepas Mukim	28,801	23%	88,020	72%	5,833	5%	122,654

Source: JPBD, 2010

Images 4a and 4b. Landuse of the George Town and Bayan Lepas mukims. George Town (left) has a significant residential land use on the outskirts and a commercial and mixed-use city core, which is now listed as a UNESCO World Heritage Site. Bayan Lepas (right) is a newer area comprising an industrial manufacturing zone, airport and residential areas.

[26] Turner, B.L., Kasperson, R.E., Matson, P.A., McCarthy, J.J., Corell, R.W., Christensen, L., Eckley, N., et al. (2003), "A framework for vulnerability analysis in sustainability science", *Proceedings of the National Academy of Sciences*, Vol. 100 No. 14, pp. 8074–8079.

[27] See footnote no 18 (Watts, 2019)

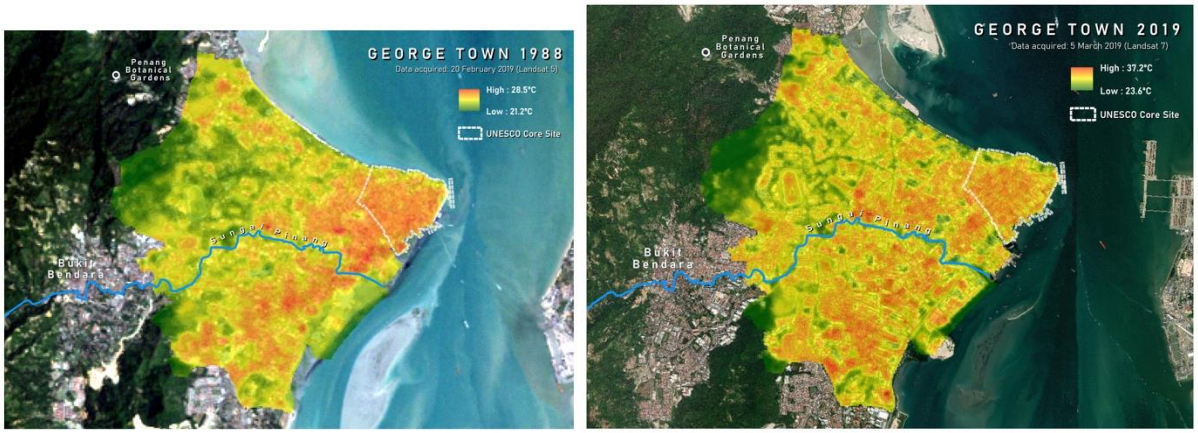


Source: JPBD, 2016. Land use for Georgetown (4a, left) and for Bayan Lepas (4b, right).

Urban Health Island Effect

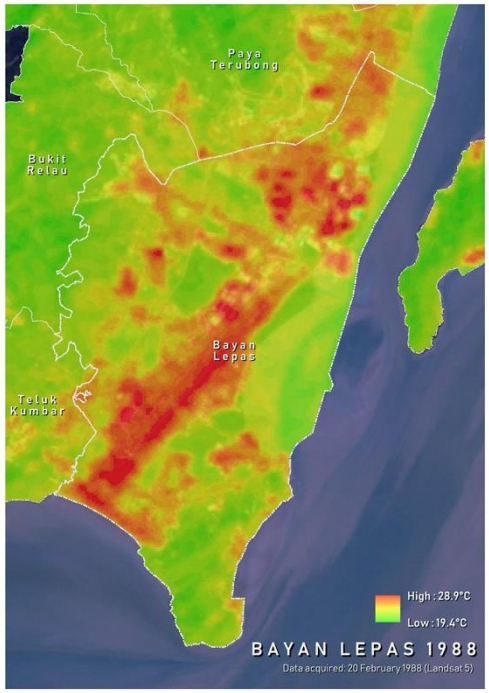
Both the George Town and Bayan Lepas mukims have significant and increasing heat island effects (Images 5a, 5b, 6a & 6b).

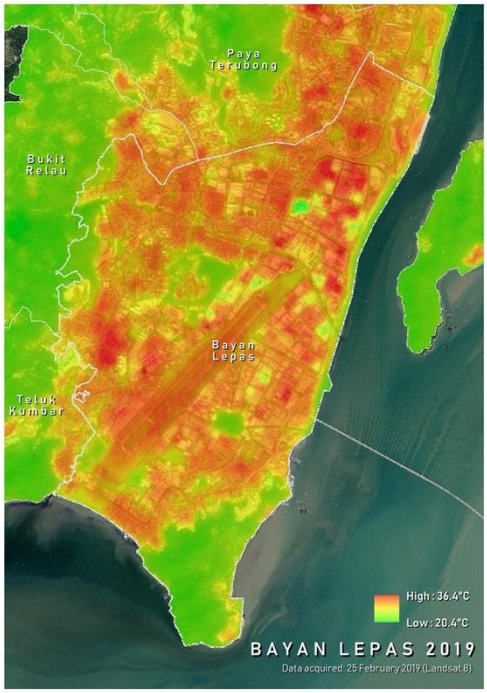
Images 5a and 5b. Remote sensing (Landsat 8) data on surface temperatures in 1988 and 2019 shows a stark increase for George Town Mukim: the temperature range in 1988 has a minimum of 21.2°C and a maximum of 28.5 °C but in 2019, the minimum is of 23.6°C and the maximum of 37.2°C. The increase in surface temperature in 31 years is of 8.7°C and 2.4°C maximum and minimum temperatures respectively.



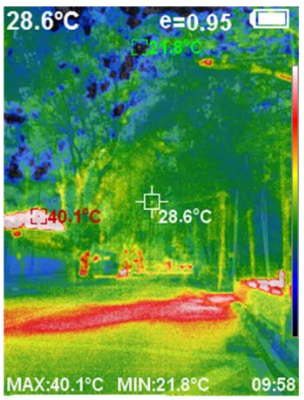
Source: Images retrieved by Think City.

Images 6a and 6b. Remote sensing (Landsat 8) data on surface temperatures in 1988 and 2019 shows a stark increase for the Bayan Lepas Mukim: the temperature range in 1988 has a minimum of 19.4°C with a maximum of 28.9°C but in 2019, the minimum is of 20.4°C and the maximum of 36.4°C. The increase in surface temperature in 31 years is of 7.5°C and 1°C maximum and minimum temperatures respectively. The impact of recent urbanisation is very visible by the expanding warming areas which coincide with built up areas.

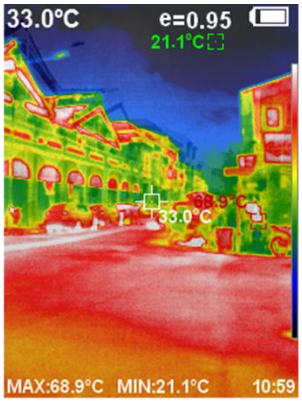




Images 7a, 7b, 7c, 7d. Thermal imagery of George Town streets highlights the impact of materials and shading on surface temperatures. Images 7a and 7c (taken at similar times) show a marked difference in temperatures in shaded areas and bitumen road surfaces. Image 8c is taken in the George Town World Heritage Site, which is significantly hotter than other urban areas.



Jalan Brown
12.07.2019
10.59am



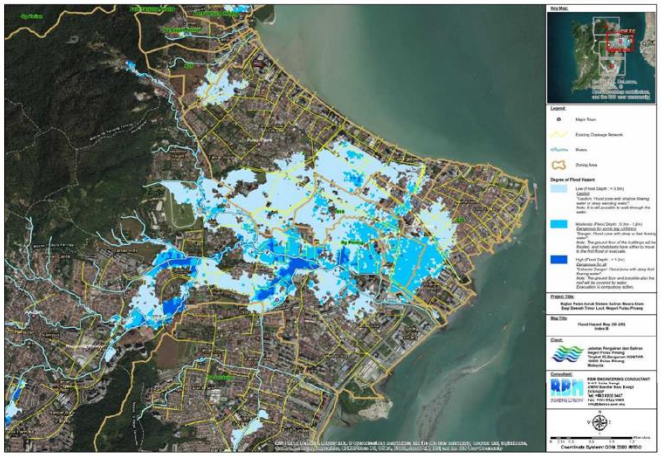
Lebuh Gereja
12.07.2019
9.58am

Source: Images taken by Think City.

Flooding

The George Town Mukim in one of the island's main flood prone areas, mostly concentrated upstream from the Penang River.

Image 8. Flood risk for George Town mukim.



Source: RBM (2018) Flood mitigation report for Penang island.

Focus of the proposal

The focus of the programme is to enhance urban resilience and reduce human and ecosystem health vulnerability to climate change impacts and extreme weather events by implementing nature-based solutions to reduce surface temperatures and storm water runoff, as well as to increase social resilience and build institutional capacity. It is a result of the identification of the most significant climate impacts to the urban areas of Penang island: increased rainfall leading to flooding and increased temperatures leading to public health impacts.

Supported by an unprecedented collaboration between stakeholders at local, regional and national levels (including government agencies, scientific support institutions and civil society), the programme has a strong community-focused approach, engaging with the most vulnerable groups of society in order to assess their main vulnerabilities in a collaborative effort (including vulnerable groups, women, disabled, and low income people - designated as B40 in Malaysia, i.e. the bottom 40% of Malaysian households by income).

Table 8. Summary of target locations and vulnerabilities

Location	Critical infrastructures	Community	Climate hazards	Underlying vulnerability
George Town mukim (sub-district)	George Town World Heritage Site Cruise and ferry terminal Roads	Ethnically diverse Culturally rich Mixed income	Flooding Storm surge High urban heat island effect/extreme heat	Traditional communities living in heritage areas High proportion of poor housing conditions , presence of low income families Above average concentration

				of elderly population of 21% (41,000) on flood-prone area
Bayan Lepas-mukim (sub district)	High-tech manufacturing zone International Airport Roads Bridges	Middle income families High proportion of migrant workers High tech manufacturing cluster of industries Supporting SMEs	High urban heat island effect	Manufacturing workers (migrant) High concentration of school children (percentage of 15%)

Project / Programme Objectives:
Goals

The main goal of the programme is to enhance urban resilience and reduce human and ecosystem health vulnerability to climate change impacts and extreme weather events by implementing nature-based solutions in order to improve stormwater management to reduce flooding, as well as improving microclimatic regulation, reducing the urban heat island effect and overall temperatures.

The programme seeks also to improve social resilience (with a particular focus on the most vulnerable communities) and to build institutional capacity.

Adopting a comprehensive approach in which a diversified set of components (i.e. urban greening, urban agriculture, public health) is implemented in one specific location reflects the acknowledgement of the complexity and interrelation of the multiple coexisting environmental and social dimensions. It will also allow to develop the programme as a pilot project which can be scaled in other cities in Malaysia and Southeast Asia.

Objectives

Community-level

1) To support the implementation of nature-based solutions to reduce flooding and the urban heat island effect (UHI) and overall temperatures.
2) To strengthen the capacity of local Social Risk Screening communities to respond to extreme weather events by raising awareness and capacity development training.

Ward-level

3) To support the implementation of resilience concrete actions that target women, youth and other vulnerable communities.
4) To promote urban agriculture and food security at different levels, including training.

City-level

5) To reduce overall temperatures (due to reducing the UHI effect).

6) To reduce incidence and severity of flooding and damage to infrastructure and private property.
7) To strengthen institutional capacity and coordination between different stakeholders in climate-related issues, improving response to extreme weather events.

National level

8) Development of the first municipal climate change adaptation programme, providing reference and methodology (as well as specific tools), for other cities in Malaysia to adopt, via the knowledge transfer platform.
9) Development of the list of climate-resilient street trees for Malaysia (developed together with Jabatan Landskap Negara, the National Institute of Landscape Architecture and Botanical Experts).
10) Development of a public health programme which will include a pilot project to monitor heat related illness in selected hospitals in Penang (as there is no systematic identification of heat related illness in hospitals in Malaysia) providing reference and methodology (as well as specific tools), for other cities in Malaysia to adopt.

Project / Programme Components and Financing

Table 9. Programme components and financing

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
Component 1. Adaptation to the urban heat island effect through urban greening (*Adaptation Fund Outcome 5: Increased ecosystem resilience in response to climate change and variability induced stress and also addresses Outcome 4 Increased adaptive capacity within relevant development sector services and infrastructure assets)*	Output 1.1. New tree-line streets / Connected canopies constructed	Outcome 1.1. Reduction of overall urban atmosphere temperatures by 1°C 5-7 years after project completion	775,000
	Output 1.2. Pocket parks / vacant spaces constructed	Outcome 1.2. Reduction of hard surfaces, resulting in the reduction of the urban heat island effect in the city	950,000
	Output 1.3. Green parking spaces constructed	Outcome 1.3. Reduction of hard surfaces and increased shading, hence reducing the urban heat island effect in the city	625,000
	Output 1.4. Green facades constructed (Built structures greening)	Outcome 1.4. Reduction of temperatures in the streets and inside buildings Storm water retention on rooftops reducing flooding	200,000
	Output 1.5. Green rooftops constructed (Built structures greening)	Outcome 1.5. Reduction of temperatures in the streets and inside the buildings	225,000
	Output 1.6. Urban agriculture programme initiated	Outcome 1.6. New urban agriculture gardens are incorporated in the city Training sessions will take place in a total number of (4/month) 240 sessions in total	400,000
Component 2 . Built projects for storm water and flood management (*Adaptation*	Output 2.1 Blue-green corridors developed	Outcome 2.1. Reduced exposure of Penang state to storm water and flooding	1,550,000

Fund Outcome 5: Increased ecosystem resilience in response to climate change and variability induced stress	Output 2.2. New upstream retention ponds constructed	Outcome 2.2. Reduced exposure of Penang state to storm water and flooding	725,000
	Output 2.3. Swales and infiltration wells restored and constructed	Outcome 2.3. Reduced exposure of Penang state to storm water and flooding	450,000
Component 3. Comprehensive vulnerability / baseline assessment and action plans in targeted communities *Adaptation Fund Outcome 1: Reduced exposure to climate-related hazards and threats*	Output 3.1. Capacity development support for vulnerability assessment and climate change-related planning provided to the two mukims.	Outcome 3.1. Increased capacity of participatory and inclusive assessments focusing on vulnerable and disadvantaged communities to improve social resilience through inclusive environment.	160,000
Component 4. Strengthening social resilience *Adaptation Fund Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local leve*	Output 4.1. School-level awareness programme developed and implemented	Outcome 4.1. Increased school building resilience, greater levels of knowledge and awareness among students, teachers and educational authorities.	575,000
	Output 4.2. Women and girls programme developed and implemented	Outcome 4.2. Reduced gender vulnerability asymmetries	400,000
Component 5. Institutional capacity and knowledge transfer platform *Adaptation Fund Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses*	Output 5.1. Communications and knowledge platform developed and implemented	Outcome 5.1. Project implementation to be fully transparent. Information of strategies and projects to be made available to other municipalities in Malaysia and in the Southeast Asia region for replication.	550,000
	Output 5.2. Penang Climate Board created	Outcome 5.2. A unit created in connection to the municipality will monitor and evaluate all climate-related risks, addressing the problem from with a fully comprehensive perspective	285,000
	Output 5.3. Climate related-public health programme developed and initiated	Outcome 5.3. Comprehensive public health programme, including pilot project monitoring heat related illness in selected hospitals in Penang	546,977
6. Project/Programme Execution cost			799,613
7. Total Project/Programme Cost			9,216,590

8. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)	783,410
Amount of Financing Requested	10,000,000

Projected Calendar:
Table 10. Programme calendar

Milestones	Expected Dates
Start of Project/Programme Implementation	November 2021
Mid-term Review (if planned)	December 2023
Project/Programme Closing	December 2025
Terminal Evaluation	September 2026

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Programme components

Climate change impacts in the urban areas of Penang island have been accelerating in the past decades. Even though sea level rise is not at threatening levels, increasing temperatures, rainfall and number of extreme weather events leading to flooding are threatening the island and its inhabitants' safety, future development and prosperity. It is necessary to implement adaptation measures and projects which can help overcome these challenges.

Nature-based solutions (NBS) have recently highlighted as a key concept in policy and management for achieving alignment of environmental and societal goals.[28] Having been found to be a possible major solution for climate change, they are now recommended for implementation at a global scale,[29] being supported by multiple international organisations, as is the case with the UN. The benefits extend beyond climate change, as nature-based solutions' impact is multifunctional, being advantageous at many different levels, such as social, public health, biodiversity and financial, having been proven to be highly beneficial in terms of cost-benefit ratios.

In cities, NBS have an instrumental role to play in transitioning to a more liveable and sustainable future high-density model.[30] The introduction of green spaces (particularly strategically placed street trees) have been proven to be the most effective strategy to control rising temperatures[31]. In fact, the introduction of vegetation can play an important role in changing the urban climate closer to a state prior to climate change impacts.[32]

Analysis and planning play an important role, as green spaces must be introduced in strategic locations to achieve optimised results, taking advantage of parameters such as solar

[28] Cohen-Shacham, E., Walters, G., Janzen, C. and Maginnis, S. (eds.) (2016). *Nature-based Solutions to address global societal challenges*. Gland, Switzerland: IUCN. xiii + 97pp
[29] Griscom, B., Adams, J., Ellis, P., Houghton, R., Lomax, G., Miteva, D., Schlesinger, W., Shoch, D., Siikamäki, J., Smith, P., Woodbury, P., Zganjar, C., Blackman, A., Campari, J., T Conant, R., Delgado, C., Elias, P., Gopalakrishna, T., R Hamsik, M., Fargione, J. (2017). 'Natural climate solutions'. *Proceedings of the National Academy of Sciences*. 114 (44) 11645-116
[30] Emilsson, T. and Sang, A.O. (2017) 'Impacts of Climate Change on Urban Areas and Nature-Based Solutions for Adaptation' in Kabisch, N., Korn, H. Stadler, J. & Bonn, A. (eds) *Nature-based Solutions for Climate Adaptation in Urban Areas. Linkages between Science, Policy and Practice*. Springer Open, pp. 15-27
[31] Kardan, O., Gozdyra, P., Misic, B., Moola, F., Palmer, L.J., Paus, T., Berman, M.G. (2015) 'Neighborhood greenspace and health in a large urban center'. *Nature – Scientific Reports*. 5, 11610–11610.
[32] Cohen-Shacham, E., Walters, G., Janzen, C. and Maginnis, S. (eds.) (2016). *Nature-based Solutions to address global societal challenges*. Gland, Switzerland: IUCN. xiii + 97pp

orientation, air circulation and others. Strategic planning includes choosing the most beneficial typology of space, planting and species, in general as well as for each specific location; for street trees, leaf organisation and canopy shape have in general the biggest impact (sparse crowns with large leaves have a higher cooling capacity)[33]. Tropical Southeast Asia has some particular advantages in terms of NBS implementation due to its climate, as vegetation growing ratios are significantly higher than for other climates.

Street trees' impact is particularly relevant in the urban context, as they require limited area at ground level and provide the broadest protection from radiation exposure to people, animals, structures and its materials, hence reducing the UHI effect.[34] Even just a few trees have been proven to significantly reduce excessive heat.[35] The positive impact of green spaces in urban contexts is well documented also in terms of public health. They provide cooling effects that can contribute to reduce stress factors that stem from overheating, leading to health-related impairments that may result in increased mortality rates.[36] They have also been proven to reduce obesity, cardiovascular diseases, blood pressure, respiratory diseases and diabetes.[37] Additional benefits include the improvement of social cohesion, economic and aesthetic added values. [38]

Microclimate regulation achieved by planting green spaces will furthermore reduce the impact of heat waves[39], which will significantly increase in Malaysia. The UHI effect in Penang can be observed in Image 3, p.9 clearly showing the correspondence of higher temperatures with more densely built areas.

The UHI effect and overall temperatures' reduction achieved by the introduction of green spaces, in particular street trees, is supported not only by the extensive research mentioned above but by several projects. Such is the case with the Medellin NBS project, where local authorities have planted green corridors along 18 roads and 12 waterways and reduced temperatures in more than 2°C, in some cases reaching 3°C[40], winning the Ashden award, *Cooling by Nature*.

Adaptation strategies addressing flooding are urgent for Penang. Studies[41] have recommended the increase of green spaces for stormwater retention, as well as the creation of a linear park with retention areas in the Pinang River. However, a more flexible approach to stormwater management is needed to address the challenges associated with changes in rainfall patterns. City managers need to introduce a more resilient approach combining soft and hard infrastructures. A sustainable drainage systems' approach is behind the concept of the sponge-city, which has achieved remarkable results in reducing floods.[42]

[33] Leuzinger S, Vogt R, Körner C (2010) 'Tree surface temperature in an urban environment'. *Agric For Meteorol* 150(1). pp. 56–62.
[34] Lenzholzer, S. (2012) 'Research and design for thermal comfort in Dutch urban squares'. *Resources, Conservation and Recycling*, 64, pp.39-48.
[35] Lindén, J., Fonti, P., Esper, J. (2016) 'Temporal variations in microclimate cooling induced by urban trees in Mainz, Germany'. *Urban Forestry & Urban Greening*, 20, pp.198-209

[37] Ulmer, J.M., Wolf, K.L., Backman, D.R., Tretheway, R.L., Blain, C.J.A., O'Neil-Dunne, J.P.M., Frank, L.D. (2016), 'Multiple health benefits of urban tree canopy: The mounting evidence for a green prescription'. *Health & Place*, 42, pp.54-62.
[38] Soares, A.L., Rego, F.C., McPherson, E.G., Simpson, J.R., Peper, P.J., Xiao, Q. (2011) 'Benefits and costs of street trees in Lisbon, Portugal'. *Urban Forestry & Urban Greening*, 10, pp.69-78.
[39] Lindén, J., Fonti, P., Esper, J. (2016) 'Temporal variations in microclimate cooling induced by urban trees in Mainz, Germany'. *Urban Forestry & Urban Greening*, 20, pp.198-209
[40] https://www.ashden.org/winners/alcald%C3%ADa-de-medell%C3%ADn
[41] DRR – Team Mission Report Malaysia (2018), Kingdom of the Netherlands.
[42] Chan F.K.S., Griffiths, J.A., Higgitt, D., Xu, S., Zhu, F., Tang, Y., Xu, Y., Thorne, C.R., (2018) '"Sponge City" in China—A breakthrough of planning and flood risk management in the urban context', Land Use Policy, 76, pp. 772-778 https://doi.org/10.1016/j.landusepol.2018.03.005

For this to be achieved, research has shown the need to address biophysical uncertainties (e.g. soil absorption, groundwater table level fluctuation). The way to address these uncertainties is to develop research and implement seasonal stormwater retention upstream areas, as well as swales and infiltration wells downstream and monitoring their impact in flood mitigation.

This programme aims to introduce a climate-conscious approach in the design of green spaces in the urban areas of Penang (either public or private), in which concerns regarding reducing temperatures and seasonally storing storm water will be an integral part of the process.

All of the project's proposed outcomes take into account sustainability; in terms of nature-based solutions, both financial and environmental sustainability, as these are far more cost-effective than existing alternatives, and mitigate climate change by sequestering carbon and ensure community/city ownership. The knowledge management component also promotes both financial and environmental sustainability at a national level. In terms of sustainable investments, demonstrating to the government its cost-effectiveness in Penang and other cities while likely promote their implementation by these entities from existing budgets.

Remote sensing

To develop the plans, it is necessary to identify the most heat stressed areas, which can be achieved using remote sensing. As the main cause of UHI is the composition of land surfaces, linking Land Surface Temperatures (LST) and land cover data can substantially assist nature-based cooling strategies as they can quantify and predict direct and indirect cooling benefits of green spaces[43]. Climatic fluctuations and anomalies will be observed and analysed using chronological remote sensing as well as observing recorded anthropogenic impacts, which play significant roles in regional, national and global climate adaptation, planning, mitigation and projection. Attaining high-resolution remote sensing data will enable the identification of buildings and neighbourhoods which exacerbate the UHI effect. This will allow for targeted intervention, introducing green spaces and promoting air flow in the most heat stressed areas.

Scenario and impact modelling (to be developed by the National Hydrological Institute Malaysia (NAHRIM) and local university Universiti Sains Malaysia (USM) experts will also assist in developing the detailed plans.

Remote sensing will, therefore, be used in this programme at three different levels: 1) identifying the most heat stressed urban areas as priorities for intervention; 2) monitoring the development of the pilot projects in order to identify the most effective strategies for replication - research through design (RTD); 3) monitoring and evaluation of the programme's impacts.

The programme's components are as follows

Component 1: **Adaptation to the urban heat island effect through urban greening**

This component focuses on reducing the impact of increasing temperatures by introducing different green elements, such as street trees, rooftop gardens, pocket parks and blue-green corridors. The introduction of these green elements will contribute to reduce the UHI and, therefore, overall urban temperatures.

[43] Zhang, Y., Murray, A. and Turner, B. (2017). 'Optimizing green space locations to reduce daytime and night-time urban heat island effects in Phoenix, Arizona'. *Landscape and Urban Planning*, 165, pp.162-171.

This component comprises six different groups of activities:

1.1 New tree-lined streets / Connected canopies constructed. Introducing new tree-lined streets in both George Town and Bayan Lepas mukims and completing the alignments in streets that are already partially shaded by street trees. The most heat stressed areas were mapped in order to identify the areas in which strategically introduced street trees will be planted in order to reduce the temperatures. The budget was calculated based on the number of trees to be planted. This activity was costed based on the assumption that 3,690 trees would be planted at a cost of USD210 per tree.

1.2 Pocket parks / vacant spaces constructed. Vacant spaces are converted into pocket parks or urban gardens, with a microclimate-oriented design, in order to reduce hard surfaces and add shade (both aiming to reduce the urban heat island effect). Vacant spaces which can become small green urban spaces were mapped and the areas calculated in order to develop a budget with reference costs provided by contractors. This activity was costed based on the assumption that an area of 10,555 m2 would be planted at a cost of USD90 per square meter.

1.3 Green parking spaces constructed. Introducing trees in car parks, for shading and UHI reduction. This will be done in both George Town and Bayan Lepas mukims, but more in the latter, due to the greater number and size of car parks in the Bayan Lepas manufacturing zone. Due to the small space occupied by tree pits, the number of car park spaces will be reduced by no more than 10%. To determine the cost of this activity, the existing car parks were mapped, and preliminary tree planting activities developed in order to determine the number of trees necessary and the budget calculated with reference costs provided by contractors and suppliers. Based on this the budget assumes 2,975 trees would be planted at a cost of USD210 per tree. Following the project planning workshops held with the local city council, it was decided that this activity would be best carried out through grants as a vast area of parking spaces are within private lands.

1.4 Green facades constructed (Built structures greening). It will be developed as a grants programme. The existing buildings in which green facades can be installed were identified and a preliminary budget calculated with reference costs provided by contractors and suppliers. Based on this the budget assumes a vertical area of 1,110 m2 would be planted at a cost of USD180 per square meter.

1.5 Green rooftops constructed (Built structures greening). It will be developed as a grants programme. The existing buildings in which rooftop gardens can be installed were identified and a preliminary budget calculated with reference costs provided by contractors and suppliers. Based on this, the budget assumes an area of 3,750 m2 would be planted at a cost of USD60 per square meter (no trees introduced).

1.6 Urban agriculture programme initiated. Identification of vacant spaces in order to add urban agriculture as well as training sessions. It will be developed as a grants programme. Vacant spaces with potential for urban agriculture were identified and areas calculated in order to budget this sub-component with reference costs for construction and training provided by contractors and NGOs working in this field.

The nature-based climate adaptation programme for the urban areas of Penang island includes the greening of four waterways (in total approximately 14 km) and 32 streets and roads corridors (in total approximately 42 km). Using as reference green spaces impact in UHI reduction and case studies such as the Medellin project, it is reasonable to expect temperatures to decrease approximately 1-1.5°C five to seven years in surrounding areas after project implementation. Evaluation and monitoring of temperatures will provide assessment regarding the effectiveness of the proposal.

One important study resulting of this programme is the identification of climate-resilient urban trees species for Malaysia (which has not been developed yet). This study is important because, as climate changes in the future, certain tree species will not be able to cope; it is essential to plant trees in the present that will be able to survive (and, hopefully, thrive) in the climate that Penang will have in 2050. This study will be developed during the programme in collaboration with the National Institute of Landscape Architecture (Jabatan Landskap Negara) and local botanic experts.

The budget allocated to component 1, Adaptation to the urban heat island effect through urban greening is of USD 3,175,000. The budget was calculated by mapping and calculating all areas and then consulting with contractors and suppliers to establish reference costs. Similar existing projects in Malaysia were also identified and their budget used as reference. The outputs with the highest budgets, 1.2 pocket parks/vacant spaces (USD 900,000) and 1.1 new tree-lined streets/connected canopies, (USD 750,000) are the ones which will be implemented more extensively and are estimated to have the biggest impact in terms of heat stress reduction. In the case of output 1.6, urban agriculture, (USD 400,000), There will be additional external funding as several sponsors have committed to support this initiative. it;

Component 2: Improved Storm Water Management

Flooding in Penang has increased due mainly to the increase of annual rainfall and rainfall patterns and impervious surfaces due to urbanisation.

The programme includes a comprehensive nature-based approach to flood management including upstream retention, expanding blue-green corridors, and restoring and adding swales and infiltration wells where possible.

This component comprises three different outputs:*2.1. Blue-green corridors developed*

Rivers are natural topography corridors for stormwater circulation, so every time there's increased rainfall, their levels rise, which often leads to flooding of neighbouring areas. Keeping the rivers free of hard materials and modelling the river margins in different levels / platforms may constrain the path of water and protect neighbouring urbanised areas. The association of green spaces with the blue corridors is essential, as it allows for the infiltration of stormwater to the groundwater table. Water retention capacity will be increased associated with the rivers in the urban areas of Penang island even though their margins have limited space. This will be made with temporarily flooded areas – mangroves around river mouths areas which may have been removed their reinstatement will be considered as a priority. Blue-green corridors will also have additional benefits in reducing heat beyond storm water management.

Following in-depth discussions with the project team, including the Department of Irrigation and Drainage (JPS Pulau Pinang) as well as experts from the River Engineering & Urban Drainage Research Centre (REDAC, USM), it was agreed that flood mitigation projects in the pipeline for

Sungai Pinang and its tributaries will be further assessed and studied under the 12th Malaysia Plan to incorporate Nature-based Solutions. A team of consultants will be appointed by JPS Pulau Pinang to look into land status matters, suitability of specific sites, existing utilities as well as detailed design for its implementation. This will include operational costs and future maintenance.

While the initial budget allocation for the development of blue-green corridors assumes an area of 17,220 m2 at a cost of USD 90 per square metre, further consultations with JPS Pulau Pinang refined the area to 1,826 m2 at a cost of USD 115 per square metre to reflect the requirements and status of pipeline projects in the state

Following in-depth discussions with the project team, including the Department of Irrigation and Drainage (JPS Pulau Pinang) as well as experts from the River Engineering & Urban Drainage Research Centre (REDAC, USM), it was agreed that flood mitigation projects in the pipeline for Sungai Pinang and its tributaries will be further assessed and studied under the 12th Malaysia Plan to incorporate Nature-based Solutions. A team of consultants will be appointed by JPS Pulau Pinang to look into land status matters, suitability of specific sites, existing utilities as well as detailed design for its implementation. This will include operational costs and future maintenance.

2.2. New upstream retention ponds constructed

Due to a combination of increased built up areas and increased rainfall, stormwater runoff leads to flooding in lower lying areas, which both in George Town and Bayan Lepas mukims are located in the heavily urbanised areas. In order to avoid this, it is essential to retain stormwater in ponds upstream so they won't runoff to downstream areas. Retention ponds also allow for slow infiltration of stormwater to the groundwater table. The most crucial areas in which to introduce retention ponds are currently being identified by experts associated to the programme - a dedicated task force was established in 2019 with different experts in stormwater management to map the most important areas in which to retain the water, and the full study is expected to be completed in August 2020.

Upstream retention areas are locations that store water in periods of heavier rainfall. In Penang, the existing drainage system is threatened by high tides and storm surges combined with a relatively small impact of sea level rise in island. Therefore, when heavy rainfall occurs simultaneously with high tides and storm surges, the drained water is pushed back inland by the tide, causing a backflow in the drainage system, which the system can't cope with, leading to severe flooding. [44] It is essential, because of this, to retain the water upstream, not allowing it to reach either rivers or the drainage system. It has been proved that, using a combination of nature-based solutions for stormwater management, peak discharge of a catchment can be reduced by more than 50%.[45] Because of this adaptation effectiveness, the project design team and all stakeholders agree that upstream retention is a critical intervention to prevent flooding in the highly urbanized area of Penang.

[44] Understanding stormwater inundation. www.coast.noaa.gov. Retrieved on April 17th 2020 from https://coast.noaa.gov/stormwater-floods/understand/
[45] Qiu, Y., Ichiba, A., Scherzer, D., Tchiguirinskaya, I. (2018) 'Evaluation of nature-based solutions for stormwater management with a fully distributed model in semi-urban catchment'. UrbanRain18, 11 th International Workshop on Precipitation in Urban Areas.

The areas identified for upstream retention are mostly green spaces associated with rivers but also to some isolated crucial green spaces, such as sports grounds and vacant land, which are heavily pressured hydrologically due to morphology reasons. Green buffers and vegetation will be added to all alternatives.

While the initial budget allocation for the construction of new retention ponds assumes an area of 12,080 m2 at a cost of USD 60 per square metre, further consultations with JPS Pulau Pinang refined the area to 2,200 m2 at a cost of USD 818 per square metre to reflect the requirements and status of pipeline projects in the state.

2.3. Swales and infiltration wells restored and constructed

Swales are vegetalised open drains which, unlike typical drains, not only collect stormwater but also allow for its infiltration to the groundwater table along its full extension. This approach seeks to reduce the accumulation of stormwater downstream, which in case of heavy rainfall often leads to flooding and possible damages of drainage infrastructure.

Infiltration wells are solutions used for heavily urbanised areas, as they provide stormwater retention and fast infiltration to the ground water table using several deep layers of aggregates of different dimension, with the function of accelerating and retaining stormwater.

While the initial budget allocation for the construction and restoration of swales and infiltration wells assumes an area of 1,880 m2 at a cost of USD 90 per square metre, further consultations with JPS Pulau Pinang refined the area to 3,000 m2 at a cost of USD 238 per square metre to reflect the requirements and status of pipeline projects in the state..

Adaptation strategies addressing flooding are crucial and urgent for Penang, considering the increase in rainfall and the damages caused by the latest floods. Flood mitigation studies specific for Penang island have previous identified the need for an increase of green spaces for water retention, along the Pinang River as well as in upstream retention.[46]

To face the challenges, a sponge-city approach should be adopted, identifying upstream areas that are more heavily pressured hydrologically to be converted (partially or seasonally), into retaining/storing water functional spaces. Introducing swales and infiltration wells downstream will also reduce impacts. With this goal in mind, the programme includes as co-implementing partners NAHRIM (Institut Penyelidikan Hydraulic Kebangsaan Malaysia, the National Hydraulic Research Institute of Malaysia) and USM (Universiti Sains Malaysia, the local university). A partnership for knowledge sharing is being established with the Sponge Cities Research Institute of Tsinghua University Innovation Center in Zhuhai, China.

JPS Pulau Pinang will be looking to incorporate and fulfil requirements of Nature-based Solutions in the flood mitigation projects under the 12th Malaysia Plan, particularly along Lembangan Sungai Pinang and its tributaries. Design and specifications for the development of infiltration wells and bioretention swales will be in accordance to the national blueprint - Urban Stormwater Management Manual for Malaysia (MSMA 2nd Edition).

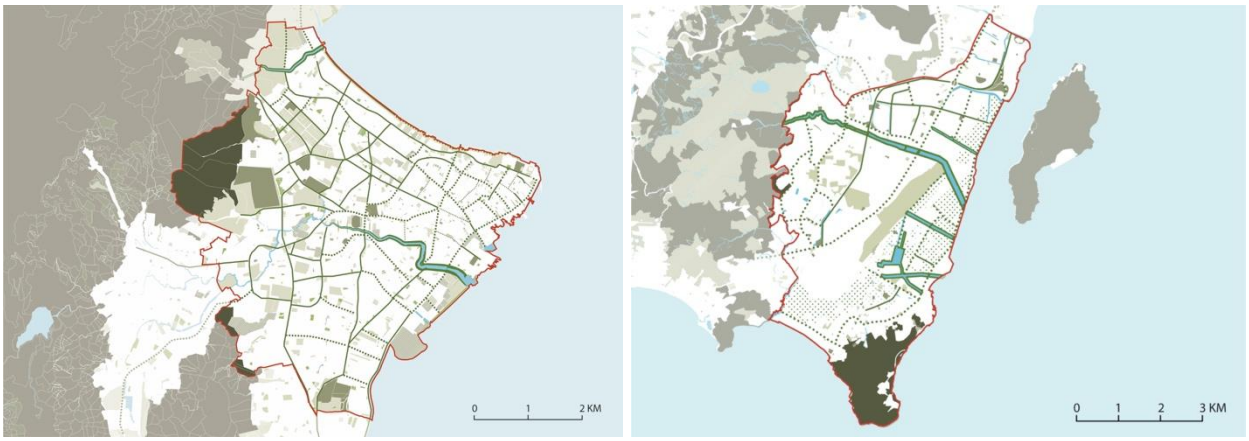
[46] DRR – Team Mission Report Malaysia (2018), Kingdom of the Netherlands.

The total budget for the physical activities for Component 2 on stormwater and flood management is USD 2,725,000. The three sub-components were mapped, the areas calculated and estimate costs obtained by initially consulting suppliers and contractors, and later refined by JPS Pulau Pinang. The allocated budget per sub-component is as follows:

Stormwater Management Components	Quantities	Cost per Unit USD	Total USD
Blue green corridors	1826m2	115/m2	210000
Upstream retention	2200m2	818/m2	1800000
Infiltration /retention underground storage	3200m2	238/m2	715000
Total			2725,000

The plans below show the areas for green infrastructure extension in both George Town and Bayan Lepas mukims.

Images 9a and 9b. Green infrastructure plans for George Town and Bayan Lepas mukims, including blue and green corridors and upstream retention, developed for the nature-based programme.



Source: Plans developed by Think City 2019.

Component 3: Comprehensive vulnerability / baseline assessment and action plans for social resilience strengthening developed for George Town and Bayan Lepas mukims.

Output:

3.1. Capacity development support for vulnerability assessment and climate-change related planning provided for the two mukims.

Having the Adaptation Fund Outcome 1 in mind, as well as regional priorities, this component focuses on laying the groundwork for reducing vulnerability to climate change impacts and hazards. Community-level resilience is the focus in the two targeted mukims, George Town and Bayan Lepas. It will include:

1) Conducting climate change vulnerability assessment.
2) Producing action plans that identify resilience investment and priorities.
3) Conducting a survey on the willingness to pay / green infrastructure revenue to ensure that infrastructure generates revenue that can be re-invested in operations, maintenance and upgrading. A special survey targeted at the private sector in the industrial area of Bayan Lepas will be conducted in order to assess willingness to pay in the near future.

The goal of this in-depth vulnerability assessment and resulting action plans is to gain as much insight and understanding of all issues and needs as possible, as well as to increase ownership and institutionalise and support priority interventions.

The vulnerability assessment and adaptation action planning will be guided by the Planning for Climate Change framework (P4CC). These principles are strategic, as implementation should be value-based and should make the best use of resources available. The programme should engage as many stakeholders as possible throughout the project life cycle and integrated them in a unified approach to climate change adaptation: the development of the programme has already achieved a significant engagement so far (see the organisational structure description in component 5, Building Institutional Capacity).

Gender assessment will be a strong component of the vulnerability baseline assessment. Women in Penang are identified as vulnerable in particular low-income groups as they are primary caregivers which is indicated by a low labour force participation rate (59%).
The budget for the comprehensive vulnerability baseline assessment and actions plans was calculated by comparing with similar studies' budgets for reference and by consulting with the city council and consultants working in this field,

Component 4: Strengthening social resilience

The social resilience programme has two main outputs:

4.1. School-level awareness programme developed and implemented

The schools programme is focused on educating young people. Creating game and technology based learning with input from youth will be appealing and can reach major proportions of students (over 10,000 secondary school students). This knowledge component is supplemented with training in urban agriculture in the school grounds. It will also include training in climate change specific issues, particularly in extreme weather events and disaster situations, but also in the science behind climate change and in mitigation strategies.

4.2. Women and girls programme developed and implemented

The women and girls programme's aim is to reduce gender vulnerability asymmetry and strengthen agency within the overall programmes geographic focus areas. Partnering with the Women's Centre for Change, Penang's most widely recognised Women's organisation, will provide wide access to women and girls. A series of engagements will bring together women NGOs, climate experts and women and girls to co-produce adaptation resources on various topics from extreme heat to urban agriculture and establish a network of peer educators for

distribution and building a social support network.[47] The programme will also include a component to promote women's participation in decision-making processes related to climate change adaptation and mitigation strategies and plans. The programme will reach 25% of B40 women and girls of George Town and Bayan Lepas mukims, which corresponds to an approximate number of 16,000 women and girls.

Activities under this component will target different types of vulnerable communities: a) areas that are periodically flooded and coincide with the highest concentration rate of elderly population in Penang; b) Low income groups (known locally as B40 communities) c) women and girls. Community engagements have shown that the B40 population in George Town Mukim describes the impacts of heatwaves to be initially in the health of children (more specifically babies) and elderly people. As such, this impacts also the caregivers, which are predominantly women. The main benefits will be to reduce exposure to flooding and heat and to empower and reduce pressure on women.

The budget for the social resilience component was estimated by consulting with the city council and different NGOs with experience in this area.

Component 5: Institutional capacity and knowledge transfer platform
Iinstitutional capacity will be reinforced via three outputs:

5.1 Communications and knowledge platform developed and implemented

The knowledge management platform will allow the capturing and dissemination of results from the programme not only to other mukims and districts in Penang state but also to other cities in Malaysia, with enhanced replication potential. It will also ensure full transparency in the implementation process, with all stakeholders being informed of strategies, monitoring and evaluation tools and results. A dedicated website will be created and monthly reports will be sent to all stakeholders.
The project development team views the knowledge management component as a central part of the programme, with the strong belief that it will have national impact. The online platform will be designed to capture the methods and impacts of the programme in a format that can be readily transferred to other Malaysian municipalities with the support from MESTECC and NAHRIM). The Penang Climate Board will act as the main repository of the knowhow within the Penang state government and be used to drive the programme beyond the Bayan Lepas and George Town mukims. However the board's primary purpose is to become a dedicated unit to address climate change specific issues holistically.

The organizational structure proposed for the programme is composed by multiple entities at local, municipal, regional and national levels, also including civil society and academic institutions. Ministry of Environment and Water (KASA)be an executing entity (as the National Designated Authority), as well as MBPP (city council), JPS (the Department of irrigation and drainage) and Think City (as the local project manager), together with Penang Green Council. Supporting executing entities include the Penang state government (with an important role in terms of coordinating and integrating areas in between MBPP and JPS jurisdictions), Jabatan Landskap Negara (the National Institute of Landscape Architecture) with whom the list of climate-resilience street trees for Malaysia will be developed and mainstreamed into national

[47] Hashagen, S., Kennedy, J., Paterson, A. and Sharp, C. 2011. Doing with, not to: Community resilience and Co-production The Implications for NHS Education for Scotland. Scottish Community Development Centre. Accessed at https://www.nes.scot.nhs.uk/media/555269/doing_with_-_not_to_final_version.pdf

policy; Plan Malaysia; Perhilitan (National Institute of Wildlife); and Perhutanan (National Forestry Institute). As supporting scientific entities, USM (Universities Sains Malaysia, the local university, which has allocated a multidisciplinary team to support the programme); NHARIM, the National Hydrology Research Institute; MRSA (Malaysian Remote Sensing Agency). As supporting NGOs and CSOs, MERCY Malaysia, WCC (Women's Centre for Change, a Penang organisation focused on women's rights) and WWF Malaysia (other organisations are expected to join in the future).

Specific benefits of intra-municipal cooperation for the implementation of NBS strategies have been identified in research. Besides enhancing the overall performance and speed of implementation of the programme, capacity building and knowledge transfer will be additional benefits for the institutions and departments involved. Beyond Penang, inter-municipal exchange platforms can serve as a multiplying factor in mainstreaming NBS into urban planning. The benefits of implementing the first NBS climate adaptation programme in Malaysia can therefore extend to the regional and national levels.

Streamlining information regarding municipal adaptation will help other cities in Malaysia and in the Southeast Asia region to develop their own climate adaptation programmes with a focus not only on resiliency but also on sustainability.

The city of Langkawi has been identified by government agencies at national level as a potential site for enhanced replication of a climate adaptation programme, particularly in the areas of stormwater and coastal management. In addition to the online knowledge-sharing platform, capacity building workshops and stakeholder engagements with the Langkawi Municipal Council will be prioritised to facilitate inter-municipal exchange of knowledge on NBS strategies for coastal cities.

The creation of a knowledge transfer platform will allow for the mainstreaming of the programme's methodology as well as the assessment of the different strategies and of projects' effectiveness. This will include (but will not be limited to): the monitoring of the flood impacts and temperatures reduction, the assessment of impact of the pilot projects, as well as the list of climate-resilient street trees species specific for Malaysia. The communications plan activities will be managed and mainstreamed via this platform. The platform will have an advocacy role at local as well as at national level.

5.2 Penang Climate Board created

The creation of the Penang Climate Board aims to create the conditions for an integrative and all-encompassing approach to all issues related to climate change, as a multi-layered comprehensive coordinated response to climate related risks should be prioritised. The climate board will manage different projects, as will be the case with the public health programme.
The goal is to create a dedicated unit to centralize all issues related to climate change - the Penang Climate Board, and it will be under the supervision of the local city council.

5.3 Climate-related public health programme developed and initiated.

Public health issues should be addressed in adaptation projects, as climate change will be significantly impact physical, mental and community health. In the recent *Lancet Countdown on*

Health and Climate Change[48] it is stated that climate change affects people across the life span and children will be affected the worst. The Penang public health programme focusses on the same geographic area as the other strategies. Its purpose is to measure for the first time current public health impact and set up a system for monitoring change that can also measure health improvements resulting from the environmental strategies.

The strategy of using NBS for the climate adaptation of urban areas in Penang will also result in several co-benefits in terms of public health and wellbeing. Research over the past years has significantly developed and demonstrated the following effects: reduced anxiety and depression, decreased stress, increased immunity, better control of non-communicable diseases (NCDs)[49] [50], increased vitamin D production (sun exposure), denser social connections[51], reduced aggression[52] and improved learning and intellectual development in children[53]. The pathways to these benefits are interrelated and mediated for example, green and thermo-comfortable spaces encourage outdoor physical activity which in turn is linked to reduction in depression[54], reduction in weight, prevention and better management of NCDs.

Three action areas make up the public health programme:

1. Measure the extreme heat impact on hospital admissions and mortality rates for better surveillance and feeding into future preparedness and community prevention strategies.

The research evidence highlights that there are certain temperature points when hospital admissions soar and death rates sharply rise[55]. The conditions are not limited to heat stress and stroke but many other conditions from kidney related diseases[56] to injuries (increased violence) and suicides.[57] [58] The study would select a number of hospitals to correlate access hospital admissions (those higher than usual) with heat wave events. As there is no lag time between symptoms and heat wave event, same days can be compared. The second part of this study would analyse death records[59] to assess increase death with heat waves.

2. Correlate climate sensitive communicable diseases with climate data and assess trends that can be used for public health interventions and assess the impact of adaptation initiatives.

Dengue, Leptospirosis, Chikungunya and other communicable diseases are on the rise due to climate change.[60] As a tropical city, most of these diseases are already endemic but the

[48] Watts N., Amann M., Arnell N. et al. (2019) The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. Lancet. 394:1836-78.
[49] Kardan, O., Gozdyra, P., Misic, B., Moola, F., Palmer, L.J., Paus, T., Berman, M.G. (2015) 'Neighborhood greenspace and health in a large urban center'. *Nature – Scientific Reports*. 5, 11610–11610. DOI: 10.1038/srep11610
[50] Ulmer, J.M., Wolf, K.L., Backman, D.R., Tretheway, R.L., Blain, C.J.A., O'Neil-Dunne, J.P.M., Frank, L.D. (2016), 'Multiple health benefits of urban tree canopy: The mounting evidence for a green prescription'. *Health & Place*, 42, pp.54-62.
[51] Ulmer, J.M., Wolf, K.L., Backman, D.R., Tretheway, R.L., Blain, C.J.A., O'Neil-Dunne, J.P.M., Frank, L.D. (2016), 'Multiple health benefits of urban tree canopy: The mounting evidence for a green prescription'. *Health & Place*, 42, pp.54-62.
[52] Kuo, F.E., Sullivan, W.C. (2001) 'Agression and violence in the inner city: effects of environment via mental fatigue'. *Environmental Behavior*, 33, pp.543-571.
[53] Haaland, C. van den Bosch, C.K. (2015) 'Challenges and strategies for urban green-space planning in cities undergoing densification: A review'. *Urban Forest & Urban Greening*, 14, pp.760-771.
[54] Ulmer, J.M., Wolf, K.L., Backman, D.R., Tretheway, R.L., Blain, C.J.A., O'Neil-Dunne, J.P.M., Frank, L.D. (2016), 'Multiple health benefits of urban tree canopy: The mounting evidence for a green prescription'. *Health & Place*, 42, pp.54-62.
[55] Beggs PJ., Zhang Y., Bambrick H. et al. (2019) The 2019 report of the MJA-Lancet Countdown on health and climate change: a turbulent year with mixed progress. Medical Journal of Australia. Published online 14. November 2019. doi: 10.5694/mja2.50405
[56] Hanson AL, Bi P, Ryan P, Nitschke M, Pisaniello D, Tucker G (2008). The effect of heat waves on hospital admissions for renal disease in a temperate city of Australia. International Journal of Epidemiology. 37:1359-65.
[57] Beggs PJ., Zhang Y., Bambrick H. et al. (2019) The 2019 report of the MJA-Lancet Countdown on health and climate change: a turbulent year with mixed progress. Medical Journal of Australia. Published online 14. November 2019. doi: 10.5694/mja2.50405
[58] Davis RE, Novicoff WM (2018). The impact of Heat Waves on Emergency department Admissions in Charlottesville, Virginia, U.S.A. International Journal of Environmental Research and Public Health. 15 (7):1436 doi: 10.3390/ijerph15071436
[59] Linares C, Diaz J (2007). Impact of high temperatures on hospital admissions: comparative analysis with previous studies about mortality (Madrid). European Journal of Public Health. 18 (3): 317-322.
[60] Garba B., Bahaman AR, Bejo SK et al. (2018) Major epidemiological factors associated with leptospirosis in Malaysia. Acta Tropica. 178: 242-247.

conditions for breeding and transmission are become even more favourable. This study will explore increases in specific communicable disease with certain weather conditions. Here lag times have to be considered, e.g. the lag between breeding cycles of mosquitoes or rats and increase in disease outbreaks.

3. Workforce Development: Raise awareness and upskill health professionals and administrators to improve recognition of relevant symptoms, understanding of correct coding and shape their community outreach and education programmes.

When doctors, hospital administrators and public health officials are more aware of the links between climate change and health, particularly when local data is available, medical conditions are more likely to be linked to specific climate change events such as a heat wave. This in turn can lead to more accurate coding which results in more accurate data feeding into the other proposed action areas and community outreach/education programmes. Strategies could include PhD scholarships for climate and health research and supporting the Medical Association of Malaysia, Penang Chapter to facilitate upskilling, awareness raising and building a community of practice that is interested in more closely linking with the adaptation fund.

Under Component 5, Building Institutional Capacity, is particularly relevant for this programme. It was designed to impact as much as possible other cities in Malaysia, in accordance with the intentions of the National Designated Authority, and it has a total budget of USD 1,306,014 for three outputs. The budget was allocated based on a combination of discussions with the senior leadership of the main project partners, the community consultation process and technical advice. The output 5.1 is the most relevant in terms of actively transmitting methodology and data to other cities in the country and, the budget of USD 550,000 was estimated by consulting with firms providing services in this field and by comparing reference costs of similar existing platforms in the region. The budget for output 5.2. was provided by the city council, as they had been planning for the creation of a similar unit (although exclusively dedicated to Disaster Risk Reduction). The budget for output 5.3., was estimated by consulting with different public health experts.

Components 1 and 2 constitute the built components of the programme to which 70,7% of all components' funding will be allocated. The high budget results from the type and specific nature of these activities and their intended outcomes: substantial results in terms of temperatures reduction and stormwater management improvement. Component 5, institutional capacity has the third highest budget, as it is the intention of all stakeholders to extend the benefits of the programme to other cities in Malaysia, and is in-line with the policy of the national government. The social vulnerability component (4) has a lower but still substantial budget, capable of leading to transformative change. The component with the lowest budget is Component 3, the vulnerability baseline assessment and action plans. 6

B. Economic, social and environmental benefits

Table 11. Economic, social and environmental benefit

Type of benefit	Baseline	With/after the project
Economic	• Increase of extreme weather events resulting in floods, impact on private	• Reduced losses on private property due to flooding.

	property and public infrastructure, economic losses and worsen livelihood conditions. • Increased impact to human health due to heat stress. • Decreased productivity for outdoor workers. • Increased negative impact in agriculture and overall ecosystem health due to weather irregularity and extreme events.	• Reduced losses on public infrastructure due to flooding. • Reduced impact to human health due to flooding. • Reduced impact to human health due to heat stress. • Reduced impact on crop yields and ecosystem health via biodiversity supporting measures. • Reduced disruption to business due to flooding
Social	• Extreme weather events such as floods and heatwaves are considered co-drivers of poverty and result in social problems such as sanitation, food security and so on. • Damage to infrastructure and property resulting of flooding have a disproportional impact on the most vulnerable communities (the poorest, the elderly, the young and the disabled people). • Heat stress has a severe impact in public physical and mental health.	• Reduced social impacts in communities under poverty. • Reduced damage to infrastructure. • More resilient vulnerable communities. • Reduced public health impacts. • Reduced mental health problems due to extreme weather events', flooding, displacement and heat stress impact on the population.
Environmental	• Extreme weather events such as floods and heatwaves have a severe impact on ecosystems and biodiversity. • Long term stress such as heat stress can have a severe impact on ecosystems and biodiversity.	• Reduced human impact in environmental degradation. • More balanced ecosystem health. • Reduced loss of urban biodiversity. • Sustained and enhanced capacity of ecosystems to provide life-supporting services

The programme will also result in an accessory benefit, although it is not the focus of this proposal: mitigating climate change, as overall temperatures being reduced will lead to reduced use of air conditioning and of energetic costs.

C. Cost effectiveness

NBS are well known for being considerably cost-effective in terms of climate change adaptation.[61]

The programme aims to be cost-effective also by:

a) Reducing impacts to public health.
b) Reducing impacts to infrastructure and private property due to flooding.
c) Reducing damage to ecosystem health and loss of biodiversity.

Other positive aspects are effectiveness of operations, community engagement and adequate selection of technical options.

Approximately 70% of the investments will be directed to built interventions, maximizing the direct beneficiaries of the project. The investments in strategies and actions will be directed to:

a) greatly benefit the implementation of the built projects;
b) strengthen the community's awareness and resilience;
c) strengthen local, regional and national levels' institutional capacity and planning policy.

Table 12. Brief cost effectiveness analysis of proposed adaptation options

Proposed action	Cost effectiveness criteria		Alternative action	Cost effectiveness criteria	
Greening urban Penang / heat reduction	Future cost of climate change	✓	Built structures for shading and introducing pedestrian air conditioned streets	Future cost of climate change	X
	Project efficiency	✓		Project efficiency	X
	Community involvement	✓		Community involvement	-
	Cost/feasibility	✓		Cost/feasibility	X
	Environmental and safeguarding risks	✓		Environmental and safeguarding risks	X
Stormwater management	Future cost of climate change	✓	Significantly extend hard drainage infrastructure	Future cost of climate change	-
	Project efficiency	✓		Project efficiency	X
	Community involvement	✓		Community involvement	-
	Cost/feasibility	✓		Cost/feasibility	X
	Environmental and safeguarding risks	✓		Environmental and safeguarding risks	X
Comprehensive vulnerability / baseline assessment and action plans for	Future cost of climate change	✓	Programmes for vulnerability self-assessment and	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	X
	Community involvement	✓		Community involvement	✓

[61] Doswald, N. et al. (2014) 'Effectiveness of ecosystem-based approaches for adaptation: review of the evidence-base'. *Climate and Development,* 6, pp.185–201.

social resilience strengthening in mukims George Town and Bayan Lepas	Cost/feasibility	✓	awareness, post disaster assistance and relocation	Cost/feasibility	X
	Environmental and safeguarding risks	✓		Environmental and safeguarding risks	✓
Strengthening social resilience	Future cost of climate change	✓	Women and youth posttraumatic support centre; Temporary shelters; School temporary relocation..	Future cost of climate change	X
	Project efficiency	✓		Project efficiency	X
	Community involvement	✓		Community involvement	X
	Cost/feasibility	✓		Cost/feasibility	X
	Environmental and safeguarding risks	✓		Environmental and safeguarding risks	X
Building institutional capacity	Future cost of climate change	✓	Developing new climate adaptation studies for each municipal programme; Climate-related programmes to be developed for all organizations and city council departments. New national level policy from the Malaysian Ministry of Health.	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	X
	Community involvement	✓		Community involvement	✓
	Cost/feasibility	✓		Cost/feasibility	X
	Environmental and safeguarding risks	✓		Environmental and safeguarding risks	✓

D. Consistency with national or sub-national strategies

The 11th Malaysia Plan 2016-2020 is Malaysia's five-year development plan towards realising its Vision 2020 and has been mapped against the UN's Agenda 2030 and its direction filters down in sub-national plans. The Nature-Based Climate Adaptation Programme for the Urban Areas of Penang Island is consistent with the 11th Malaysia Plan, notably Focus Area D Strengthening Resilience Against Climate Change and Natural Disasters – and is aligned with programme strategies as follows:

Programme area: Stormwater management

The Department of Irrigation and Drainage Malaysia (JPS) will use alternative and new technologies, including multifunctional mechanisms, to mitigate floods and encourage investment. For example, retention ponds, besides mitigating floods, will also be used as artificial wetlands for water quality improvement, habitat grounds for wildlife and recreational parks. Retention ponds with aesthetic improvements will increase the commercial value of land surrounding the area.

In addition, the JPS and relevant agencies will strengthen long-term flood mitigation solutions through implementation of Integrated Water Resource Management, Integrated River Basin Management and Integrated Flood Management. This includes the implementation of integrated solutions using a combination of structural components (e.g. retention ponds, diversion and river improvement works) and non-structural components (e.g. flood maps, flood warning system and flood proofing).

Programme area: Vulnerability assessments

The Government will implement strategies to raise the income and wealth ownership of the B40 (Bottom 40%) households, address the increasing cost of living and strengthen delivery mechanisms for supporting B40 households. The Government is also committed to introduce the Multidimensional Poverty Index (MPI) to ensure that vulnerability and quality of life is measured in addition to income. The use of the MPI will ensure that policy deliberations will shift beyond poverty, to include vulnerability as well and complement the Poverty Line Income.

Programme area: Institutional capacity: Knowledge transfer, climate board, public health programme

Communication, education and public awareness (CEPA) programmes engaging all levels of society will be enhanced to increase awareness about the environment, climate change adaptation and mitigation, conserving natural resources, and the role of green growth in raising productivity. This will instil a sense of shared responsibility among all stakeholders including federal and state governments, the private sector, academia, NGOs and the community towards comprehensive and coordinated efforts for better quality of life.

In addition to the 11th Malaysia Plan, the National Environmental Health Action Plan[62] was recently launched. It is a national level method of planning and implementing comprehensive and holistic actions with regard to the health of the environment and how to address climate change and health issues.

Social resilience building: Women and schools

The Government will improve the effectiveness of CEPA programmes by coordinating and integrating public awareness messages communicated by different public sector agencies and on different themes, including demand side management, transport, energy consumption, recycling, biodiversity conservation, climate change, disaster risk management and environmental pollution. Better coordination will increase understanding, visibility and retention of such messages, ensuring the right messages are communicated to the correct target audiences, such as women and school children.[63]

Several related policies have been developed by the government to ensure that climate resilient development is able to fulfill the national sustainability agenda.

[62] http://nehapmalaysia.moh.gov.my/

63 Eleventh Malaysia Plan 2016-2020: https://www.talentcorp.com.my/clients/TalentCorp_2016_7A6571AE-D9D0-4175-B35D-99EC514F2D24/contentms/img/publication/RMKe-11%20Book.pdf

Ministry of Environment and Water (KASA) .[64]

KASA's vision is to ensure energy sustainability and wealth creation through science and technology, and environmental sustainability. The federal agency has four key missions: 1) managing energy resources, 2) creating growth opportunities through investment in science and technology, 3) preserving the environment through education, awareness and enforcement, and 4) leading climate change adaptation and mitigation measures to ensure the country's resilience. Most, if not all, of these are in development: establishing a National Climate Change Centre (NCCC); developing climate change mitigation and adaptation plans; and drafting a Climate Change Act 2021 bill. Recently, a draft final report on a National Low Carbon Cities Masterplan has been developed which draws out a guide for the implementation of low carbon cities at the state and local level.

The programme is fully aligned with the *Malaysia Third National Communication and Second Biennial Update Report to the UNFCCC*, developed by the Ministry of Energy, Environment, Science, Technology and Climate Change and finalised in 2018 in terms of the development of relevant adaptation strategies.

With regards to the state of Penang, both the Penang State Government and the Penang Island City Council have a general greening policy which tackles waste management and greening schemes. They are currently developing policies to address climate change.

Penang State Government

Prior to the State's Penang 2030 vision, a Cleaner Greener Penang policy was formed to beautify Penang's image as a green and clean state and to improve the liveability of its built environment with a focus on waste management. Under Penang 2030 one of its four primary thrusts is to invest in the built environment to improve the state's resilience through the development and implementation of a climate change adaptation plan. The State is concurrently developing the Penang Green Agenda which aims to identify and prioritise environmental targets including strategies to mitigate and adapt to climate change.

Penang Island City Council

The City Council adopted the State's Cleaner Greener Penang initiative as a general road map to deliver a cleaner and greener city and improve the quality of life in Penang. Some of these initiatives include a bike sharing system, energy efficient lighting, plogging and tree-planting programmes. The city council is currently developing a low carbon cities framework to guide future urban development in the state.

E. Compliance with relevant national technical standards and the Environmental and Social Policy of the Adaptation Fund.

The Nature-Based Climate Adaptation Programme for the Urban Areas of Penang Island is cognizant of complying with relevant technical standards and will take due care to do so.

64 http://inisiatif.mestecc.gov.my/core/3rd_sector/3.4.2_ms.html & http://inisiatif.mestecc.gov.my/core/3rd_sector/3.4.3_ms.html

Compliance will be ensured with all national technical standards as well as UN-Habitat and Adaptation Fund Environmental and Social, and Gender Policy requirements.

The programme is in accordance with two national regulation plans, the National Landscape Master Plan and the National Urbanisation regulations, which provide mostly guidelines but also a few technical standards. The National Landscape Master Plan regulations provides guidelines on green urban spaces, softscape and hardscape and on the protection of Malaysian landscape. The National Urbanisation Plan regulations provides guidelines on urban open spaces, recreational and sports areas.

PlanMalaysia's planning guidelines include a few standards related to green neighbourhoods[65], rooftop gardens[66] and back lanes.[67]

The organisations in charge of executing the programme will also comply with the Malaysian technical standard MS ISO 14001:2015, which is identical to ISO 14001:2015, *Environmental management systems - Requirements with guidance for use, published by the International Organization for Standardization (ISO).*'

Table 13. Compliance with relevant national technical standards and tools

Expected Output or Intervention	Relevant rules, regulations, standards and procedures	Compliance, procedure and authorities involved	Screening against AF ESP Principles
Output 1.1. New tree-line streets / Connected canopies constructed **Output 1.2.** Pocket parks / vacant spaces constructed **Output 1.3.** Green parking spaces constructed **Output 1.4.** Green facades constructed (Built structures greening) **Output 1.5.** Green rooftops constructed	11th Malaysia Plan 2016-2020: Anchoring Growth on People; dated 2015 12th Malaysia Plan 2021-2025; pending parliamentary approval National Policy on Climate Change; dated 2019 National Policy on Biological Diversity 2016-2025; dated 2016 National Landscape Master Plan; dated 2011 National Environmental	Collaboration with the national government will be part of the process of promoting the social programmes output, raising public awareness, and using their multidimensional poverty index to conduct the vulnerability assessments. Outputs 1.1 to 2.3, focused on implementing nature-based solutions, will require co-implementing partners such as The Penang State Government, The Department of Irrigation	All principles will be considered when producing the outputs. No environmental and social principles are expected to be triggered as a result of this action When carrying out outputs 1.1 to 1.6 and outputs 2.1 to 2.3, particular importance will be placed maintaining AF ESP Principles 1 2, 3, 8, 9, and 10,

[65] https://www.townplan.gov.my/index.php/en/agensi/penerbitan-planmalaysia/garis-panduan-perancangan/2083-5-gp024-gpp-kejiranan-hijau/file

[66] https://www.townplan.gov.my/index.php/en/agensi/penerbitan-planmalaysia/garis-panduan-perancangan/2082-4-gp014-a-gpp-taman-atas-bumbung/file

[67] https://www.townplan.gov.my/index.php/en/agensi/penerbitan-planmalaysia/garis-panduan-perancangan/2090-12-gp025-gpp-lorong-belakang/file

(Built structures greening) **Output 1.6.** Urban agriculture programme initiated **Output 2.1.** Blue-green corridors developed **Output 2.2.** Upstream retention constructed **Output 2.3.** Swales and infiltration wells constructed **Output 3.1.** Capacity development support for vulnerability assessment and climate change-related planning provided to the two mukims. **Output 4.1.** School-level awareness programme developed and implemented **Output 4.2.** Women and girls programme developed and implemented **Output 5.1.** Communications and knowledge platform developed and implemented **Output 5.2.** Penang Climate Board created **Output 5.3.** Climate-related public health programme developed and initiated	Health Action Plan, dated 2007 Cleaner, Greener Penang state initiative; launched 2010 Penang 2030: A Family-focused green and smart state that inspires the nation; dated 2018 Penang Green Agenda; expected 2020 publication date Low Carbon City Framework (LCCF); Performance Criteria 2,3 and 10; dated 2011 Urban Stormwater Management Manuel for Malaysia 2011; dated 2011 National Urbanisation Plan, dated 2006 Malaysia Standard ISO14001:2015: Environmental management systems, dated 2015 Kejiranan Hijau guidelines (Green Neighbourhood); dated 2012 Lorong Belakang (Lorong Belakang); dated 2014 Taman Atas Bumbumg guidelines (Rooftop Gardens); dated 2012	and Drainage (JPS), NAHRIM (National Hydrology Research Institute), National Institute of Landscape Architecture, the National Forestry Institute, and so on, to ensure the appropriate procedures are followed. Several knowledge-exchange partnerships will be established, most notably with the Smart Utilities Research Institute of Tsinghua University Innovation Center in Zhuhai, China, to discuss the design of sponge cities. The project aims to partner with the Women's Centre for Change, Penang's most widely recognised women's organisation, to ensure gender inclusive outputs. To deliver Penang 2030, the Cleaner Greener initiative, and meet the necessary compliance procedures for each output, the project will work closely with Penang State Government and the Penang Island City Council. The Mistry of Energy, Science, Technology, and Climate Change (KASA) will be the executive entity for the Penang Climate Board output.	due to their relevance to the delivery process. When carrying out output 3.1, AF ESP Principles 3, 4, 5, 6, 7, and 8 will be observed to ensure all vulnerabilities are accounted for. When carrying out outputs 4.1 to 4.2, special focus will be placed aligning with AF ESP Principles 2, 3, 4 and 5 so as to achieve equitable and inclusive outputs. When carrying out outputs 5.1 to 5.3, observing AF ESP Principles 2, 3, and 4 will be especially important for the delivery of equitable and inclusive outputs.

The programme may result in adjustments to national technical standards. Some outputs, such as the selection of climate-resilient street trees for Malaysia, to be developed together with Jabatan Landskap Negara (National Institute of Landscape Architects), will have an impact on policy and urban design guidelines and, possibly, on technical standards as well, in what relates to specific construction details for tree pits.

F. Duplication with other funding sources

The Penang state government has allocated for the year RM150 million in funds to implement 8 flood mitigation projects to reduce flood occurrence risk in hotspots area funds for flood mitigation projects, which will include mostly drainage infrastructure and approximately 15% of nature-based solutions.

No other relevant nature-based climate adaptation projects are being proposed for Penang island external to the programme and the projects listed below and. It is, however, possible that there will be social vulnerability reduction initiatives being developed parallel to the programme by NGOs without the team's knowledge. Most investments from Penang government are mitigation-focused (solar panels and so on). These are complementary and not overlapping measures.

The significant projects from the city council (MBPP) are:

a) Tree planting in George Town and Bayan Lepas for 2020/2021 – budget of RM 250,000.
b) Backlanes greening in Kampung Malabar, Lebuh Cintra and Lebuh Chulia for 2020/2021 - budget of RM 800,000.
c) Backlanes greening in People's court area for 2020/2021 – budget of RM 1,000,000.
d) Grant offer for application by public and organizations to encourage Green Initiatives / Green Building Institute (GBI) certifications - budget of RM 1,000,000.
e) There will be additional co funding to some components of the programme. Since the concept note was submitted to the Adaptation Fund, the programme has received the Climathon Global Cities Award from EIT Climate-KIC, in the amount of Euros 60,000. This amount will be allocated mostly to the study of climate-resilient street trees for Malaysia. Naturally adjustments will be made to the budget before the final proposal is submitted and during the development of the programme.

The additional co funding for urban agriculture is as follows:
RM 200,000 (Habitat Foundation – RM 35,000; Sultan Idris University – RM 10,000; US State department/US embassy – RM 25,000; Penang state government – RM 40,000; Homegrown farms – RM 30,000; Chief Minister Incorporated – RM 60,000).

G. Learning and knowledge management

At a local level, a participatory approach involving communities and local authorities in planning and implementation will lead to increased local awareness and knowledge on climate change risks and adaptation. Pilot projects will contribute to sharing lessons and evaluate the best strategies.

At city level, transfer of results and lessons learnt to other communities across Penang state will be promoted. All information will be consolidated in reports and fully accessible online via the knowledge management platform, which will, naturally, also be available nationally and internationally. Beyond reports, specific tools and guidelines will also be available to all levels.

As the programme is designed to be demonstrative / proof of concept with a strong knowledge codification component, to be scaled in Malaysia and elsewhere in the region, both national and international levels are particularly important. To that end, the full proposal will seek to track and measure all the project's adaptation benefits, and use its knowledge management-related activities to promote and replicate both the benefits and the MRV system that tracks them.

At national level, knowledge transfer will benefit other vulnerable municipalities by mainstreaming municipality adaptation methodology and assessment of effectiveness of the different strategies. Partnering ministries, government agencies, CSOs and scientific support institutions (as NAHRIM) in the programme will facilitate countrywide dissemination of strategies and methodology, including in terms of policy. By partnering with NAHRIM for monitoring and modelling purposes, effective knowledge consolidation will trigger institutional learning processes, allowing for replication and scaling of strategies nation-wide.

Beyond the knowledge transfer online platform, KASAand NAHRIM will help to mainstream municipal climate adaptation framework and methodology to all cities in Malaysia in multiple formats.

At international level there are several knowledge-exchange partnerships being discussed, most notably with the Smart Utilities Research Institute of Tsinghua University Innovation Center in Zhuhai, China, focused on sponge cities design.Since the concept note was submitted to the Adaptation Fund, the programme has received the Climathon Global Cities Award from EIT Climate-KIC. This already allowed for international exposure, and the award is comprised of scientific support from the Crowther Lab and ETH Zurich university, beyond the monetary reward.

UN-Habitat will also provide a knowledge platform for the programme via a number of international dissemination mechanisms.

A communications plan established in the inception phase of the project and managed in association with the knowledge management plan, will contribute to ensure active knowledge dissemination at all levels.

Table 14. Learning and Knowledge Programme Components

Expected concrete outputs	Learning objectives & indicators	Knowledge products
1.1 In-depth comprehensive vulnerability / baseline assessment and action plans for social resilience strengthening in mukims George Town and Bayan Lepas	a) Improved climate change -sensitive planning at community and city level	Mukims climate action plans
1.2. Extensive tree alignments will be introduced in existing streets	b) Impact of street trees on temperature reduction	List of climate-resilient street trees' species for Malaysia (developed together with Jabatan Landskap Negara and botanic experts, to be incorporated in policy) Scientific reports and articles
1.3. New climate-conscious green	c) Impact of small green	Scientific reports and articles

areas will be built in vacant spaces in urban areas	urban spaces on temperature reduction	
1.4. Existing car parks will be shaded by trees	d) Impact of tree-shading in car parks and asphalt	Scientific reports, toolkits and articles
1.5. Green will be introduced to facades	e) Impact of green facades in street temperature	Scientific reports, toolkits and articles
1.6. New green roofs	f) Impact of green roofs in reducing the UHI effect	Scientific reports, toolkits and articles
1.7. New urban agriculture plots will be introduced, and training provided	g) Improving resilience and diet of communities	List of species for urban agriculture in Penang and how different species can contribute to reduce nutrient-deficiency Toolkits
1.8. Climate-conscious green elements will be added to existing river corridors to promote temperature reduction, air circulation and stormwater storage and retention	h) Impact of river corridors in temperature reduction and stormwater retention capacity	Scientific reports and articles
1.9. Storage and retention areas will be introduced in strategic areas upstream in order to reduce flooding	i) Impact of upstream retention areas in reducing flooding downstream	Scientific reports and articles
1.10. Swales and infiltration wells will be introduced in urban areas	j) Impact of swales and infiltration wells in reducing flooding	Scientific reports and articles
1.11 Schools programme	k) Increased awareness of main challenges youth faces	Reports
1.12 Women and girls programme	l) Improved understanding of gender-biased climate vulnerability m) Equal gender representation in climate-related decision making processes	Reports Standards for gender representation in climate-related decision making
1.13. Creation of a knowledge transfer platform and a communications plan	n) understanding how knowledge dissemination will be extended to other vulnerable communities	Online knowledge transfer platform Monthly reports sent to all stakeholders
1.14. Creation of the Penang climate board, a unit in the municipality to address climate-related issues	o) improve understanding of how effective a climate dedicated unit in the city council will be and its impact in different municipality departments' decisions	Scientific reports and articles
1.15. Development of a climate-related public health programme	p) contribute to the understanding of the impact of climate change in public health in Malaysia	Scientific reports and articles

H. Consultative process

During the development of the programme a multipronged community and stakeholder consultation methodology was undertaken that included a series of one-on-one meetings, two workshops, six focus group discussions (FGD) and a survey. The workshops were attended by 77 local people, the focus groups by 53 and the survey was answered by 324 people.

A display outlining the programme was installed as part of the Penang Climate Action Week (the first of its kind to take place in Malaysia). An additional workshop on climate adaptation was held by the Penang State Government in November 2019 as part of its Penang2030 initiative and was attended by 35 participants from multiple organisations.

The goal of the engagement was to gain insights on the impacts of climate change, self-identified vulnerabilities, as well as to identify the main concerns and possible strategies for adaptation. Nature-based solutions were presented and advantages and challenges of implementation discussed with the community and key stakeholders. Most consultation activities took place in October and November 2019.

FGDs were held in communities vulnerable to climate change impacts: a) UNESCO World Heritage Site (vulnerable to floods, heat stress and extreme weather events), b) Sungai Pinang community (the most flood-prone area of the city), c) Air Itam (low income communities). Other relevant stakeholders engaged were significant industry players, different CSOs, some of them representative of vulnerable groups (women and youth) and various government and non-government agencies.

Table 15. Stakeholders and communities engaged

Communities	World Heritage Site	Communities	Lim Jetty
			Acheh Mosque
			People's court
	Sungai Pinang		Hasnim Yahya Mosque
			Taman Free School
			Jalan Perak
	Air Itam		Kampung Melayu
			Kampung Pisang
			Taman Lumba Kuda
			Masjid Negeri
CSOs	Penang Youth Development Centre		
	Youth Parliament of Malaysia		
	Penang Women Development Corporation		
	Women and Family Development committee		
	Penang Deaf Association		
	Penang Forum		
	Water Watch Penang		
	Persatuan Ilmu Murni Pulau Pinang		
	Malaysia Nature Society		
Industry	Penang Skills Development Corporation		
	Penang Development Corporation		
	LLA Arkitet		
	Perunding YAA		
	PAM (Malaysian Architects Association)		
	CREST		
	ILAM (Malaysian Landscape Architects Association)		
	Real Estate & Housing Developers' Association		
	Construction Industry Development Board		

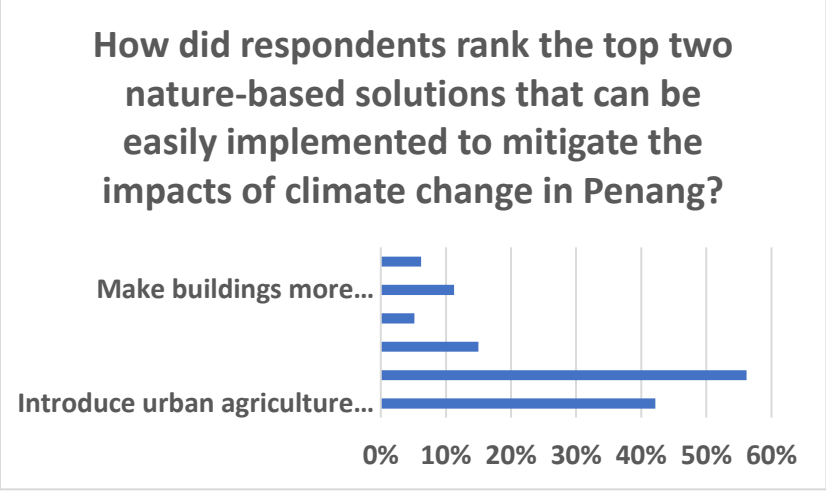
	Perbadanan Bekalan Air Pulau Pinang
	Penang Hill Corporation
	Master Builders Association Malaysia
Government	Majilis Bandaraya Pulau Pinang urban services
	Jabatan Kerja Raya (Public Works Department)
	EXCO YB Phee Boon Poh (State minister for Social Harmony and Environment)
	EXCO YB Zairil KHir Johari (State minister for Public Works and Flood Mitigation)
	Penang Green Council
	Jabatan Pengairan Dan Saliran (Drainage and Irrigation Department)
	Chief Minister Incorporated
	BPEN (State Economic Planning Unit)
	Plan Malaysia
	Jabatan Kerja Raya (Public Works Department)
	Pegis Penang
	Majlis Bandaraya Seberang Perai
	Bahagian Kerajaan Tempatan
	Malaysia Green Building Council
	Implementation Coordination Unit
	Jabatan Alam Sekitar
	Penang 2030
Institutions	Penang Institute
	Habitat Foundation
	Penang Botanical Garden
	Universiti Sains Malaysia

Findings

- All stakeholders agreed that Penang is vulnerable to climate change impacts due to its geographic location, however, awareness varies between groups.
- All stakeholders mention increased temperatures and flooding as the main impacts' changes in terms of climate in Penang island.
- Flooding was the impact highlighted for George Town mukim and temperature rise for the Bayan Lepas mukim.
- Vulnerable communities identified an increase of heat-related diseases (flu, fever and so on), mainly linked to the elderly and children.
- Vulnerable communities identified mental health impacts of heat, such as increased irritability, and emotional stress related to storms.
- Some stakeholders – not all – were able to link their socio-economic wellbeing to climate change impacts.
- The use of NBS for the urban areas of Penang island was overwhelmingly supported but some obstacles were highlighted, such as operational challenges and contestation over responsibility.
- Residential as well as commercial areas have reported losses due to flooding (in a range of RM10,000 to 50,000) and associated limited mobility.
- Lack of community organisation identified in non-commercial areas, making it difficult to organise a response in times of crisis.

- In the George Town mukim consultation, new tree lined streets were consistently rated has having a high impact but challenging to implement due to impact of the root system in the pavement and maintenance costs.
- In the Bayan Lepas mukim consultation, the NBS prioritised was new tree lined streets as well as greening car parks. Green roofs were considered to be of low to medium impact but of easy implementation.

Figure 2. Results of the Penang Climate Adaptation Survey



Conclusions

- Climate change awareness is needed for the entire population but youth groups were identified as being particularly unaware of climate change risks. This may signal the need to develop specific awareness programmes dedicated to this age group.
- Challenges identified in relation to the implementation of NBS are often a result of technical implementation errors, as is the case with trees falling during storms. The reason for this to happen in Penang is more often due to the lack of proper development of the root system, which curtails its structural function (due to lack of adequate sizing of the tree pit and the wrong choice of tree species) than to the intensity of winds.
- Increase of heat-related diseases in the elderly and children may pose a risk of overburdening women, due to their role as main caregivers.
- Despite the seven casualties in the floods of 2017, health is mentioned more in association to heat stress than to flooding.
- Even though NBS implementation in Penang was supported, some mentioned construction as being a disruptive.
- Upstream retention is not prioritised possibly because it is a technical, unfamiliar term and concept and its potential for reducing flooding is not fully understood.

The multipronged community consultation adopted used different techniques to solicit community and stakeholders' views. The survey results legitimise the inclusion of an urban agriculture component, but other forums suggested that vulnerable groups were more concerned about heat stress and the risk of flooding. The consultation also helped shape the

project components, for example extra support for caregivers (mostly women) as heat stress has demonstrated to have a major impact on children and elderly's health. The full consultation document is available upon request.

I. Justification

Table 16. Project justification

Outcomes / planned activities	Baseline (without AF)	Additional (with AF)	Comment and alternative adaptation scenarios
Outcome 1.1. Reduction of overall urban atmosphere temperatures by 1°C 5-7 years after project completion.	Increased heat stress. Specific vulnerable groups, as outdoor workers, children and the elderly becoming more exposed.	Reduced temperatures and heat stress.	Introduction of artificial shading in the streets (research shows its impact will be significantly lower than that of street trees). Introduction of air conditioning in the streets, furthering climate change problems (production of carbon dioxide) and vulnerabilities (by increasing reliance and pressure on the power grid, exposing the population to power outages).
Outcome 1.2. Reduction of hard surfaces, resulting in the reduction of the urban heat island effect in the city.	Cumulative impact of urban heal island effect and climate warming increasing the temperature above the mean atmosphere temperature.	No additional temperature increase due to the urban heat island effect.	Adding a coating that reduces heat absorption to pavement. Tests developed in Penang by Think City demonstrate that this type of coating may reduce the temperature of temperature up to 8C degrees, while hard/surfaces/soft surfaces can differ in up to 30C degrees.
Outcome 1.3. Reduction of temperatures in the streets and inside buildings.	Increased temperatures and dependency on air conditioning. Increased energy costs, disproportionally impacting vulnerable communities.	Reduced temperatures in urban areas and therefore, in households. Reduced reliance on air conditioning and costs with energy costs.	To reduce disproportional impact to vulnerable communities, possibly creating a support programme to finance low income households' energy costs.
Outcome 1.4. New urban agriculture gardens are incorporated in the city. Training sessions will take place in a number of (4/month) 240 sessions in total.	Increased costs of food disproportionally impacting the most vulnerable communities.	Community gains knowledge on urban agriculture and nutrition, Community grows their own produce. Reduced nutrient deficiency. Reduced food miles	Policies and initiatives supporting low income communities' access to produce and nutrition.
Temporary storage of stormwater, reducing flooding	Increased flooding.	Reduction in economic losses (private property and infrastructure) and negative impacts to public health, natural assets and ecosystems.	Significant extension of the drainage hard infrastructure. Although Penang urban areas are not very vulnerable to sea level rise, drainage infrastructure could be impacted, as there's a risk that stormwater could not be drained in a situation of combined high tide and heavy rainfall

Outcome 1.5. Increased awareness on systems assessment, including private property, infrastructure and natural assets; improved planning for adaptation.	Vulnerable community with little awareness regarding climate risks in general and on critical infrastructure and private property.	Community is aware, critical infrastructure and property become more resilient. New projects developed include climate adaptation measures.	No alternatives to awareness on climate change and improved planning for adaptation were identified.
Outcome 1.6. Increased school building resilience, greater levels of knowledge and awareness among students, teachers and educational authorities.	Youth is unaware of climate risks (as verified in community consultation). Schools are vulnerable to disruptions resulting of extreme weather events. Youth is uninformed and untrained on urban agriculture. School grounds do not fulfil their potential in temporary stormwater retention.	Youth becomes aware of climate risks and trained in urban agriculture. Schools are prepared to deal with extreme weather events.	Other programmes directed at youth on climate change awareness may be developed at national level.
Outcome 1.7. Reduced gender vulnerability asymmetries.	Women are disproportionally impacted by climate change. Women are not represented equally in climate-related decision-making processes. Increase of heat-related diseases in children and elderly people place an additional burden on women as the main caregivers.	Women are aware of climate-related risks and given tools to deal with specific challenges, such as children and elderly heat-related diseases. Quotas for women representation in Penang climate-related decision-making processes.	Other programmes directed at youth on climate change awareness may be developed at national level.

Outcome 1.8. Project implementation to be fully transparent. Information of strategies and projects to be made available to other municipalities in Malaysia and in the Southeast Asia region for replication.	Knowledge transfer and dissemination is not developed in terms of municipal climate adaptation.	Knowledge transfer will increase and the likelihood of follow up finance for additional investment will be increased. Other vulnerable communities in Malaysia and in the Southeast Asia region can access knowledge developed in the programme, which may assist with the development of their own climate adaptation projects and plans.	Without the knowledge transfer platform the chances of wider knowledge generation resulting of the programme and follow-up financing would be limited.
Outcome 1.9. Penang climate board: a unit created in connection with the municipality will monitor and evaluate all climate-related risks, addressing the problem with a comprehensive perspective.	There is no city council department addressing climate change in a holistic, integrated way.	The creation of a dedicated and centralised unit addressing climate related risks and challenges will be of great significance in increasing resilience in Penang island.	National and regional level dedicated units for climate related risks and challenges.
Outcome 1.10. Comprehensive public health programme, including pilot project monitoring heat related illness in selected hospitals in Penang.	Heat-related diseases such as heat stress and heat stroke are not identified and coded accordingly in hospitals, therefore there is no data related to public health impact of heat waves and temperature rise.	Heat-related and other climate-related diseases are identified by hospitals and research can be developed in order to identify measures which can be put in place to reduce the risks.	A programme addressing specific climate-related public health risks developed at national level.

J. Sustainability

Institutional
The programme is aligned with Malaysian national goals in terms of adaptation initiatives. It is expected that the programme will contribute to the adaptation of other municipalities in Malaysia via knowledge transfer platform and replication of strategies.

Penang2030 was launched in 2018 by the Penang State Government with the headline to be a "family focused, green and smart state that inspires the nation'. One its four overarching themes is to invest in the built environment to improve resilience. There is an explicit initiative to implement a climate adaption programme underpinned by nature based solutions, sponge city principles and partnerships with international agencies (www.penang2030.com).

Social
Community consultation had a significant impact in designing the programme. When the projects are implemented, communities will gain greater awareness of climate change impacts and the need for adaptation. Additional benefits are added training and skills in urban agriculture and building and maintaining green infrastructure.

By directly addressing the needs and engaging with vulnerable communities (B40, women and girls and youth) the programme will also contribute to reduce unbalances in the social dynamics in what relates to vulnerability to climate impacts.

Economic
Adaptation measures are essential in order to reduce economic losses, mainly from flooding. As exemplified previously in the cost-benefit analysis, one flood in 2017 caused significant damages; avoiding floods would have a significant positive impact in limiting damages and economic losses.

Financial
When action plans are completed under component 3, a study will be conducted to identify national, regional and local financial sustainability models. Willingness to pay engagements and studies will be conducted, particularly directed to the private business community of Bayan Lepas mukim.

Environmental

It is of utmost importance that no component of the project (particularly built components 1 and 2) has any negative impacts in the ecosystem. Beyond the botanical experts consulting for the programme, both Perhilitan (National Institute of Wildlife) and Perhutanan (Forestry National Institute) were invited to participate as supporting executing entities, to which they have agreed. All elements (plant species and projects) will be reviewed by these two entities in order to confirm they have no negative impact in local ecosystems or wildlife.

K. Environmental and social impacts and risks

Risks associated with the creation of green spaces are mainly associated with possible negative ecosystem impacts of species introduced. By having Perhilitan (National Institute of Wildlife) and Perhutanan (Forestry National Institute) as supporting executing entities, analysing and validating the species proposed, this risk is greatly reduced.

In the community consultation stage two other risks were identified. The first risk was the possibility of trees falling during storms and damaging property or endangering lives. Trees falling during storms occasionally happens in Penang, not due to the intensity of winds, by as result of technical implementation errors resulting in the lack of proper development of the root system. Two main reasons for this were identified: small and inadequately designed tree pits and the wrong choice of tree species may lead to an abnormal development of trees, in which the canopy is not balanced in size by the root system, severely endangering its natural structure. This risk will be mitigated by the development of a list of climate-resilient street trees for Malaysia, in partnership with Jabatan Landskap Negara and local botanical experts as well as typical construction details for street trees' pits.

The second risk identified in community consultation was the disturbance of the normal life of citizens during construction. This risk will be mitigated by having a strong and detailed planning phase, which will allow to reduce the duration of the construction works to the minimum and, therefore, also reduce the disturbance of the citizens' routines.

Table 17. Risk Mitigation Actions

Checklist of environmental and social principles	No further assessment anticipated required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	X	
Access and Equity		X
Marginalized and Vulnerable Groups		X
Human Rights	X	
Gender Equity and Women's Empowerment		X
Core Labour Rights		X
Indigenous Peoples	X	
Involuntary Resettlement		X
Protection of Natural Habitats		X
Conservation of Biological Diversity		X
Climate Change		X
Pollution Prevention and Resource Efficiency	X	
Public Health		X
Physical and Cultural Heritage		X
Lands and Soil Conservation	X	

Table 18. ESP risks and possible mitigation measures for further analysis

Adaptation Fund environmental and social principles	**Possible risks**	**Possible mitigation measures**
Compliance with the Law	None beyond the compliance issues identified in Part II Section E of this proposal document	No mitigation measures required
Access and Equity	Certain groups may have less access to training or to green infrastructure or urban agriculture or specific groups may have privileged access	Community management rules ensuring equal access is guaranteed, enforced through monitoring and legal agreements (where necessary)
Marginalised and Vulnerable Groups	There are some refugees in the Bayan Lepas area who are vulnerable to discrimination. Other forms of racial discrimination	Community management must ensure equal access extends to refugees and migrant population and equal treatment among
Human Rights	None, other than those issues in Marginalised and Vulnerable Groups, Gender Equality and Women's Empowerment, Core Labour Rights and Involuntary Resettlement	No mitigation measures required
Gender Equity and Women's Empowerment	Women not having equal representation in decision making processes, women are excluded from activities under the programme, such as training and urban agriculture	Quotas for female participation and inclusion in decision making at all levels
Core Labour Rights	People working on the project may have improper contracts, working conditions, unsatisfactory occupational health and safety or there could be discrimination against women at work.	Proper contracts, in compliance with ILO standards and occupational health and safety standards in line with international best practices.
Indigenous Peoples	There are no indigenous people in Penang island	No mitigation measures required -
Involuntary Resettlement	Involuntary resettlement or disruption of access arising from construction	Proposed interventions only on state land
Protection of Natural Habitats	Damage to local ecosystems due to introduction of dangerous species of flora	Perhilitan and Perhutanan to review all projects to make sure no dangerous species is proposed
Conservation of Biological Diversity	Damage to local ecosystems due to introduction of dangerous species of flora	Perhilitan and Perhutanan to review all projects to make sure no dangerous species is proposed
Climate Change	Inefficient sourcing of materials	Preferring local materials in

	may generate emissions. Poor construction/planning may lead to "mal-adaptation"	the procurement process. Multi-stakeholder consultation and approval process for designs
Pollution Prevention and Resource Efficiency	Built projects will generate waste	Incorporate waste management and disposal into design
Public Health	Construction sites pose a risk to the public if not properly managed and demarcated. Water-related activities pose contamination risks	Zero-accident construction site management. Practices to ensure water sources are not contaminated
Physical and Cultural Heritage	Penang old town is a UNESCO World Heritage Site	Consultation with UNESCO, Department of Heritage Conservation (MBPP) and George Town World Heritage Incorporated about implementing the project in accordance with heritage preservation principles.
Lands and Soil Conservation	No risks identified beyond those highlighted in Protection of Natural Habitats	

PART III: IMPLEMENTATION ARRANGEMENTS

A. Arrangements for project management

The UN-Habitat will be the Multi-lateral Implementing Entity (MIE) for the nature-based climate adaptation programme for the urban areas of Penang island, as requested by the National Designated Authority (NDA), the Ministry of Environment and Water and by the city council of Penang island. The programme involves a broad range of stakeholders, local government, scientific institutions, and civil society in order to deliver a broad range of results, with impacts on the physical, technical, social, policy and institutional levels. The impacts of climate change are already being felt in Penang island, particularly in terms of temperature rise and in changes in rainfall patterns leading to flooding. The programme will deliver nature-based physical projects to address these issues and also programmes addressing social vulnerability and capacity building.

The Executing entities will be MBPP, JPS and Think City. They will be responsible jointly for the timely delivery of inputs and outputs and for coordination of all other responsible parties including other ministries, relevant agencies, and a broad range of institutes and local organisations. The Project Director will be appointed by the Steering Committee.

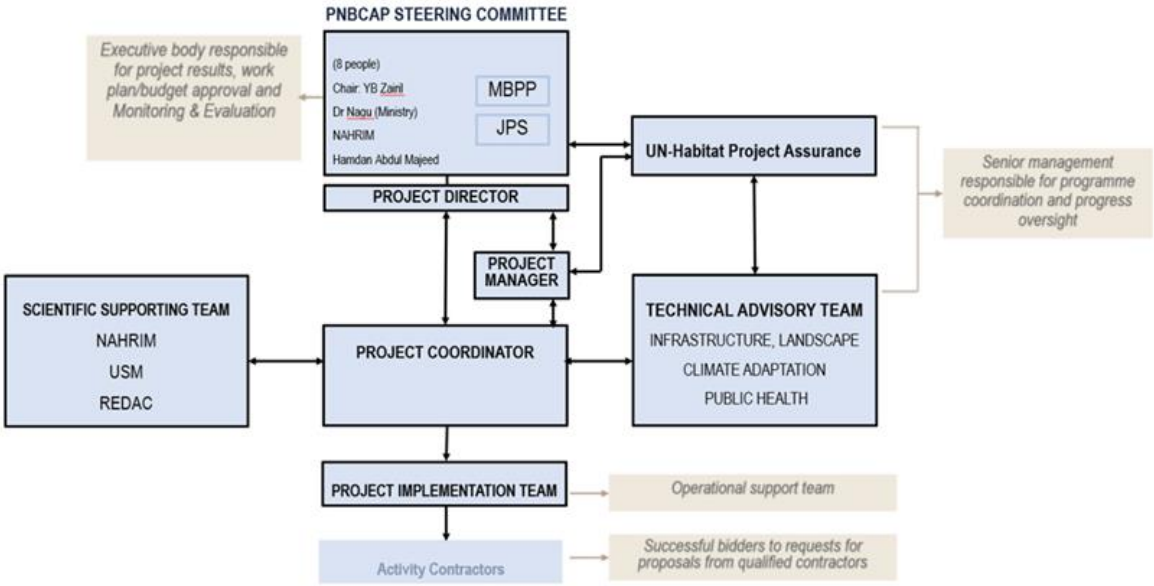


Image 10. Organigramme of the programme.

The programme organisation is presented in image 10. Project Execution Responsibilities are outlined below.

SC - Steering Committee – The Executive body, made up of eight members, will include key personnel from the executing entities, government, local council, scientific and research bodies, as well as civil society, representing interests from all levels of society. They will be responsible for policy guidance for management decisions for the programme, playing a critical role in programme monitoring and evaluation and quality of processes,. The SC will also be responsible for evaluations for performance improvement, accountability and learning.

PD - Project Director – The PD is to be appointed by the Steering Committee and will serve as the designated National Executing Entity lead officer and focal point for the project. The PD will report to UN-Habitat and provide liaison between the Steering Committee and the PC and the PM, supporting the coordination of the various project components.

PM - Project Manager – a Penang-based UN-Habitat liaison project manager for the duration of the project. The Project Manager's prime responsibility will be to ensure the programme is run in accordance to the AF and UN-Habitat's guidelines within specified time constraints and cost.

PC – Project Coordinator - the local project coordination unit will facilitate the drawing up of the scope and standards of the project's components and the production of the expected outputs as specified in the programme documentation. Responsible for stakeholder management and for providing guidance and supervision to the Project Implementation team.

PIT – Project Implementation Team - An operations task force consisting of key staff facilitated by technical and community consultants. The team will be responsible for the day-to-day management of project activities and the overseeing of the implementation of relevant project activities that will be largely delivered by Activity Contractors. They will also be responsible for developing the technical specifications for the project activities.

SST - Scientific Supporting Team - A multidisciplinary team comprising of representatives from several academic and scientific institutions, namely NAHRIM, USM, and REDAC, who will be co-implementing partners. The team will be responsible for providing a wide range of scientific and research support, advisory, assurance and guidance with regards to water management, drainage, and climate-monitoring. They will also support capacity development and training as part of the knowledge management component of the programme.

TAT - Technical Advisory Team – The Technical Coordination Team will serve as the Advisory Group, assisting the PC on technical matters. They will provide guidance and advice on technical questions relating to climate change/resilience, water management, landscape and urban planning, health and hygiene, as well as vulnerable and marginalised communities. The main objective of the TAT is to identify technical strengths and weaknesses in the programme, propose solutions to pressing technical issues, and provide overall technical support to the programme.

Project Assurance - UN-Habitat as the Multilateral Implementing Entity, will support the project implementation through the monitoring of project budgets/expenditures and recruiting/contracting of project personnel and consultant services. They will also monitor the overall management of the programme, achievement of the project outcomes/outputs, and ensure the efficient use of funds through the assigned Steering Committee and Project Director. (overall PM)

EEIC – Executing entity in charge – MBPP, JPS and Think City.

Activity Contractors - Packages of work activities will be procured through competitive bidding processes managed by the **EEIC** and overseen by the PC, with specifications approved by the PIT.

PT - Project team, all of the above except for the activity contractors.

B. Measures for financial and programme risk management

The key risks which may threat the programme have been analysed during its formulation phase and included consideration of different types of threats, characteristics of local governance and specificity of target sites.

The status of financial and programme risks will be monitored and overviewed by UN-Habitat throughout the programme, including the identification of measures required to avoid, minimise and mitigate them. A risk analysis and documentation meeting will be held every six months, scheduled by the PC.

The risks facing the project and mitigation strategies are listed below:

TABLE 19. Risks and risk management

No.	Type	Description	Management/mitigation strategies	Rating Impact/ Probability (1:Low-5:High)
1	Institutional	Complex programme structure and heavy bureaucracy impacting and delaying schedule	- Joint responsibility regarding programme schedules between the Implementing Entity, Executing Entities, and the Project Manager. - Establishment of an inclusive Steering Committee will ensure overall commitment, participation, and ownership towards the project's progress.	Impact: 3 Probability: 4
2	Institutional	Policy makers prioritise economic benefits over long-term benefits and sustainable activities	- The programme is deliberately designed to closely engage policy makers in knowledge and capacity building, promoting the complementary and multi-dimensional benefits of nature-based and resilient systems towards holistic development.	Impact: 2 Probability: 2
3	Institutional	Policy makers prioritise short term non-sustainable initiatives over medium-long term sustainable actions	- Justifications and knowledge-sharing via a knowledge management platform will serve as demonstration/proof of effectiveness of the nature-based solutions whilst providing transparency on the implementation process.	Impact: 3 Probability: 2

4	Institutional	Failure in monitoring of activities due to conflict of interest among stakeholders	- Both the Steering Committee and UN-Habitat will be involved in the monitoring of the project activities with the scope and role of each stakeholders defined through a clear agreement to ensure accountability.	Impact: 4 Probability: 2
5	Institutional	Communities may not adopt/maintain activities/ infrastructure after the AF project	- The interventions will be institutionalised within the ministry/local council and formal agreements put in place to ensure sustainable delivery post project implementation. - Community engagement from the inception to promote community ownership	Impact: 3 Probability: 1
6	Institutional	Lack of monitoring and enforcement capability to follow through with interventions, (before and during the executing process)	- Project management measures put in place: risks identified by the Implementation team will be categorized in three levels (green, yellow and red. When a risk is identified with colour red, the PM will fast track it to the SC within a 10-day timeframe. - The establishment of the Penang Climate Board to coordinate effort/ response to breaches that pose climate related risks.	Impact: 3 Probability: 4
7	Environmental	Pandemic control measures/constraints that may delay project activities	- Implementing and Executing Entities to work closely in monitoring the current and possibly recurring pandemic and taking into consideration its impact on planning and execution of programme activities. Vulnerability/baseline assessments along with a climate-related public health programme will be initiated in the early stages of the project to better prepare and complement contingency plans in the event of a pandemic.	Impact: 3 Probability: 3

8	Social	Built interventions/maintenance work may become obstructive to daily routine of community during construction	- Extensive planning and regular consultations with community groups, MBPP and JPS will be carried out to ensure execution of works are carried out during 'off-peak' hours and kept to a minimum duration.	Impact: 1 Probability: 4
9	Social	Lack of commitment/buy-in from local communities may result in delay at intervention sites	- A multi-pronged community and stakeholder consultation held between October to November 2019, has contributed to the development of the vulnerability assessment outline, understanding the needs of the communities and further raising awareness among all parties to ensure ownership and buy-in. - A grievance mechanism will be established to allow any affected communities to raise concerns/suggestions to the Project Implementation team.	Impact: 2 Probability: 1
10	Social	Lack of community organisation/representation in non-commercial areas to organise response during crisis	- Community engagements will be facilitated periodically throughout the project life cycle through focus group discussions with all levels of the civil society to ensure unified action plans are established.	Impact: 2 Probability: 2
11	Financial	Costs of proposed activities may be higher than expected	- Programme activities have been costed as accurately as possible and referenced against similar existing projects during the development stage. - Monitoring mechanisms via the annual work plan and expenditure as well as periodic progress reports will assist in ensuring activities are executed within the budget.	Impact: 3 Probability: 2

12	Financial	Cost of remodelling/ reconfiguring/ restoring existing infrastructure may be higher than actual project activities	- The built projects under Components 1 and 2 will be meticulously planned in the early stages of the programme with due considerations given to existing infrastructure and systems and consultations with respective stakeholders including community. . Extensive consultations will also be undertaken with the Technical Coordination and Project Implementation team to ensure optimisation of resources.	Impact: 3 Probability: 4
13	Financial	Incompetent financial governance/management on a local level may impede project execution and lack integrity	- UN-Habitat in its capacity as Implementing Entity, will ensure adherence to AF's operating policies and guidelines in particular, the *Fiduciary Risk Management Standards*. - Transactions and disbursement of funds by the IPs are to be audited periodically by an independent organisation.	Impact: 4 Probability: 3

C. Measures for management of environmental and social risks

A broad range of local stakeholders, including government, civil society, NGOs and scientific institutions were engaged in different consultations held in multiple occasions spanning the 12 months prior to the submission of the full proposal (mentioned in chapter X and annexes Y and Z). These consultations included in depth discussions of the programme and of screening and assessing potential threats, including threats to its implementation. These inputs substantially contributed to the programme's proposed framework and to the component's activities.

An environmental and social risk management plan (ESMP) has been developed to ensure risks are identified and avoided; if it is not possible to avoid the risks, mitigation measures will be put in place in order to minimise their threat. The ESMP identifies roles and responsibilities for monitoring risks, as well as risk management arrangements, risk reduction and programme's grievance mechanism.

The ESMP identifies measures and actions that will reduce potentially adverse environmental and social impacts. The ESMP is focused on:

a) Identifying and summarizing adverse environmental and social impacts in accordance with the Adaptation Fund ESP principles.

b) Identifying and describing mitigation measures at two levels, the first in order to mitigate the risks in terms of the activity implementation/development and the second in order to uphold all ESP principles.

c) Describing a process for establishing screening procedures and assessment of programme activities and conditions under which screening and mitigation will be required.

d) Assigning roles and responsibilities for screening, assessment, mitigation, approvals and monitoring and reporting.

e) Fully integrates and complies with Malaysia's federal regulations and laws as well as Penang's states regulatory framework.

An assessment of gender issues was conducted in order to comply with the Adaptation Fund gender policy. Extensive data on gender issues was available in several Penang's NGOs and governmental and scientific institution's departments focused on addressing gender vulnerabilities; this assessment is included in annex 8. The data collected has informed the development of the components' activities. Gender-specific risks will be monitored by the M&E arrangement plan

Monitoring strategy:

A monitoring plan will be developed during the inception phase of the programme, describing the types of Monitoring & Evaluation (M & E) activities, responsible parties, allocated budget, and frequency of reporting. The M & E of progress in achieving project results will be based on targets and indicators established in the Project Results Framework. Besides that, the status of identified environmental and social risks and its management plan (ESMP), financial, and project management risk, including the required mitigation measures, will be monitored throughout the project via annual project performance, mid-term, and final evaluations.

- A fully developed monitoring plan will be prepared during the inception stage of the project identifying roles and responsibilities regarding the monitoring of activities and results framework indicators. Reporting systems will be developed according to the AF, UN-Habitat, federal government of Malaysia and the government of Penang state requirements, monthly, quarterly, and annually.

Due to the nature of the programme activities, the Project Implementation Team (PIT) will play a critical role in providing operational support and oversight. The PIT's purpose is to provide technical and field filed supervision on detailed specifications and implementation; its tasks include enhanced quality assurance, effective management M&E system. The PIT will focus on three outcomes:

a) Technical and environmental quality assurance in the implementation by activity contractors.

b) Effective communication with the PM and between the PM, EEIC and activity contractors, as well as with the local community.

c) Monitoring and reporting of risks, the effectiveness of management strategies and tracking the medium-term implementation plans.

The implementation team will be focused on overseeing implementation and field operations, as well as in identifying and flagging risks, communicating, supporting and being supported by the PM. The scope of the PIT includes also technical guidance, work implementation plans and quality monitoring and reporting. The PIT will complement the PM in terms of ensuring, on the ground, that the scope of activities is implemented effectively, aligned with the pre-defined quality standards, on schedule and within budget, managing adjustments as necessary. The PIT will also be in charge of flagging risks, colour-coding them (green- non-urgent risks; yellow- medium level of urgency; red – urgent threats) in order for the PM to proceed accordingly (risks colour-coded in red will be fast-tracked within a 10-day timeframe to the SC).

- Adaptive environmental management of strategic issues

The adaptive environment management approach is developed to ensure that certain risk management and knowledge development objectives are addressed and adequately dealt with. This approach is based on the use of scientific methods in a systematic manner to identify, test and refine environmental interventions and associated assumptions, adapting the interventions based on experience and on a rolling basis. It includes a 'research by design' perspective, as well as the fundamentals of a learning organization, in a process of continuous evolution and adjustment of processes. This is in order to learn from the ongoing activities by integrating this knowledge in the programme's framework for continuous improvement of processes and outcomes.

TABLE 20. Monitoring and evaluation plan of the proposed project

Type of M&E activity	**Responsible Parties**	**Budget USD**	**Time frame**
Inception workshop and Report	PM SC UN-Habitat	3,000 USD	Within 3 months of programme's initiation
Measurement of means of verification for Project Progress on output and implementation	Oversight by: PM TCT SC	n/a	Annually prior to the PPR and to the definition/adjustment of the yearly work plans
PPR	PM TCT SC UN-Habitat	0	Yearly
Periodic status/ progress reports	PM PIT	0	Quarterly and annually
Community consultations	EEIC SC PM	0	Prior to implementation, during planning stage
Mid-term evaluation	PM TCT UN-Habitat	40,000	No later than six month after the mid-point of the programme

Final evaluation	PM UN-Habitat TCT External consultants	40,000	Nine month after programme closing
Audit	UN-Habitat PM	2,000	As per UN-Habitat regulations
Visits to field sites	MBPP, JPS and Penang Government representatives UN-Habitat	30,000	Yearly
TOTAL COST			105,000

Table 21 . Project evaluation plan

Type of M&E Activities	Responsible Parties	Timeframe	Reporting
Inception Workshop and Report	National Project Manager Project Implementing Team UN-Habitat ROAP	Workshop: within first two months of start Report: within first quarter	Inception Report
Periodic status/ progress reports	National Project Manager	Quarterly	Quarterly Reports
Final Evaluation	National Project Manager UN-Habitat ROAP Project Implementing Team External Consultants	Final: At least three months before the end of project implementation	Final Evaluation Report
Project Terminal Report	National Project Manager UN-Habitat ROAP Local consultant	At least three months before the end of the project	Terminal Report
Audit	UN-Habitat ROAP National Project Manager	As per UN-Habitat regulation	Audit Reports

D. Arrangements for monitoring, reporting and evaluation

The programme will fully comply with formal guidelines, regulations, protocols and toolkits issued by the AF, UN-Habitat, the federal government of Malaysia and the government of Penang state.

The Monitoring and Evaluation (M&E) will be based on targets and indicators established in the programme results framework (E) and focused on achieving programme's expected

results. The status of environmental and social risks and the ESMP will be monitored throughout the programme's life-cycle (quarterly, yearly, mid-term and terminal report). The same applies to financial and project management risks and mitigation measures.

The project team (PT) will develop an M&E plan during the programme's inception phase, which will be circulated among all participants in the inception workshop. The focus of the M&E plan will be on:

a) Participatory outcome and results' monitoring

b) Programme's risks (programme management & financial, environmental & social)

c) Programme learning and a 'adaptive environmental management' and 'research by design' approach

d) Programme's sustainability

UN-Habitat will ensure that the project team (PT) is fully briefed on requirements related to the M&E and will ensure baseline and progress data to be fully collected and for the codification of the M&E for programme's PPR and 'learning organisational' purposes and into the Knowledge transfer component.

The development and outcomes of the action plans and of the programme's components data will be collected also for the purpose of the knowledge transfer platform to be created, one of the programme's components. Household and sub-household level data focused on vulnerable communities will be collected, when possible disaggregated.

Participatory monitoring mechanisms will build upon the above-mentioned information and database; they will include different levels of government, institutions such as PAM and ILAM, and collected data via the app to be developed within the scope of the social vulnerability component. The systems put in place are focused on fully transparent decision-making and learning mechanisms for the updating of data to support M&E and reporting

The communities will be able to access all data and provide inputs to the M&E process and to highlight issues in programme delivery in order to strengthen adaptation benefits, including in the replication and sustaining of programme's gains. The data collected will include the most vulnerable communities of both George Town and Bayan Lepas mukims, disaggregated when possible.

The annual programme performance review will be prepared to monitor progress since programme initiation, particularly for the previous reporting period. The PPR includes, but it is not limited to:

a) Progress on the programme's objectives and outcomes (addressed via indicators, baseline data and targets)

b) Project and programme's annual outputs

c) Lessons learned/'research by design' approach.

d) Annual work plan and expenditure

e) Annual management

f) Environmental and social risks (status of implementation of the ESMP, including the measures required to minimize or mitigate risks. The report will also include corrective actions when deemed necessary.)

g) Project financial and management risks.

The independent Terminal Evaluation (TE) will take place as the last activity before programme closing, in accordance to the AF guidance and following UN-habitat's practices and standard framework. This evaluation will focus on delivery of the programme's results, as initially planned and reflected in the M&E framework, including implementation of environmental and social mitigation measures. The TE will assess the impact ans sustainability of results, including their contribution to capacity building and the achievement of the programme's gains and benefits.

The reports which will be prepared in the context of M&E are:

a) M&E plan

b) Programme inception report

c) Annual, mid-term and terminal programme performance reports

d) Technical reports associated to different programme's components.

For the M&E budget a breakdown of implementing entity's fees will be utilized in the supervision of the M&E function; for the related data, targets and indicators, see programme proposal results framework.

E. Project Proposal Results Framework

TABLE 22. Project results framework with indicators, their baselines, targets, risks & assumptions and verification means.

Objective & Components	Indicators	Baseline	Targets	Source of Verification	Risks & Assumptions
Programme Objective:	Enhance urban resilience and reduce human and ecosystem health vulnerability to climate change impacts and extreme weather events				
Component 1: Adaptation to the urban heat island effect through urban greening	Temperature reduction in the surrounding areas, 5 -7 years after project implementation. Reduction of hard surfaces and increased shading.	Mean temperature increase in Bayan Lepas from 1951 to 2018 is 1.5°C. Surface temperatures in urban areas of Penang Island are approximately 8°C higher than neighbouring natural/ rural areas.	Recorded temperature decrease between 1 - 1.5°C in the surrounding areas, 5 -7 years after project implementation.	Remote sensing of surface temperatures recorded annually	Implementation and maintenance on the urban greening interventions are followed through the duration of the programme and beyond with strong buy-in / commitment by local agencies and communities.
	Number of community groups with knowledge of urban agriculture and access to such sites.	Zero	At least 26 community groups are trained in urban agriculture and have access to farmed produces.	Training impact evaluations and field assessment surveys	
Outputs: 1.1 New tree-lined streets / Connected canopies constructed 1.2 Pocket parks/ vacant spaces constructed 1.3 Green parking spaces constructed 1.4 Green facades constructed 1.5 Green rooftops constructed 1.6 Urban agriculture programme initiated					

Component 2: Built projects for storm water and flood management	Increased water retention capacity of rivers in the urban areas of Penang Island. Reduction of peak discharge of catchment	Increased in impervious surface resulting in generation of high runoff volume and peak discharge during storm events due to development of major new residential and commercial areas in the suburban areas of George Town over the last decade. Total of 159 areas in Penang affected by floods in its worst recorded flooding in 2017. Areas along Sungai Pinang, including the historical core of George Town, up to Sungai Air Hitam are projected to experience Moderate to High Flood Hazard (>0.5m) under the 50 and 100 years ARI Design Flood.	By the end of the programme, all areas have 0% or reduced flood risks (low risk - flood depth below 0.5m). Reduction of peak discharge of catchment by 50%	Annual flood reports by JPS / NAHRIM	Identification of key upstream areas and targeted interventions monitored periodically with the support and input of technical agencies/ institutions.
Outputs: 2.1 Blue-green corridors developed 2.2 New upstream retention ponds constructed 2.3 Swales and infiltration wells restored and constructed					
Component 3:	Percentage of targeted	Estimated losses of	At least 50% of	Field assessment	Vulnerable groups

Comprehensive vulnerability / baseline assessment and action plans in targeted communities	population with increased level of awareness on systems assessment, including private property, infrastructure and natural assets, and improved planning for adaptation. Increased ownership with institutionalised priority interventions	RM200 - 300 million in the manufacturing sector during the 2017 flooding. 2,626 farmers and 3,464 hectares of agricultural land impacted with an estimated economic loss of RM5.7 milliion during the 2017 flooding. Estimated losses of RM57.5 million in the fisheries sector during the 2017 flooding. Difficulty in organising strategic response to crisis and disasters due to lack of community organisation in non-commercial areas	vulnerable community groups in the target locations of George Town and Bayan Lepas are aware and prepared. Critical infrastructure and property become more resilient. All new projects developed include climate adaptation measures	surveys by MERCY Malaysia Monitoring reports by Penang Climate Board	actively engaged and equipped in consultations, assessments and action plans alongside NGOs. CSOs, and government agencies. Strong commitment by local government and key industry players to incorporate climate adaptation measures in new developments.
Outputs: 3.1 Capacity development support for vulnerability assessment and climate change-related planning provided to the George Town and Bayan Lepas mukims.					
Component 4: Strengthening social resilience	Number of schools and youths equipped with awareness and knowledge of climate change and its mitigation/adaptation strategies.	Youth groups are particularly unaware of climate change risks. Youth is uninformed and untrained in urban agriculture.	At least 10,000 students from local schools are engaged and equipped with the knowledge and know-hows of urban farming and climate mitigation/adaptation strategies.	Annual assessments and project reports	Relevant and practical engagement tools are used. Strong participation in the programmes from its inception phase of building awareness.

		Schools are vulnerable to disruptions resulting from extreme weather events.	At least 25% of B40 women and girls of George Town and Bayan Lepas, equivalent to approximately 16,000 women and girls, are aware of climate-related risks and given tools to deal with gender-specific challenges.		Targeted action plans guided by detailed vulnerability assessments.
	Reduced gender vulnerability asymmetries	Women are disproportionally impacted by climate change Increase of heat-related diseases in children and elderly people place an additional burden on women as the primary caregivers. Women are not represented equally in climate-related decision-making processes.	Approximately 6,479 single mothers benefit from the peer support network and disaster-preparedness programmes. Adoption of a 40:40:20 ratio, whereby a benchmark allocation of 40% women representation in the committee of the Penang Climate Board is implemented	Field assessment surveys Annual review of Gender Inclusiveness Policy within the Penang Climate Board	Strong buy-in and participation by women's group at all levels. Continuous capacity building efforts and leadership training among women's groups to ensure strong representation at decision-making level.
Outputs: 4.1 Youth and school awareness programme developed and implemented. 4.2 Women and girls programme developed and implemented.					
Component 5: Institutional capacity and	Availability of information on strategies and projects to other municipalities in Malaysia	Limited knowledge and dissemination mechanisms in terms of municipal climate	By the end of the programme, all municipalities in Malaysia will have full	Development of database, manuals and user guide produced for	Well-developed methodologies and evaluation tools for establishment of the

knowledge transfer platform	and in the Southeast Asian region.	adaptation.	access to the methodologies and impacts of the programme that will assist the development of their own climate adaptation plans.	practitioners	knowledge management platform.
	Comprehensive approach in monitoring, evaluating, and addressing all climate-related risks at the municipal level.	There is no integrated department at municipal level addressing climate change issues in a holistic way.	A dedicated and centralised unit addressing climate-related risks and challenges is established within the local council in Penang Island.	TORs and other official documents noting the establishment of the Penang Climate Board committee	An operational framework for the unit is set in place and implemented.
	Improved monitioring of heat-related illnesses in health institutions in Penang.	Lack of data related to public health impacts of heat waves and temperature rise.	A pilot comprehensive public health programme, including the monitoring and systematic coding of heat and climate-related illnesses is established in 3 selected hospitals in Penang to develop measures for risks reduction.	Development of database (including risks and measures to reduce health impacts of climate change)	Strong buy-in and collaboration among public and private health sectors.
Outputs: 5.1 Communications and knowledge platform developed and implemented 5.2 Penang Climate Board created 5.3 Climate-related public health programme initiated and developed					

F. Project Alignment with the Adaptation Fund Results Framework

TABLE 23. Project alignment with the Adaptation Fund results framework

Project Outcome	Project Outcome Indicator	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD
Adaptation to the urban heat island effect through urban greening	Temperature reduction in the surrounding areas, 5 -7 years after project implementation.	Increased ecosystem resilience in response to climate change and variability induced stress	Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	3,175,000
Built projects for stormwater and flood management	Increased water retention capacity of rivers in the urban areas of Penang Island.	Increased ecosystem resilience in response to climate change and variability induced stress	Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	2,725,000
Comprehensive vulnerability / baseline assessment and action plans for social resilience strengthening developed for George Town and Bayan Lepas mukims	Percentage of targeted population with increased level of awareness on systems assessment, including private property, infrastructure and natural assets, and improved planning for adaptation.	Reduced exposure to climate-related hazards and threats	Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	160,000

Strengthening social resilience Programme	Number of schools and youths equipped with awareness and knowledge of climate change and its mitigation/adaptation strategies.	Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	975000
Institutional capacity and knowledge transfer platform	Availability of information on strategies and projects to other municipalities in Malaysia and in the Southeast Asian region.	Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	No. of targeted institutions with increased capacity to minimize exposure to climate variability risks	1,381,977

TABLE 24. Indicative Core Indicator Targets

Adaptation Fund Core Indicators	Indicative Targets	Comments
1. Number of beneficiaries	343,739	The beneficiaries include both direct and indirect from the results of the project.
2. Early warning systems	1	The project will look into the development of a peer support network on mobile application for disaster-preparedness under the Women and Girls programme.
3. Assets produced, developed, improved or strengthened	3	At this stage, it is conservatively estimated that three infrastructure / infrastructure system will be improved and strengthened over the two mukims
4. Increased income or avoided decrease in income	All beneficiaries	The project will reduce the impacts of the urban heat island effects and extreme weather events on economic activities.
5. Natural assets protected or rehabilitated	2	Two mukims will benefit from eco-system improvements

G. Detailed Budget

Programme Component	Output	Activity	Total Budget (USD)	2021 (Year 1)	2022 (Year 2)	2023 (Year 3)	2024 (Year 4)	2025 (Year 5)	2026 (Year 6)	Notes	
Component 1. Adaptation to the urban heat island effect through urban greening	1.1 New tree-line streets / Connected canopies constructed	1.1.1 Carry out preliminary studies and draw scope of work	$ 775,000	$ 15,000	$ 25,000	$ 150,000	$ 225,000	$ 210,000	$ 150,000	Technical Advisory	USD 2000/mth
		1.1.2 Conduct community engagement at project site									
		1.1.3 Launch of design tender bids									
		1.1.4 Development of design and specifications									
		1.1.5 Launch of construction tender bids									
		1.1.6 Construction / Project implementation									
		1.1.7 Maintenance / Surrender of project site									
	Output total		$ 775,000	$ 15,000	$ 25,000	$ 150,000	$ 225,000	$ 210,000	$ 150,000		
	1.2 Pocket parks / vacant spaces constructed	1.2.1 Carry out preliminary studies and draw scope of work	$ 950,000	$ 30,000	$ 50,000	$ 120,000	$ 250,000	$ 300,000	200000		USD 1000/mth
		1.2.2 Conduct community engagement at project site									
		1.2.3 Launch of design tender bids									
		1.2.4 Development of design and specifications									
		1.2.5 Launch of construction tender bids									
		1.2.6 Construction / Project implementation									
		1.2.7 Maintenance / Surrender of project site									
	Output total		$ 950,000	30,000	50,000	120,000	250,000	300,000	200,000		
	1.3 Green parking spaces constructed	1.3.1 Launch and initiation of the grants programme	$ 625,000		$ 175,000	$ 200,000	$ 150,000	$ 100,000		Technical Advisory	USD 1000/mth
		1.3.2 Review and processing of applications									
		1.3.3 Awarding of grants									
		1.3.4 Monitoring of project implementation									
	Output total		$ 625,000		175,000	200,000	150,000	100,000			
	1.4 Green facades constructed (Built structures greening)	1.4.1 Launch and initiation of the grants programme	$ 200,000		$ 10,000	$ 25,000	$ 60,000	$ 60,000	45000	Technical Advisory	USD 1000/mth
		1.4.2 Review and processing of applications									
		1.4.3 Awarding of grants									
		1.4.4 Monitoring of project implementation									
	Output total		$ 200,000	$ -	$ 10,000	$ 25,000	$ 60,000	$ 60,000	$ 45,000		
	1.5 Green rooftops constructed (Built structures greening)	1.5.1 Launch and initiation of the grants programme	$ 225,000		$ 10,000	$ 50,000	$ 60,000	$ 60,000	45000	Technical Advisory	USD 1000/mth
		1.5.2 Review and processing of applications									
		1.5.3 Awarding of grants									
		1.5.4 Monitoring of project implementation									
	Output total		$ 225,000		10,000	50,000	60,000	60,000	45,000		
	1.6 Urban agriculture programme initiated	1.6.1 Launch and initiation of the grants programme	$ 400,000	60000	$ 100,000	$ 150,000	$ 75,000	$ 15,000		Technical Advisory	USD 1000/mth
		1.6.2 Review and processing of applications									
		1.6.3 Awarding of grants									
		1.6.4 Facilitate training and workshops									
		1.6.5 Monitoring of project implementation									
	Output total		$ 400,000	$ 60,000	$ 100,000	$ 150,000	$ 75,000	$ 15,000	$ -		
	Component 1 Total		**$ 3,175,000**	**$ 105,000**	**$ 370,000**	**$ 695,000**	**$ 820,000**	**$ 745,000**	**$ 440,000**		

Programme Component	Output	Activity	Total Budget (USD)	2021 (Year 1)	2022 (Year 2)	2023 (Year 3)	2024 (Year 4)	2025 (Year 5)	2026 (Year 6)	Notes	
Component 2. Built projects for stormwater and flood management	2.1 Blue-green corridors developed	2.1.1 Carry out preliminary studies (utilities mapping and feasibility study) and draw scope of work	$ 1,550,000	$ 40,000	$ 75,000	$ 100,000	$ 600,000	$ 400,000	335000	Technical Advisory	USD 2000/mth
		2.1.2 Conduct stakeholders engagement at project site									
		2.1.3 Launch of design tender bids									
		2.1.4 Development of design and specifications									
		2.1.5 Launch of contsruction tender bids									
		2.1.6 Constuction / Project implementation									
		2.1.7 Maintenance / Surrender									
	Output total		$ 1,550,000	$ 40,000	$ 75,000	$ 100,000	$ 600,000	$ 400,000	$ 335,000		
	2.2 New upstream retention ponds constructed	2.2.1 Carry out preliminary studies (utilities mapping, feasibility study, design development) and draw scope of work	$ 725,000		$ 65,000	$ 80,000	$ 300,000	$ 250,000	30000	Technical Advisory	USD 2000/mth
		2.2.2 Conduct stakeholders engagement at project site									
		2.2.3 Launch of construction tender bids									
		2.2.4 Construction / Project implementation									
		2.2.5 Maintenance / Surrender									
	Output total		$ 725,000		65,000	80,000	300,000	250,000	30,000		
	2.3 Swales and infiltration wells restored and constructed	2.3.1 Carry out preliminary studies (utilities mapping, feasibility study, design development) and draw scope of work	$ 450,000			$ 45,000	$ 60,000	$ 180,000	$ 165,000	Technical Advisory	USD 1000/mth
		2.3.2 Conduct stakeholders engagement at project site									
		2.3.3 Launch of construction tender bids									
		2.3.4 Construction / Project implementation									
		2.3.5 Maintenance / Surrender									
	Output total		$ 450,000			45,000	60,000	180,000	165,000		
	Component 2 Total		**$ 2,725,000**	**$ 40,000**	**$ 140,000**	**$ 225,000**	**$ 960,000**	**$ 830,000**	**$ 530,000**		
Component 3. Comprehensive vulnerability / baseline assessment and action plans in targeted communities	3.1 Capacity development support for vulnerability assessment and climate change-related planning provided to George Town and Bayan Lepas mukim	3.1.1 Plan, conduct, and provide reports for the comprehensive social/ community vulnerability assessment associated with climate change impacts in George Town and Bayan Lepas mukim	$ 160,000	64153	$ 20,430	$ 24,971	$ 24,971	$ 25,475		Technical Advisory	USD 2000/mth
		3.1.2 Plan and develop communications / social engagement strategy									
		3.1.3 Conduct 20 public engagements and 10 training workshops									
		3.1.4 Prepare final comprehensive report									
	Component 3 Total		**$ 160,000**	**$ 64,153**	**$ 20,430**	**$ 24,971**	**$ 24,971**	**$ 25,475**	**$ -**		
Component 4. Strengthening social resilience Programme	4.1 School-level awareness programme developed and implemented	4.1.1 Create an awareness and communication campaign to promote the advocacy of women empowerment and awareness of gender-specific risks	$ 575,000	40,000	125,000	160,000	125,000	125,000			
	Output total		$ 575,000	40,000	125,000	160,000	125,000	125,000	0		
	4.2 Women and girls programme developed and implemented	4.2.1 Develop education programmes with women NGOs and local climate leaders at both institutional and community level, on the gender-specific climate threats and disaster preparedness									
		4.2.2 Promote co-production of training modules, tools, and adaptation resources on various topics from extreme heat to urban agriculture for community women NGOs, climate experts and women leaders									
		4.2.3. Create a Flexible Peer Support Network on mobile application which will have multiple modalities capable of responding to different environmental threats								Technical Advisory	USD 1000/mth
		4.2.4 Provide support, access to information, and training for women leadership in the skills that they need to influence climate discussions and activism, including training on how to train other women in the community									
		4.2.5Adopt the 40:40:20 ratio, whereby a benchmark allocation of 40% women representation in the committee of the Penang Climate Board is implemented									
		4.2.6 Create a climate and environmental women activitist forum to discuss gender-specific risks, policies, and actions, and to further raise awareness on the issue	$ 400,000	50000	$ 125,000	$ 125,000	$ 100,000				
	Output total		$ 400,000	50,000	125,000	125,000	100,000			$	400,000
	Component 4 Total		$ 975,000	$ 90,000	$ 250,000	$ 285,000	$ 225,000	$ 125,000	$ -	$	975,000

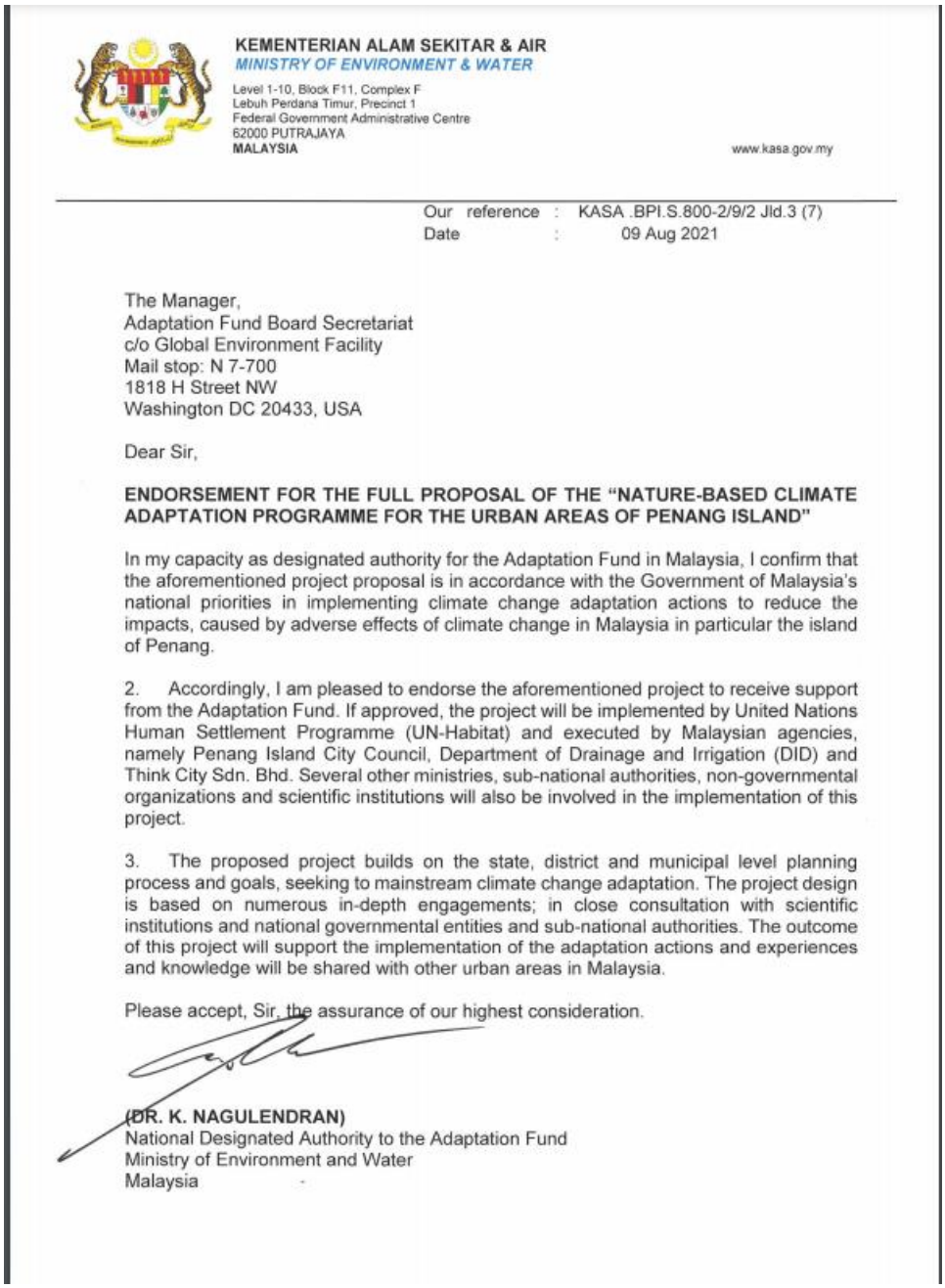
	5.1. Communitions and knowledge platform developed and implemented	5.1.1 Conduct school visits to selected natural environments								Technical Advisory	USD 1000/mth
		5.1.2 Climate awareness exhibition									
		5.1.3 Facilitate lectures on climate change at seven participating schools, conducted by partner organisations once every four months									
		5.1.4 Conduct Nature through Art and story-telling competitions culminating in an exhibition at the Youth for Nature Forum for the winners									
		5.1.5 Conduct a Makers' Workshop once every four months for youths to address urban challenges and energy transitions									
		5.1.6 Conduct a Sustainable School Programme for five participating schools over a duration of 2 - 6 weeks									
		5.1.7 Initiate 6-month internships for young people aged between 18 - 22 in monitoring the rivers, sponsored by MBPP and JPS									
		5.1.8 Provide 2 one-day training sessions for 15 youths to monitor, sample, and test air, soil, and water for environmental pollution at two survey sites in Sungai Ara/ Sungai Keluang river basin									
		5.1.9 Initiate Youth for Nature Forum as a youth-oriented platform for nature advocacy building									
		5.1.10 Establish the Penang chapter of the Malaysian Youth Delegation									
		5.1.11 Create database of the programme's scientific and technical framework								Technical Advisory	USD 1000/mth
		5.1.12 Monitor and collate results in a database									
		5.1.13 Create a website for collecting all programme information and disseminate it upon registration to cities' authorities	$ 550,000	50000	$ 100,000	$ 120,000	$ 140,000	$ 100,000	40000		
Component 5. Institutional capacity and knowledge transfer platform	**Output total**		$ 550,000	$ 50,000	$ 100,000	$ 120,000	$ 140,000	$ 100,000	$ 40,000		
	5.2 Penang Climate Board created	5.2.1 Representative selection								Technical Advisory	USD 1000/mth
		5.2.2 Develop operational framework									
		5.1.3 Develop standard proceedings and policy integration									
		5.1.4 Establish Penang Climate Board	$ 285,000	$ 15,000	$ 60,000	65000	75000	70000			
	Output total		$ 285,000	$ 15,000	$ 60,000	$ 65,000	$ 75,000	$ 70,000		$ 285,000	
	5.3 Climate-related public health programme developed and initiated.	5.3.1 Undertake study of hospital admissions and deaths during heat waves over the past 5 years in at least 3 hospitals and continue an annual assessment								Technical Advisory	USD 1000/mth
		5.3.2 Raise community awareness campaigns and calls to action to support the public health interventions									
		5.3.3 Identify trends in climate-sensitive communicable diseases in partnership with Penang Health Department and map cases geospatially									
		5.4.4 Set up a set of workshops with health professionals and hospital administators on heat impact on hospital admissions									
		5.3.5 Provide professional development for Penang-based medical doctors on climate and health, focussing on heat, flooding, and managing at-risk patients									
		5.3.6Set up a set of workshops with health professionals and hospital administators on heat impact on hospital admissions									
		5.3.7 Provide professional development for Penang-based medical doctors on climate and health, focussing on heat, flooding, and managing at-risk patients	$ 546,977	$ 46,977	$ 100,000	$ 100,000	$ 125,000	$ 100,000	$ 75,000		
	Output total		546,977	$ 46,977	$ 100,000	$ 100,000	$ 125,000	$ 100,000	$ 75,000		
	Component 5 Total		**$ 1,381,977**	**$ 111,977**	**$ 260,000**	**$ 285,000**	**$ 340,000**	**$ 270,000**	**$ 115,000**	**$ 1,381,977**	
A. Project Activities Total			**$ 8,416,977**	**$ 411,130**	**$ 1,040,430**	**$ 1,514,971**	**$ 2,369,971**	**$ 1,995,475**	**$ 1,085,000**	**$ 8,416,977**	
Programme Execution Costs			$ 799,613	$ 39,057	$ 98,841	$ 143,922	$ 225,147	$ 189,570	$ 103,075		
B. Programme Execution Total		**9.5%**	**$ 799,613**	$ 39,057	$ 98,841	$ 143,922	$ 225,147	$ 189,570	$ 103,075		
Total Programme Cost			**$ 9,216,590**	**$ 450,187**	**$ 1,139,271**	**$ 1,658,893**	**$ 2,595,118**	**$ 2,185,045**	**$ 1,188,075**		
C. Programme Cycle Management Fee for Implementing Entity		**8.5%**	**$ 783,410**	**$ 38,266**	**$ 96,838**	**$ 141,006**	**$ 220,585**	**$ 185,729**	**$ 100,986**		
Amount of Financing Requested (A+B+C)			**$ 10,000,000**								

G. Disbursement Schedule

Schedule Date	October 2021 or Upon Signing (USD)	October 2022 (USD)	October 2023 (USD)	October 2024 (USD)	October 2025 (USD)	October 2026 (USD)	Total
A. Project Funds	1,262,547	1,262,547	1,683,395	1,683,395	1,683,395	841,698	8,416,977
B. Programme Execution	119,942	119,942	159,923	159,923	159,923	79,961	799,613
C. Programme Cycle Management	117,512	117,512	156,682	156,682	156,682	78,341	783,410
Total	1,500,000	1,500,000	2,000,000	2,000,000	2,000,000	1,000,000	10,000,000

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[68] *Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:*



KEMENTERIAN ALAM SEKITAR & AIR
MINISTRY OF ENVIRONMENT & WATER
Level 1-10, Block F11, Complex F
Lebuh Perdana Timur, Precinct 1
Federal Government Administrative Centre
62000 PUTRAJAYA
MALAYSIA
www.kasa.gov.my

Our reference : KASA .BPI.S.800-2/9/2 Jld.3 (7)
Date : 09 Aug 2021

The Manager,
Adaptation Fund Board Secretariat
c/o Global Environment Facility
Mail stop: N 7-700
1818 H Street NW
Washington DC 20433, USA

Dear Sir,

ENDORSEMENT FOR THE FULL PROPOSAL OF THE "NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND"

In my capacity as designated authority for the Adaptation Fund in Malaysia, I confirm that the aforementioned project proposal is in accordance with the Government of Malaysia's national priorities in implementing climate change adaptation actions to reduce the impacts, caused by adverse effects of climate change in Malaysia in particular the island of Penang.

2. Accordingly, I am pleased to endorse the aforementioned project to receive support from the Adaptation Fund. If approved, the project will be implemented by United Nations Human Settlement Programme (UN-Habitat) and executed by Malaysian agencies, namely Penang Island City Council, Department of Drainage and Irrigation (DID) and Think City Sdn. Bhd. Several other ministries, sub-national authorities, non-governmental organizations and scientific institutions will also be involved in the implementation of this project.

3. The proposed project builds on the state, district and municipal level planning process and goals, seeking to mainstream climate change adaptation. The project design is based on numerous in-depth engagements; in close consultation with scientific institutions and national governmental entities and sub-national authorities. The outcome of this project will support the implementation of the adaptation actions and experiences and knowledge will be shared with other urban areas in Malaysia.

Please accept, Sir, the assurance of our highest consideration.

(DR. K. NAGULENDRAN)
National Designated Authority to the Adaptation Fund
Ministry of Environment and Water
Malaysia

6. Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

Implementing Entity Certification

I certify that this proposal has been prepared in accordance with the guidelines provided by the Adaptation Fund Board, and prevailing National Development Plans, including 11th Malaysia Plan, the National Environmental Health Action Plan, national sustainability agenda, Malaysia Third National Communication and Second Biennial Update Report to the UNFCCC. Subject to approval by the Adaptation Fund Board, I commit to implement the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund Board and on the understanding that the implementing entity will be fully (legally and financially) responsible for the implementation of the project/programme.	
 **Raf Tuts** Director, Global Solution Division UN-Habitat	
Date: 04/08/2021	Tel: +254-20-762-3736 E-mail: raf.tuts@un.org
Project Contact Person: Laxman Perera, Human Settlements Officer, UN-Habitat Regional Office for Asia and the Pacific	
Tel: 81-97-724-7121	Email: laxman.perera@un.org

Annexes

Annex 1. Community Consultation Report

Annex 2. Community Consultation via Roundtable Discussions from Programme Exhibition

Annex 3. Project Planning Workshops

Annex 4. Alignment of Project Objectives / Outcomes with Adaptation Fund Results Framework

Annex 5. Preliminary Vulnerability Assessment

Annex 6. Environmental and Social Management and Monitoring Plan

Annex 7. Programme Mapping

Annex 8. Project Implementation Schedule / Gantt Chart

Annex 9. Think City's Grants Programme Policies and Procedures

Annex 10. Think City's Capacity in Community Engagement

Annex 11. Part 2 Plan Summary Table

Annex 1. Community Consultation Report

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

Community Consultation Report

CONSULTATION TEAM
LEAD | ADELINE CHUA
SUPPORT | KANG YUE SHERN, LEE KWAI HAN
ADDITIONAL SUPPORT | LIYANA CHE ISMAIL,
AUDREY TAN, ROSE AFRINA MANSOR, SITI NASIHA ILIAS

REPORT PREPARED BY ADELINE CHUA

thinkCITY
REJUVENATING THE CITY TOGETHER

CONTENTS

Executive Summary

The community consultation report aims to collect data and insights that contribute to the full proposal of the Nature-Based Climate Adaptation Programme for The Urban Areas of Penang Island program. Using nature-based solutions, the program's objective is to enhance urban resilience and reduce human and ecosystem health vulnerability to climate crisis impacts.

Aside from built projects targeted at greening, stormwater and flood management, social resilience programming and institutional capacity building are also part of the program's core components.

The consultation process engages communities vulnerable to climate change and identifies their climate change awareness levels, the impacts of climate change on their lives, how they cope, and what the barriers to their resilience are.

6 communities were identified as vulnerable groups and through various consultation methods, 418 persons were engaged throughout the 2-month consultation process. With a focus on those living in flood-prone urban areas on Penang island, individuals and organisational representatives from the B40 income level, the elderly, migrants and refugees, persons with disabilities, women and girls and youth were consulted.

Insights gained from their input lead to recommendations surrounding policy, community leadership, community initiative planning and intervention communication plans.

Background

The community consultations were done in support of the Nature-Based Climate Adaptation Programme for The Urban Areas of Penang Island, a program to enhance urban resilience and reduce human and ecosystem health vulnerability to climate change impacts and extreme weather events by implementing nature-based solutions (NBS) to reduce surface temperatures and storm water runoff. The program also seeks to increase social resilience and build institutional capacity to ensure the methodology can be scaled and adopted in the near future by other cities in Malaysia and the region.

The objective of the consultation process was to engage communities most vulnerable to climate change and identify:

I. Their awareness levels regarding climate change
II. Impacts of climate change on them
III. Their coping mechanisms
IV. Barriers to resilience in the face of environmental crises
V. Recommendations for the program based on all the above

Overall Methodology

Phase I of community consultations were carried out late in 2019. Insights gained from that process informed Think City's proposal to the Adaptation Fund. Once the proposal passed the technical review, a larger scale consultation – Phase II – was planned and implemented from June to August 2020.

Based on research and consultation done in Phase I, it was predetermined that Phase II community consultations would cover **6 vulnerable communities (sample size 400 persons) living in flood-prone urban areas in George Town and Bayan Lepas mukim**.

The 6 vulnerable communities are:

I. B40
II. Elderly
III. Migrants and Refugees
IV. Persons with Disabilities
V. Women and Girls
VI. Youth

A mix of 4 consultation methods were used to engage these 6 communities according to suitability and resources available.

I. One-on-one interview

Individuals were approached by the consultant for long or short interviews lasting from 20 to 60 minutes. Interviewees were either selected because of their personal life or work experience or because they represent an institution or organisation supporting one of the vulnerable communities identified.

Selection criteria:

A) Individual – People who can related detailed first-hand experience of living and facing the impacts of climate change in the study areas or community leaders/champions that work independently with vulnerable groups without association to any organisation.

B) Institution/Organisation – Representatives from institutions/organisations that work to support, advocate for or in service of the 6 vulnerable communities identified. Example: CEO of Penang Women's Development Corporation or Manager of a commercial aged care facility.

II. Group Interview

Casual chats done in groups of 2 to 5 consisting of interviewees who are relating their own life experiences and observations regarding the topic of climate change. This method was employed to capture a wide variety of opinions without too much pressure on the individual to be an expert on the topic.

III. Survey

A questionnaire filled in independently or with translation help from consultants. The survey could be completed within 8 minutes and was given out at targeted locations within the study areas. This method allowed larger scale data collection that was more indicative of public opinion of the selected outreach location.

IV. Focus Group Discussion

Participants were invited to represent different perspectives on the topic of climate change. Discussion were carried out in a formal setting, requiring in-depth input from each participant and active discussion between invited participants.

Over the course of a 2-month engagement period, the targeted minimum sample size of 400 persons was exceeded through these various methods of consultation:

Community	**Method of consultation**	**Numbers**
B40	Survey	290
Elderly	One-on-one interview (individual)	11
	One-on-one interview (institution)	2
	Group interview	5
Migrants and Refugees	One-on-one interview (institution)	1
	Group interview	24
Persons with Disabilities	One-on-one interview (institution)	3
	Focus Group Discussion	15
Women and Girls	One-on-one interview (individual/institution)	9
	Focus Group Discussion	21
Youth	Group Interview	37
	TOTAL	**418**

Overall Recommendations

For more detailed recommendations, please refer to individual sections. These recommendations are a summary of overarching themes identified from all consultations across 6 communities.
They revolve around these areas:

I. **Policy intervention** that ensures:

- Building designs adhere to design principles for accessibility and sustainability
- Allocation for women's sanitary hygiene needs (products as well as facilities) within the disaster relief budget
- Diversity and intersectionality at top management level within state government

II. **Community leadership** is nurtured through

- Education that encourages civic questioning and civic participation
- Capacity building and leadership training
- Enabling and investing in organisations or groups that support and develop community leaders

III. **Community initiatives** that

- Are co-created, co-planned and owned by communities
- Act as opportunities for community education on climate change
- Add value to the lives of communities involved – be it knowledge, skills, emotional support or income

IV. **Intervention communication** that

- Is sensitive to the needs and aspirations of demographically diverse communities
- Takes care to convey why the intervention was chosen, how to use and care for it
- Uses multiple ways to reach its targeted community and provides multiple ways for the communities to reach it

1. B40

Context

The Department of Statistics Malaysia classifies household incomes into 3 main groups – B40, M40 and T20. 2019's categorisation of the a B40 household income can be broken into[69]:

- B1 (household income below RM2,500)
- B2 (RM2,501-RM3,169)
- B3 (RM3,170-RM3,969)
- B4 (RM3,970-RM4,849)

For context, 2019's Household Expenditure Survey Report reported a mean monthly household consumption expenditure of RM5126 in the Northeast district (where George Town is) and RM5414 in the Southwest district (where Bayan Lepas is).[70]

1.1 Methodology

The B40 outreach was done in 4 locations within the program's two study areas -- George Town and Bayan Lepas mukim. 2 were conducted in George Town and 2 in Bayan Lepas. In total, 290 surveys were conducted.

Although no data on household income was collected, all outreach locations were selected because they were either low-cost flats or commercial areas that were surrounded by low-cost residential buildings. These sites were also located near flood-prone urban areas.

A 13-question survey in the national language, Bahasa Malaysia was designed and respondents either filled out the forms independently or answered them aided by the consultant team (who acted as translators). After filling up the forms, respondents were given a gift as a token for completing the survey.

Location	Number of respondents
PPR Jalan Sungai, George Town	167
Macallum Flats, George Town	
Jalan Tengah Food Court and Market, Bayan Lepas	123
Bukit Jambul Shopping Complex, Bayan Lepas	
Total	**290**

7 out of 13 questions were meant to collect details of respondents like demographics and living arrangements. The other 6 questions measured the respondents' awareness of climate change, the impacts of it on them, and their attitudes towards nature-based solutions.

See **Appendix 1** for the whole survey.

[69] https://www.thesundaily.my/local/b40-m40-and-t20-households-classified-into-10-categories-XG2778176

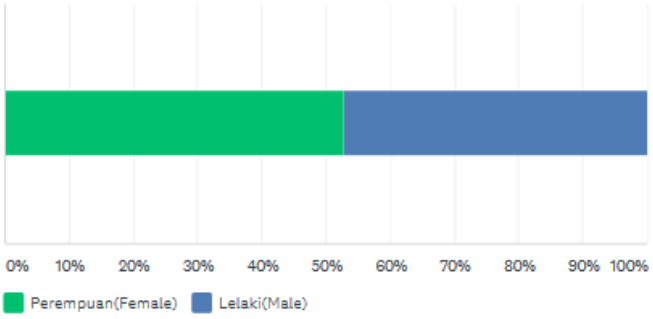
[70] https://www.dosm.gov.my/v1/uploads/files/1_Articles_By_Themes/Prices/HIES/HES-Report/HES_Pulau_Pinang.pdf, pg5

1.2 Findings

Q7

Jantina(Gender)

Answered: 290 Skipped: 0



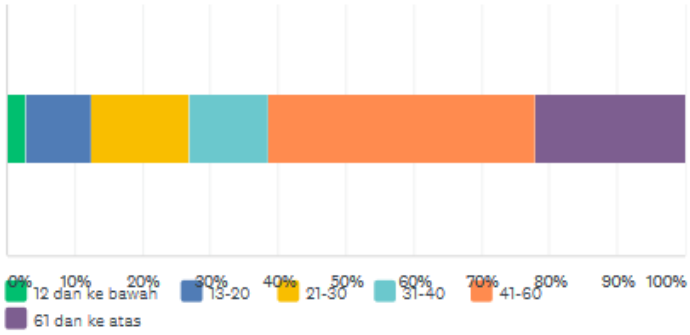
ANSWER CHOICES	RESPONSES	
Perempuan(Female)	52.76%	153
Lelaki(Male)	47.24%	137
TOTAL		290

53% of respondents are female and 47% are male.

Q8

Umur(Age)

Answered: 290 Skipped: 0



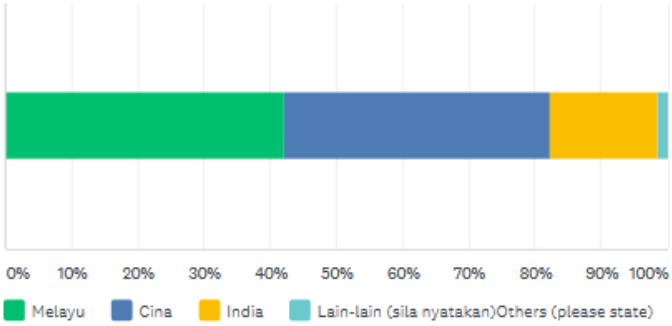
ANSWER CHOICES	RESPONSES	
12 dan ke bawah	2.76%	8
13-20	9.66%	28
21-30	14.48%	42
31-40	11.72%	34
41-60	39.31%	114
61 dan ke atas	22.07%	64
TOTAL		290

The largest age range consulted was 41 – 60 at 39%, followed by 61 and above at 22% and 21- 30 at 14%.

Q10

Bangsa(Ethnicity)

Answered: 290 Skipped: 0



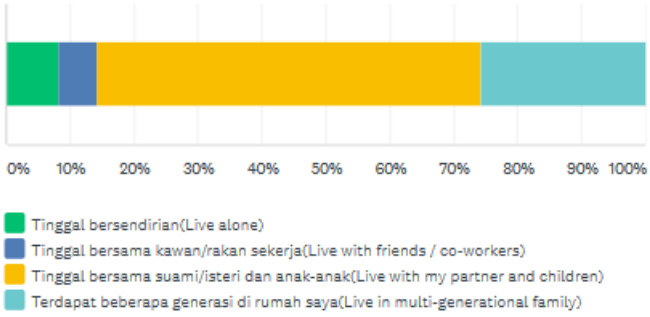
ANSWER CHOICES		RESPONSES	
Melayu		42.07%	122
Cina		40.34%	117
India		16.21%	47
Lain-lain (sila nyatakan)Others (please state)	Responses	1.38%	4
TOTAL			290

The majority consulted during the outreach events were Malays (42%) and Chinese (40%). Indians made up 16% of the respondents and the remaining 1% were non-Malaysians from Bangladesh and Thailand.

Q12

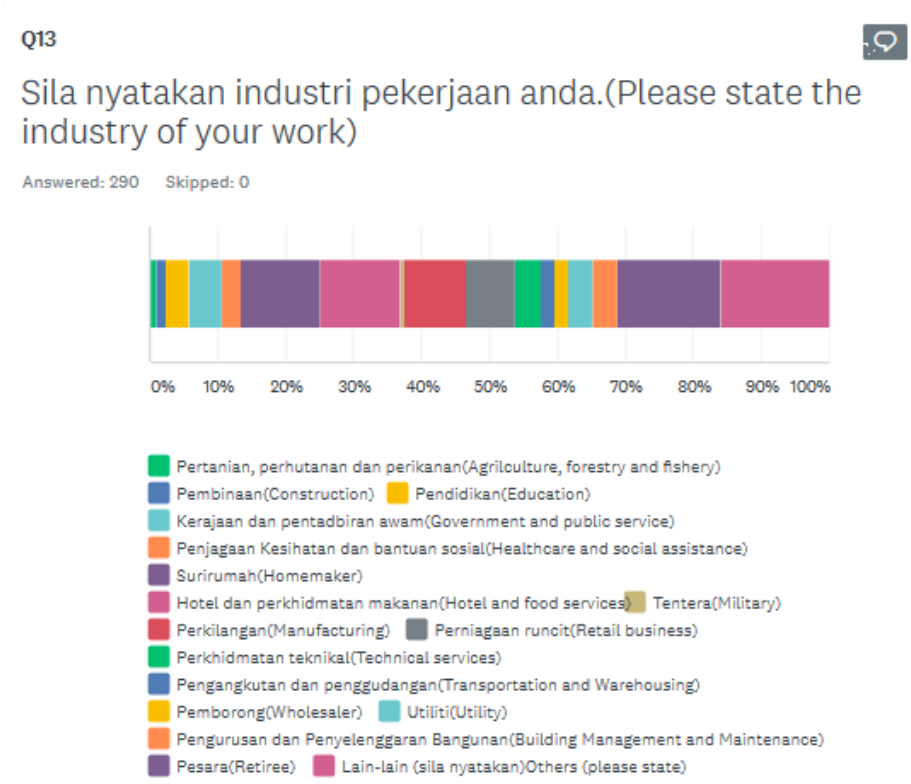
Siapakah yang berkongsi tempat tinggal dengan anda?(Who do you live with)

Answered: 289 Skipped: 1



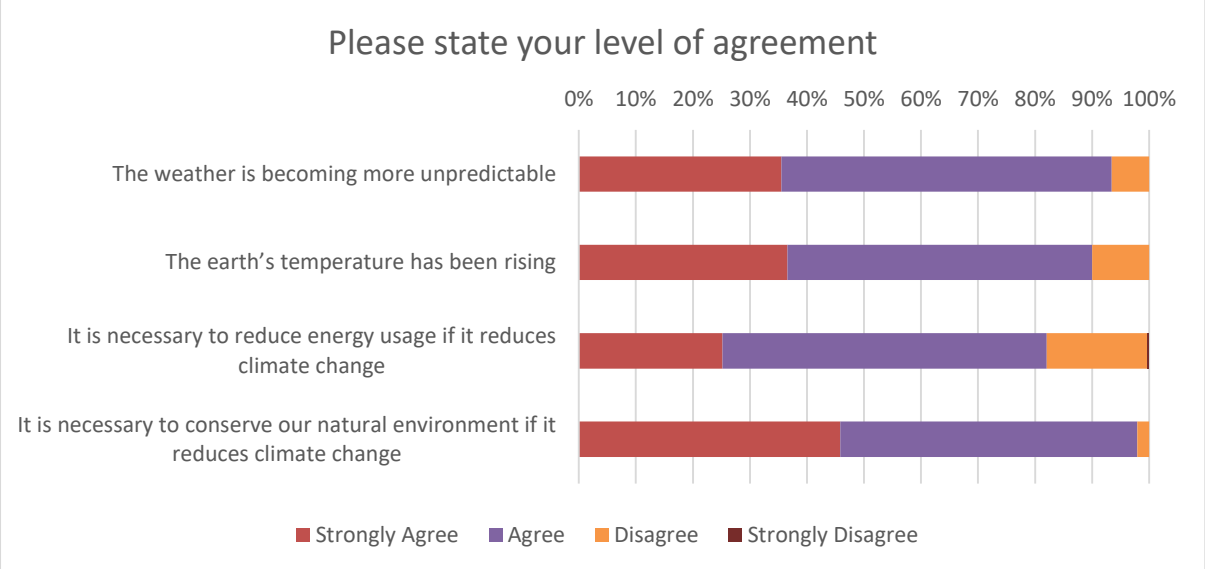
ANSWER CHOICES	RESPONSES	
Tinggal bersendirian(Live alone)	8.30%	24
Tinggal bersama kawan/rakan sekerja(Live with friends / co-workers)	5.88%	17
Tinggal bersama suami/isteri dan anak-anak(Live with my partner and children)	60.21%	174
Terdapat beberapa generasi di rumah saya(Live in multi-generational family)	25.61%	74
TOTAL		289

60% of the respondents lived with their direct family, while 26% lived in multi-generational homes. 8% lived alone and 6% lived with friends or co-workers.



Most of the respondents were retirees (15%), followed by homemakers (12%) and those in hotel or food services (12%). 15% belonged to the 'Others' group and consisted mostly of students and the unemployed.

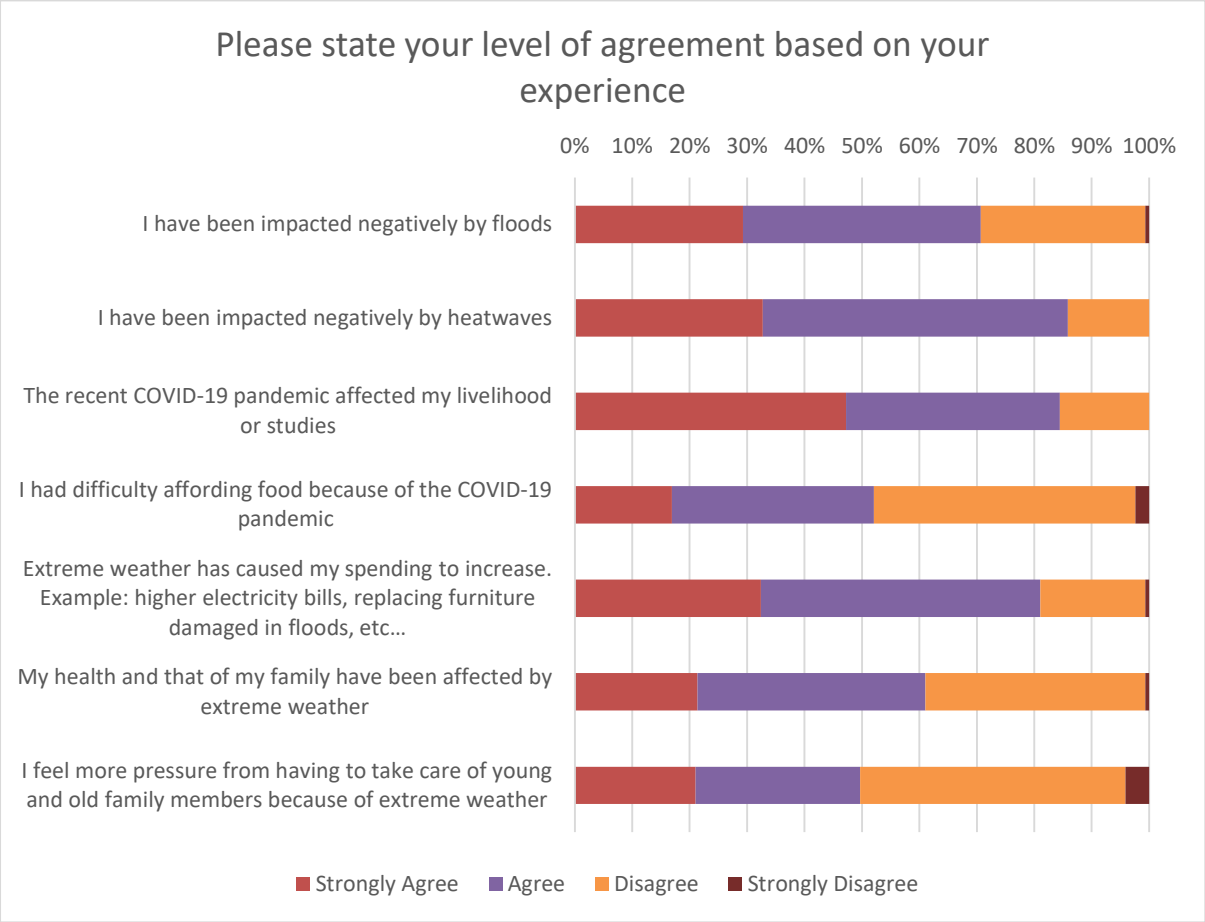
Awareness of climate change



93% strongly agreed or agreed that the weather was becoming more unpredictable, while 90% strongly agreed or agreed that the earth's temperature has been rising. When asked what kind of changes needed to be made to combat climate change, 98% strongly agreed or agreed that conserving the natural environment would help, but only 82% thought it was necessary to reduce energy usage. **Respondents perceived a lower correlation between energy usage and climate change than conservation of the natural environment.**

87% of respondents from George Town regard energy usage as affecting climate change compared to 75% in Bayan Lepas. This difference in perception may be caused by the higher population density in George Town compare to Bayan Lepas.
Due to high density, George Town residential areas are closer in proximity to its non-residential areas, where commercial activities such as high usage of airconditioning units (that give off heat) and higher usage of transportation vehicles contribute to the overall heat felt by residents there.

Impact of climate change



Highest impact felt was from heatwaves. 86% of respondents agreed that they have been negatively impacted by heat. In comparison, only 71% said they were negatively impacted by floods. Viewed as rare occurrences, floods are seen as having less of an impact on respondents as 3 out of 4 locations were flats and apartments; its residents only indirectly impacted by flooding if it happens in areas surrounding their homes.
Responses also differ according to location, with 91% of respondents from George Town agreeing that heat negatively impacted them but only 79% in Bayan Lepas thought so.

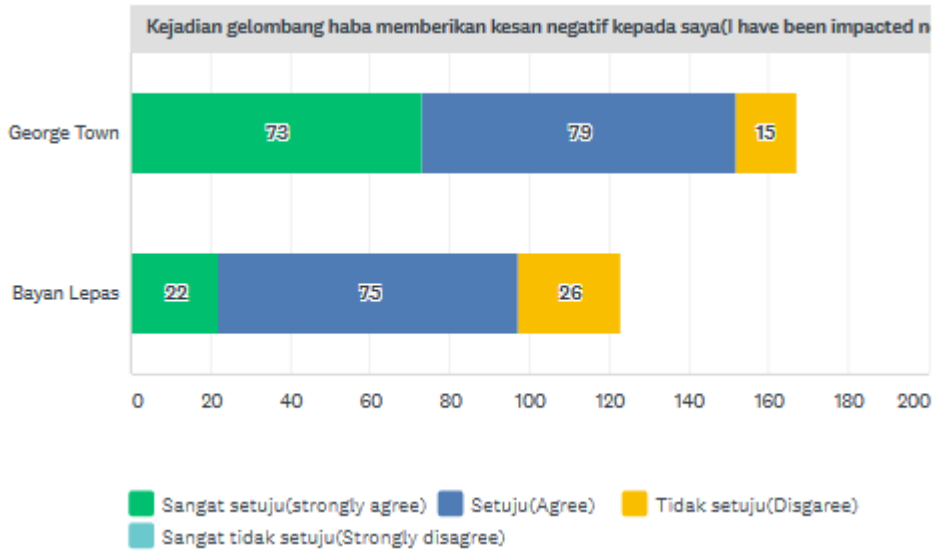
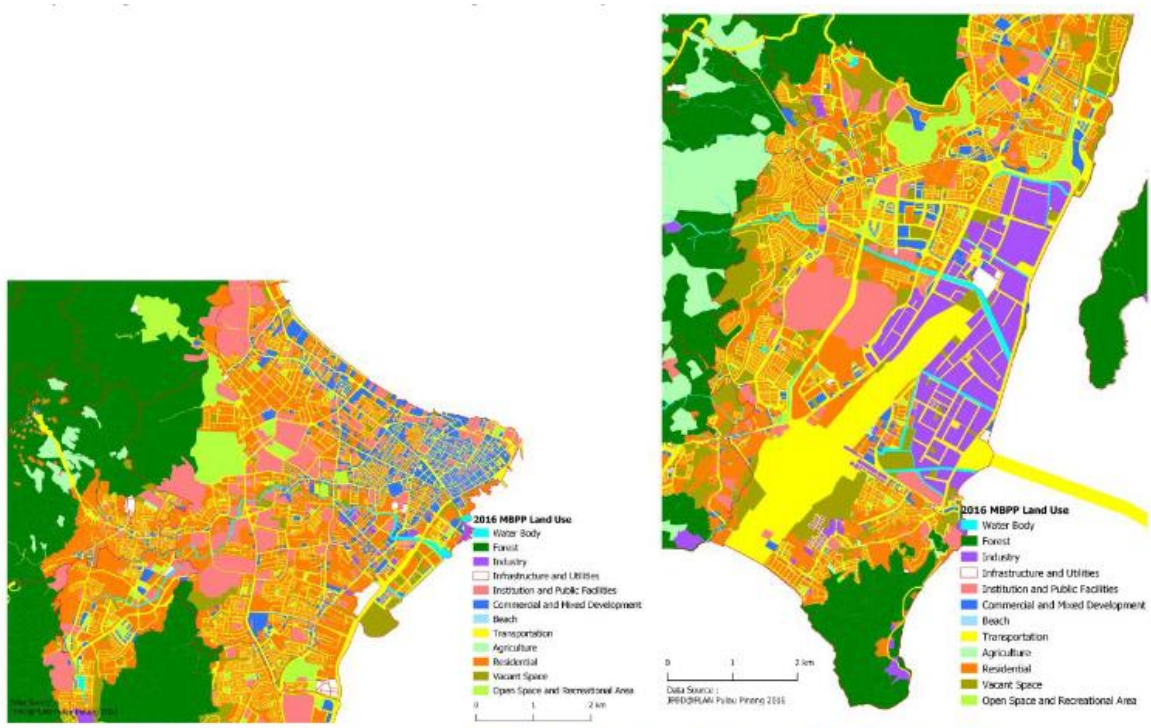


Chart shows respondents level of agreement to the statement 'I have been impacted negatively by heatwaves' by location.

George Town respondents may feel a higher impact from heat because of the higher population density in George Town and its mixed land use. Census data from 2010 show that George Town mukim had a higher density of 79people/ha whereas Bayan Lepas had 42people/ha. The two George Town locations selected for the survey are situated in the city core zone, which consist of commercial and mixed land use whereas Bayan Lepas
residential locations are fairly segregated from its industrial zones.[71]



Source: JPBD, 2016. Land use for Georgetown (4a, left) and for Bayan Lepas (4b, right).

[71] Nature-based climate adaptation programme for the urban areas of Penang island Programme Proposal to Adaptation Fund, pg12

Other two significant impacts for respondents were related to livelihood and spending. 84% agreed that their livelihood was disrupted during the MCO and 81% agreed that extreme weather had increased their spending (higher electricity bills, money to replace damaged furniture/appliances/goods during flood).
Respondents felt the least impacted in terms of **access to food** (only 52% agreed that they faced difficulty affording food) and **caregiving** (50% said that they felt pressure from having to take care of young and old family members because of extreme weather). Responses to these two statements differ significantly based on location and gender.

Access to food during MCO

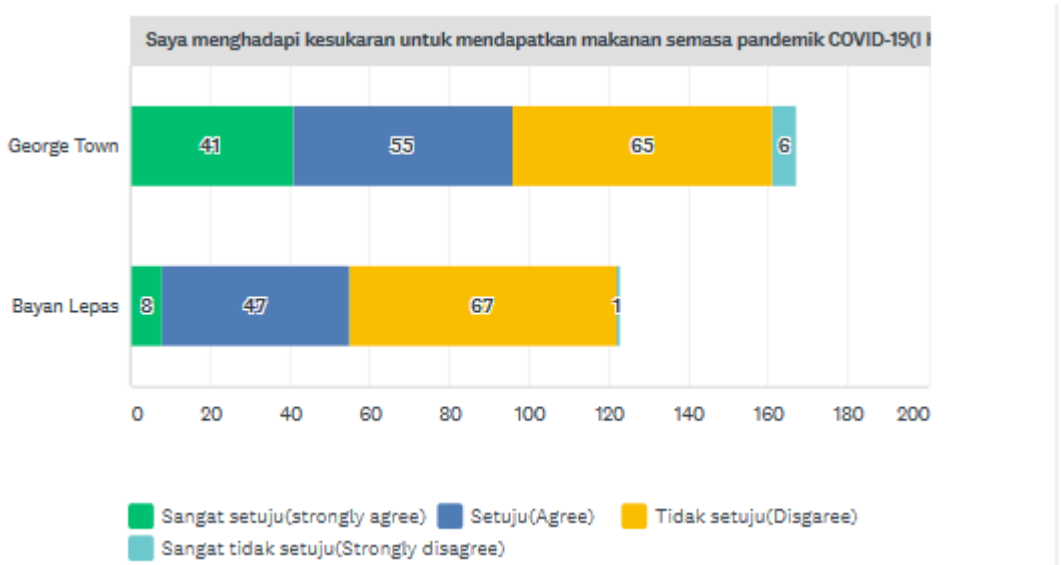


Chart shows respondents level of agreement to the statement 'I had difficulty affording food during the COVID-19 pandemic' by location.

58% of respondents from George Town agreed that their access to food was affected negatively during MCO whereas only 45% of respondents in Bayan Lepas felt this way. This may be because 29% of respondents from George Town are 61 years-old and above, whereas only 13% of respondents from Bayan Lepas are in that age range. Not having a steady income, not having the means to move around easily, and being more vulnerable to COVID-19 are factors that would affect access to food during a disaster

Stress from caregiving

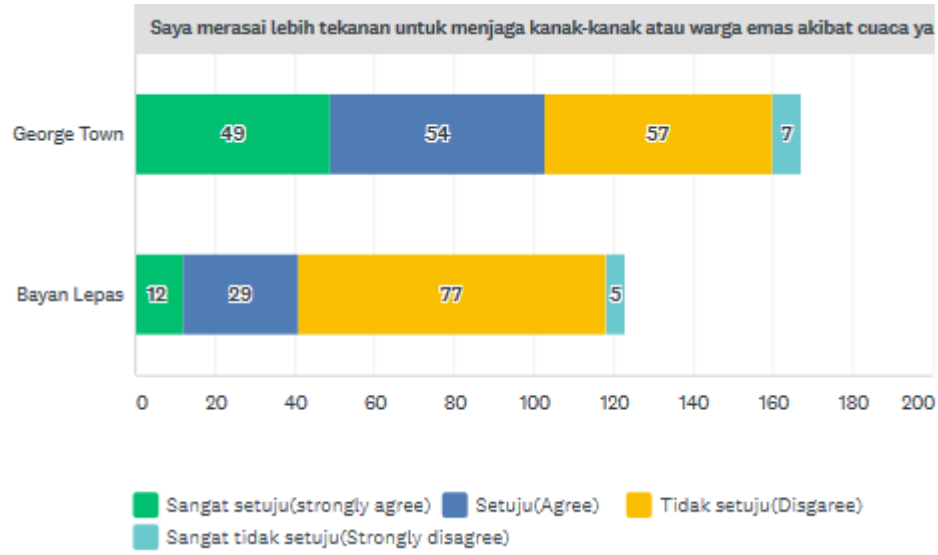


Chart shows respondents level of agreement to the statement 'I feel more pressure from having to take care of young and old family members because of extreme weather' by location.

61% of respondents from George Town agreed that they felt more stress from taking care of young and old family members during extreme weather whereas only 34% of respondents from Bayan Lepas felt this way.

This stress could be from having to live in multi-generational living spaces, with caregivers possibly taking care of both children and parents. With its higher population density, more George Town respondents (35%) live in multigenerational homes compared to those in Bayan Lepas (13%). Higher population density could also mean higher urban heat effect and higher chances of catching communicable diseases.

Data according to gender also shows a significant difference in perception.

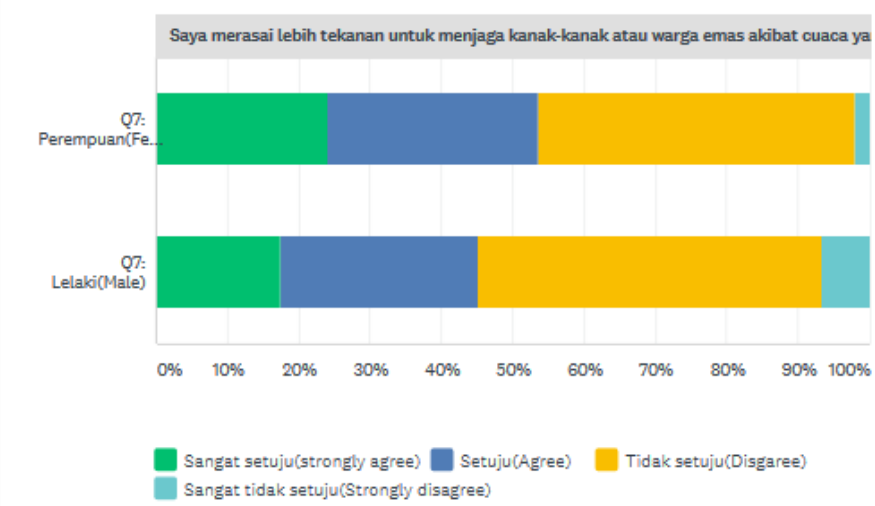
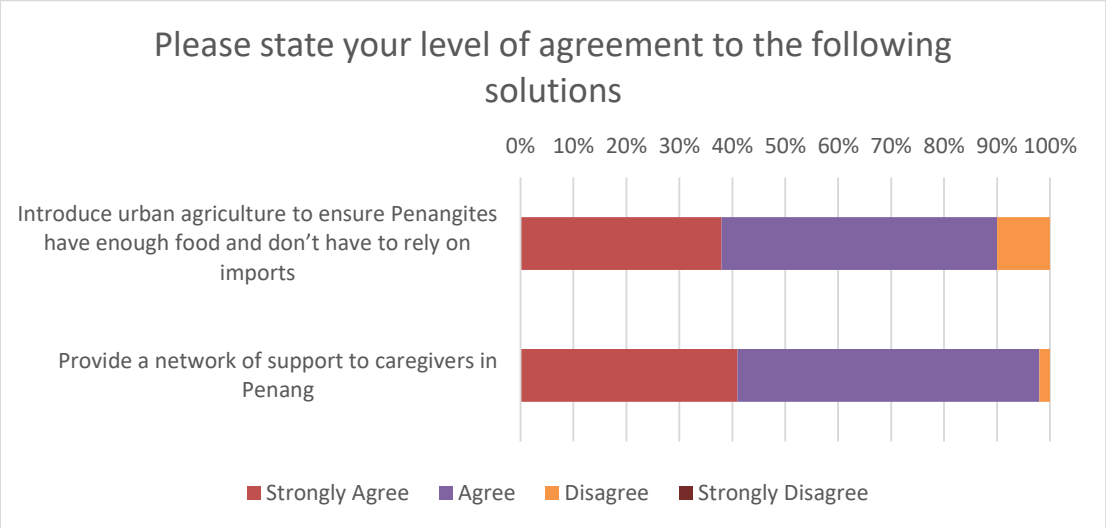


Chart shows respondents level of agreement to the statement 'I feel more pressure from having to take care of young and old family members because of extreme weather' by gender.

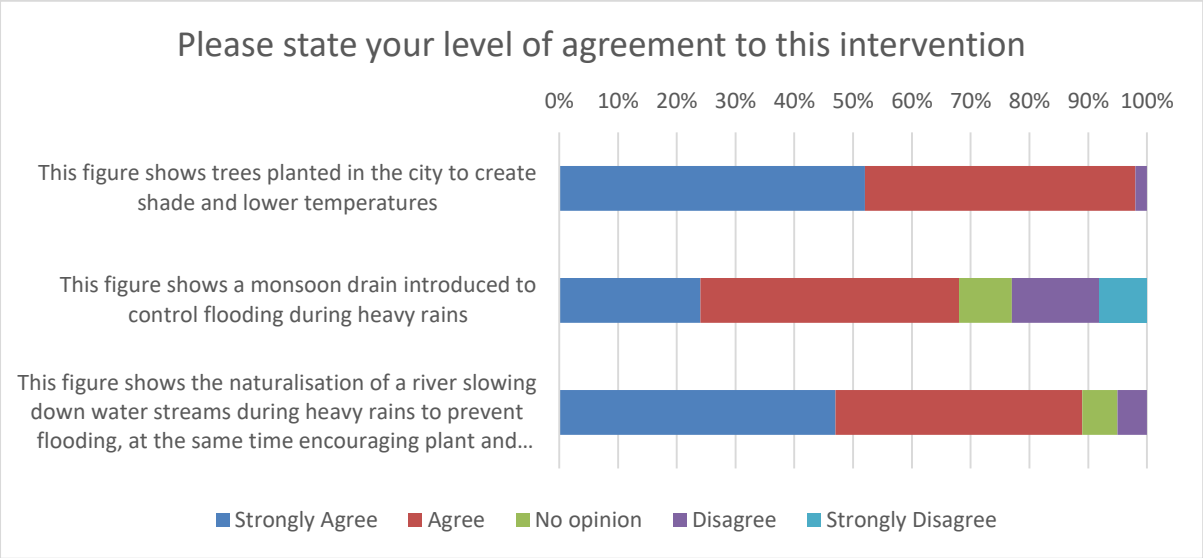
54% of women respondents agreed that they experienced more pressure taking care of young and old family members in extreme weather whereas only 45% of men felt that way. The burden of caregiving may fall heavier on women; they may be fulltime homemakers that do not have the necessary resources and network to feel supported or have to juggle between holding down a job and taking care of family.

Attitudes towards nature-based solutions



Some still doubt the plausibility of urban farming (10% disagreed) – this could be due to having no experience or bad experience with urban farming or community gardens. It could also be because access to food is not seen as an obstacle yet. Almost half (48%) of all respondents said that they did not face challenges paying or getting food during the MCO.

However, almost all agreed that caregivers should receive support.



98% agree with the intervention of planting trees to provide shade and lower temperatures. When comparing monsoon drains to naturalisation of rivers, most respondents favoured the latter – only 68% agreed to monsoon drains (and 8% strongly disagreeing that it was a suitable intervention) whereas 89% agreed with naturalisation of rivers. All these corelate with data on respondents' **high awareness levels of climate change being tied to conservation of the natural environment.**

1.3 Recommendations

I. The experiences of both B40 groups in George Town and Bayan Lepas are markedly different due to population density. Residents in George Town experience a higher negative impact when it comes to urban heat, effects on health and caregiving more than those in Bayan Lepas. **The messaging and dissemination of communications related to interventions (whether infrastructural or social) need to be sensitive to this.**

II. **Programming and allocation of resources for educational/awareness efforts in George Town and Bayan Lepas should be differentiated**. Although respondents from both areas are open to greening interventions (like planting of trees and naturalisation of rivers), there seems to be a lower awareness in Bayan Lepas that climate change is related to increase of energy usage.

III. There is some hesitance to urban farming as an intervention. Seeing how communities view disruption to livelihood and increased spending as results of climate change, **urban farming should be presented to them as a means of income generation**. Having a strong education program about nutrition, food security and how urban farming can be a source of income would help to increase community ownership of such an initiative. There is also opportunity for **partnership with federal government under the recently launched Urban Agricultural Project**, which is part of the National Economic Recovery Plan (Penjana)[72].

IV. **Awareness-building around the unpaid labour of caregiving and household management** (inclusive of food management) predominantly done by women should be carried out. Not only to the public, so there is greater empathy and support on ground level,

[72] https://www.malaymail.com/news/malaysia/2020/08/23/govt-allocates-rm10m-for-urban-agriculture-project-says-deputy-minister/1896354

but also to policymakers, so decision-making around food aid and caregiving support is gender inclusive.

V. **Social resilience programming should also prioritise retirees** as their lack of steady income, lack in mobility and higher health risks make them especially vulnerable, requiring support in basic needs like access to food when a crisis like the MCO strikes.

2. Elderly

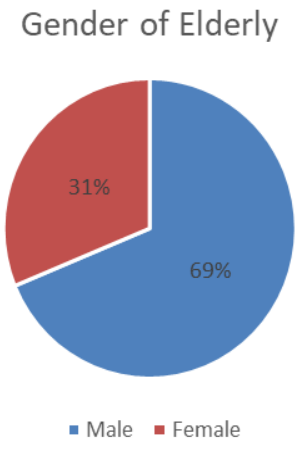
2.1 Methodology

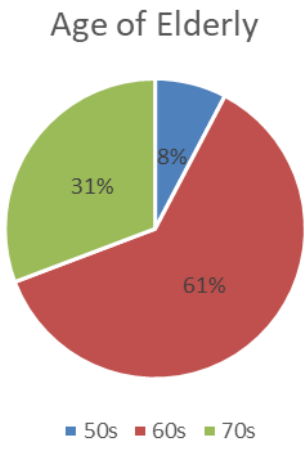
The consultation involved 2 types of interviews – one with organisations providing aged care services and one with elderly individuals themselves.

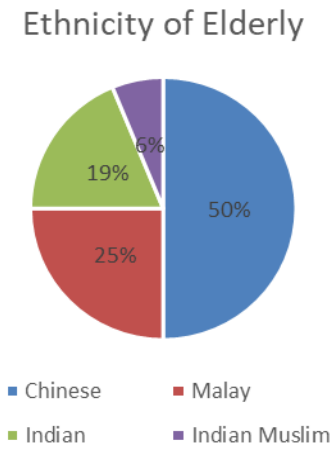
2 representatives from aged-care centres were interviewed. One worked in a private, commercial age-care facility located in the North and Northwest region of the island and one is the founder of a non-profit age care centre in Central island.

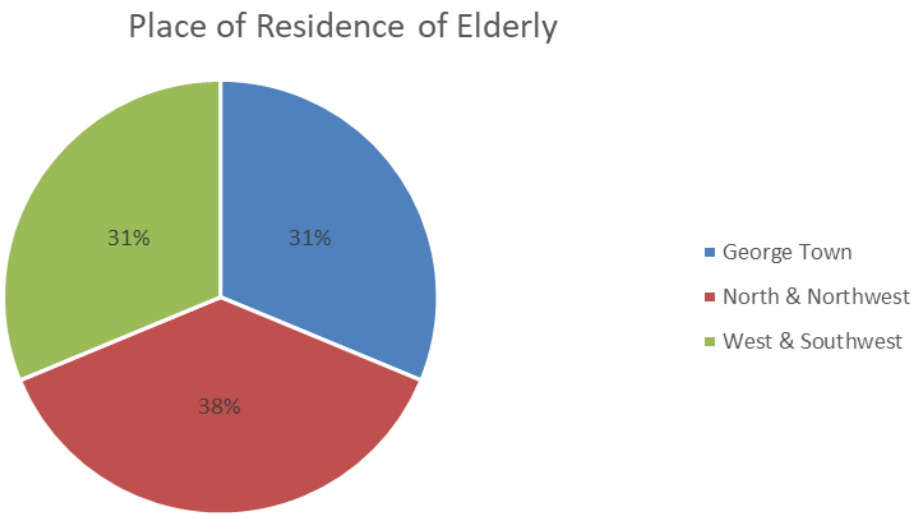
16 elderly individuals were interviewed, either in group settings or one-on-one settings. They were mostly personal contacts of the consultant, or contacts of her friends, or people she approached spontaneously. Initially, elderly in their 80s were part of the target group but because of difficulty getting access to them, especially during the Restricted Movement Control Order, the consultation focused on those in their 60s and 70s.

5 females and 11 males were consulted. 1 is in her late 50s, 8 are in their 60s and 4 are in their 70s. 8 are Chinese, 3 are Indian, 4 are Malays and 1 is an Indian Muslim. All of them are living in 3 major areas on Penang Island – 5 live in George Town, 6 live in the North and Northwest parts (Tanjung Bungah, Tanjung Tokong, Mount Erskine, Pulau Tikus) of the island and 5 live in the West and Southwest (Sungai Ara).









2.2 Findings

Awareness of climate change

Only 2 out of 16 can **identify the meaning of the term 'climate change'** but all can point to how the weather has changed drastically over the decades and its effects on their personal lives. 2 interviewees displayed particular awareness on **broader implications of climate change and how to respond to it** from a governance point-of-view. They both have stalls selling food and vegetables and display interest in self-improvement and community work.

These are the recurring observations that display awareness of all interviewees consulted:

- Change in climate is mainly related to **heat increase**, with one group displaying awareness that this is due to the 'hole in the ozone layer'. Most also noted the **unpredictability of the weather** now.
- Many see the **chopping of trees due to overdevelopment** (mostly the increase of new condominiums and high-rise buildings) as a cause for higher temperatures, floods, and landslides. These buildings also interfere with wind flow and drainage of the area.
- One mentioned that there is **lack of political will** to balance development and sustainability as individual's pockets are being filled through the many development projects carried out.

Impact of climate change

Interviewees from this group were not only asked to identify current impacts of climate change on their lives but also how climate has changed over the decades, based on their personal experience.

I. Current impacts

Environmental	Social	Economical
• Floods happen more frequently • Sinus, breathing problems • Fever • Allergic reactions, skin itching • For those bedridden or wheelchair bound, sweat will cause fungal infections • Dwindling number or size of animals around (sparrows, monitor lizards, fish) • Monkeys coming closer to where humans live – could be because there are less fruits in the jungle now	Heat increases: • Irritability • Drowsiness • Lethargy • Inability to focus or 'brain fog' • Reluctance to go out • Unpredictable weather causes disruption in routines, this is particularly disorienting for dementia patients	• Heat causes less people to come out in the afternoon, affects business • Damage of stock during flood • Vegetable seller notes paddy yields affected by prolonged drought. Low yield in vegetables increases cost price, affects sales • Non-profit old folks home recorded RM70,000 worth of damage in last flood • Commercial old folks home electricity bill up by 30% because of heat. Spending on

• Certain insects turning up near the aged care home (small green ones, Charlie ants – all these bite)		purchase of coolers, air-conditioning units • Affects labour-related work, feeling faint because of heat

II. Comparing the climate: Then and Now

When asked about their memories of how the climate used to be when they were young, the elderly interviewees made comparisons around these topics:

A) Unpredictable/extreme weather

- Seasonal wind patterns have changed – the 'North Wind' no longer happens during Chinese Lunar New Year as usual. It comes later and ends faster.
- Storms are stronger, 'like bombs', blowing away awnings and trees
- Penang did not used to be affected by natural disasters but now face effects of disasters like Typhoon Damrey that caused major floods in 2017

B) UV rays and temperature:

- Penang Hill was much cooler back then
- Overall Penang is hotter, dry seasons last longer
- Used to be able to see mist in the morning, now non existent
- Used to be able to ride trishaws, motorbikes, walk shirtless in the mornings, too hot to do it now
- Have to leave fan switched on the whole day, previously unnecessary
- Have to head outdoors for cooler air at night when it gets too hot

C) Rain and its impact on infrastructure

- Rain is less frequent but when it does rain, it floods easily (waters rise faster and higher than before)
- Mud slides never used to happen but are now more frequent
- Interviewee in 60s noted that the last time Carnarvon Street flooded was when he was 10. Another noted that the only time Gurney Drive flooded was in 2017.
- Sungai Ara was deep enough for bathing and washing clothes in. Although water today is clean, the river is purportedly shallower (cause for this could be less rainfall or a lower ability for retention at its source)

D) Increase in pollution

- Interviewee inferred that drop in soil quality is due to plastic pollution
- 10 – 15 years ago there was no haze, now an annual occurrence

Coping Mechanisms

Behaviour or habit change	• Taking showers more frequently, using wet cloth to wipe and cool body down • Increasing water intake • Consuming cooling herbal tea • Heading to nature when it gets too hot at home • Elevate goods/stock in case of flood • Aged care home carries out weekly check-ups measuring blood pressure, temperature, sugar and oxygen levels in blood • Aged care home prepares evacuation options
Adapting	Solutions include nature-based ones, switching to cleaner options, convenient

surroundings	but non-environmental-friendly solutions: • Having more plants around house/compound to cool down • Switching to cleaner energy options like solar panels in view of increasing usage of electricity in heat • Switching to LED lights to save energy and reduce heat emission • Installing air-conditioning units at home and at work • Adapting heritage houses to accommodate air-conditioning
External help	• YB helped with evacuation of old folks from the Home to neighbouring school • Home received funds from private companies and the public for necessities

Barriers to Resilience

3 interviewees stressed that the biggest barrier to building resilience is not having in place **environmental education and awareness inculcated since young**. They attribute acts of littering and vandalism as barriers to a society benefitting from climate adaptation solutions. They stress that environmental education is most effective if it involves hands-on activities like tree planting and waste management at kindergarten level.

Several elderly interviewees mentioned heading out of the house to escape heat indoors. This may only be available if one lives on landed property in a safe neighbourhood or a residential area with greenery within proximity. These things may not be readily available to those living in **poor, high density, urban neighbourhoods**.

Other perceived barriers are related to overdevelopment. One interviewee said that rain will have greater impacts on citizens due to the **overdevelopment** of the island. Another said that residents are bearing the brunt of flash floods because of **badly designed drainage systems**. There is also the perception of **space limitation in urban areas** and having to give up either parking space or development space in order to plant trees.

2.3 Recommendations

I. **Creating green spaces** for elderly and children to find respite and use as a place of interaction is important, especially in **urban areas that are poor and high density**. These do not have to be conventional places of recreation like parks if space limitation is an issue.

   General requests from the majority of elderly interviewees is to have more greenery around to offset overdevelopment. Many of them mention leaving the house and heading outdoors (preferably somewhere near nature) when the indoors become too oppressively warm. Although they may live in the right type of housing or in the type of neighbourhood to be able to do that, elderly occupants in high density, low cost housing may not have easy access to open space not too far from their doorstep or even a green space that is easy to access and safe for them.

II. Providing **public transport and point-to-point access that is safe and accessible** to elderly folk. All levels of society should be able to afford public transport, allowing them independent mobility that is clean, safe and comfortable. This step of climate adaption will make sure that the current climate will not impede the elderly from participating in social or economic life.

III. Providing **resources for caregivers** as the elderly show high propensity to be impacted in health by climate change. Respiratory and skin related diseases are the top complaints, followed by problems related to specific conditions like dementia. Caregivers can be supported through education on how to use sustainable and natural methods to deal with or prevent these health issues from happening as weather becomes unpredictable, extreme and air quality drops.

IV. **Education or awareness campaigns that involve interactions between school students and the elderly** are not just a way to inculcate environmental awareness in young and old participants but encourage intergenerational knowledge sharing and bonding through hands-on activities that contribute to green efforts.

3. Migrants and Refugees

Context:

Migrants have work permits and are usually holding a job assigned by an agency. This agency also provides living accommodation for them, usually worker hostels.

Roughly, 70% of them are on the mainland and 30% are spread out over the island in Jelutong, Gelugor, Teluk Kumbar, Tanjung Tokong, Bukit Jambul, Bayan Lepas and George Town. Totalling 22000, they make up 25% of the workforce in Penang.

A person fleeing from their own country where there is a threatening situation may seek a refugee status from the High Commission in Kuala Lumpur. After running a background check, the person is granted a UNHCR refugee card which in theory will protect them against any form of harassment but this is not the case in real life. Amongst others, even police have been known to extort money from them. UNHCR refugees are technically 'in transit' here in Malaysia as UNHCR works to relocate them. This relocation can sometimes involve decades of waiting.

3.1 Methodology

The consultation targeted 3 types of interviewees:

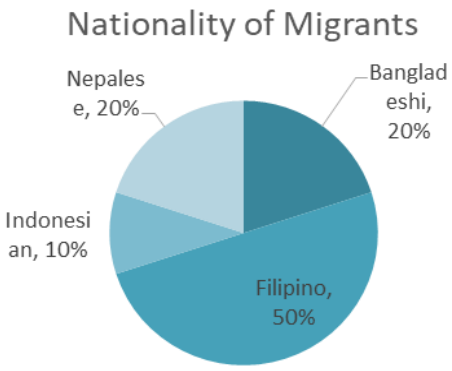
Type	Number of participants	Method of consultation
Representative from organisation supporting migrants and refugees	1	Long, one-on-one interview
Migrants	10	Mix of short individual and group interviews
Refugees	14	Group interviews

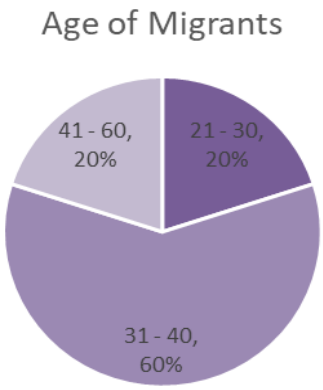
I. Representative from organisation supporting migrants and refugees

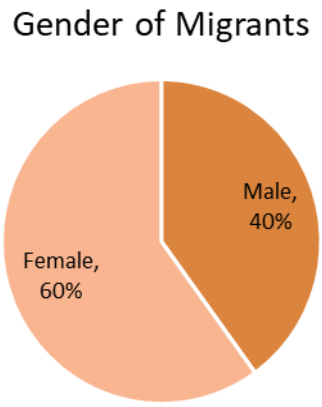
The organisation interviewed was Penang Stop Human Trafficking Campaign (PSHTC), an organisation involved in raising awareness on human trafficking, working in advocacy and engagement with the refugee communities in Penang.

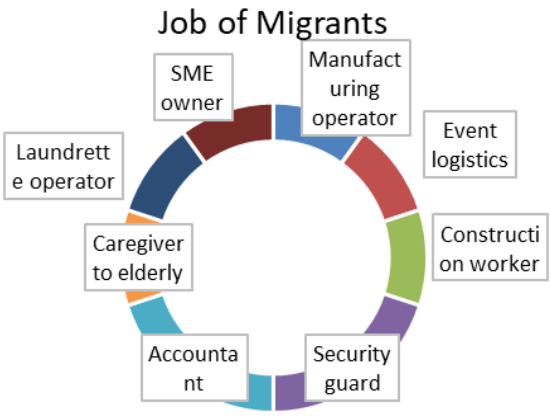
II. Migrants

The chart below shows the nationalities of migrant workers interviewed during this consultation process.



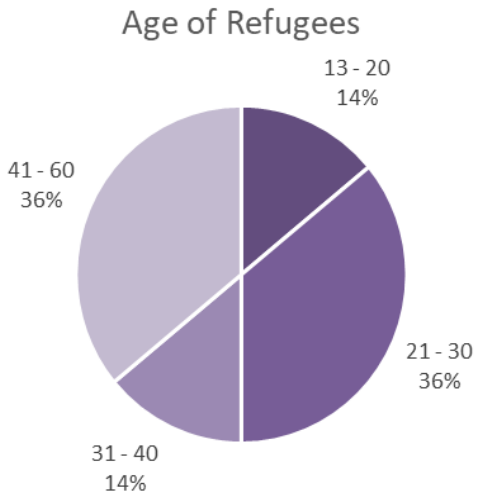






III. Refugees

All 14 refugees interviewed are Rohingya, male and working in construction. They were all introduced to the consultant via PSHTC. Malaysian and Rohingya members of PSHTC met to discuss who within the community was more well-versed in Bahasa Malaysia and was suitable to participate in group interviews. A list was then given to the consultant and she went by herself to meet them.



Limitations:
The interviews of the Rohingya men were done at their residential areas in Jelutong. Access to women was limited although most of these men had wives and children living with them. Attempts at speaking with the women were made but these were met with reticence by the women themselves even though the consultant was of the same gender and came under recommendation by PSHTC.

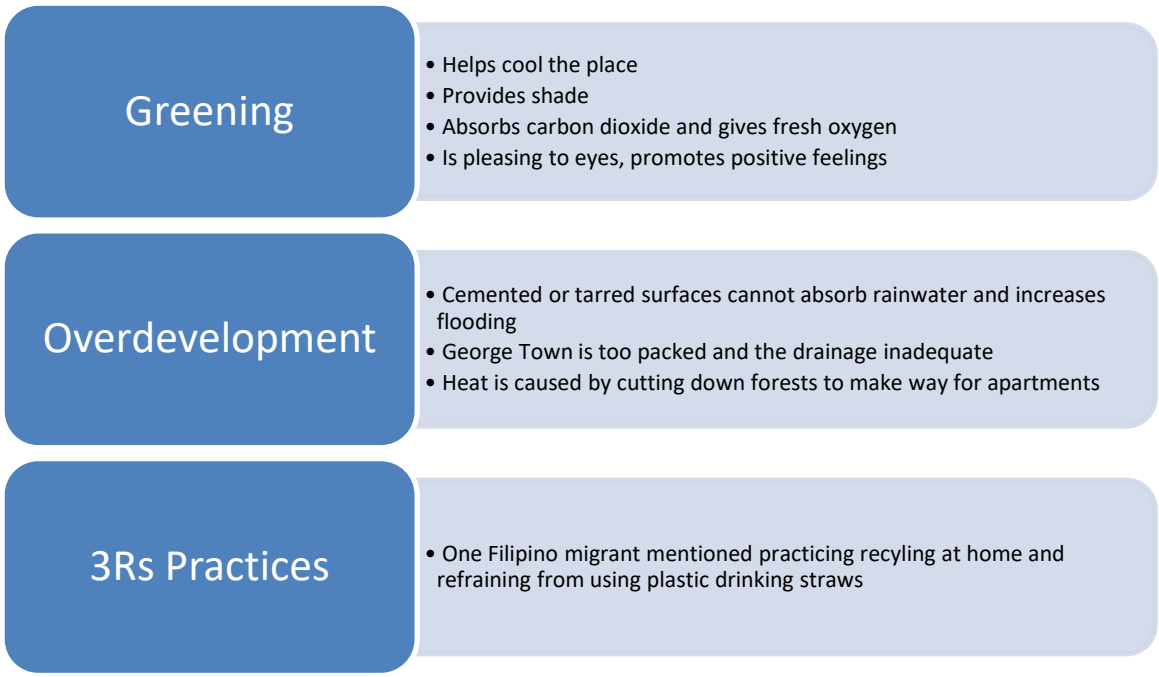
This hesitance may be attributed to not being able to speak in Bahasa Malaysia nor English, learned wariness of Malaysian figures of authority, and the cultural verbal passivity within the female Rohingya community in a social setting involving non-family members.

3.2 Findings

Findings are categorised into 4 focus areas: awareness of climate change, impacts of climate change, coping mechanisms and barriers to resilience.
For each focus area, the report will discuss perspectives collected from migrants and refugees separately, unless stated otherwise.

Awareness of climate change

Perspectives gathered from interview with PSHTC are incorporated into data collected from migrant and refugee interviews.
Most **migrant interviewees** were able to point out instances of extreme weather but not all see this as having an effect on their lives.
Half of them clearly said that extreme weather had no noticeable impact on their work, health or mobility. Some point out that Penang's weather is better than their hometown (Medan, Indonesia). And that mild flooding that recedes within 10 minutes is normal and the heat is normal.
Regardless of whether they felt climate change had an impact on their lives, the majority of them could point out how nature-based solutions could help with climate adaptation. Their knowledge on the environment centre around these ideas:



For **refugee interviewees**, climate change is not something that is on their minds. They are still struggling to look for a job, access safer housing and affordable healthcare, and educate their children.
However, one interviewee did associate flooding with clogged drains in his village.

Impact of climate change

Majority of **migrant interviewees** were able to list impacts of climate change on them.

Environmental	Social	Economic
•Child suffered from **heat rash** for a week. Had to spend on doctor's consultation and prescription cream •Heat causes **fever, flu** •Better **quality of sleep** when it rains, no airconditioning to deal with heat •Sleeping in semi-outdoor area in hot weather, resulting in **higher exposure to mosquitoes** •Needs to **move furniture** whenever there is threat of flooding •Flood waters carry **water-bourne diseases**, stagnant water **breeds mosquitoes** •**Unsafe living conditions**: prefab buildings on construction sites, low cost flats with 20 housemates	•**Stress** of cleaning after flood •**Fear of looting** prevented flood victim from evacuating •Sound of frequent strong winds (2 - 3 times a month) in highrise apartment causes **anxiety and lost of sleep** •Elderly more **irritable** in hot weather •Hot weather **affects mood** negatively •**Cancellation of social outings** on off-days if it floods	•**Delay in work** (bus not able to access flooded area) •**Cancellation of jobs** (events) due to flood •**Drop in productivity:** worried about house flooding when it rains heavily, discomfort of working in wet shoes/trousers, having to spend a month cleaning the house after flood •Loss and **damage of property** and stock in flood/storm •**Purchase extra fan** to deal with heat •**Unable to conduct clothing business** during MCO, in need of financial aid •**Earnings fell** by 70% even after lockdown lifted (clothing store)

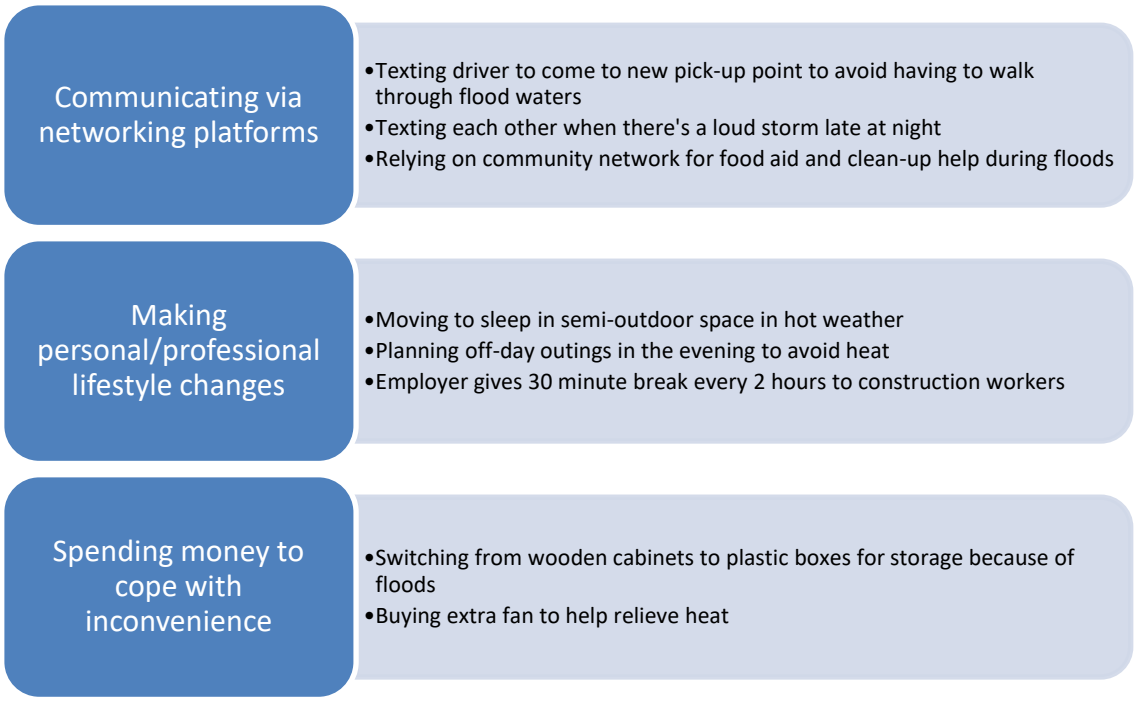
However, some noted that the climate had little effect on their lives. Those that noted this all worked indoors and were rarely exposed to the elements. Instances where mobility was limited because of flooding or if they got wet on the way or back from work were viewed as small inconveniences.
The only exception was an interviewee who worked at the construction site. Despite working outdoors, he felt that the weather was normal and that his rest times away from heat and rain were satisfactory. He reported little negative impact to his work even during the MCO, as construction was allowed to continue.
Half of the interviewees were unable to comment on electricity bills as their house owners or agencies paid the utility bills.

These are the impacts **refugee interviewees** listed.

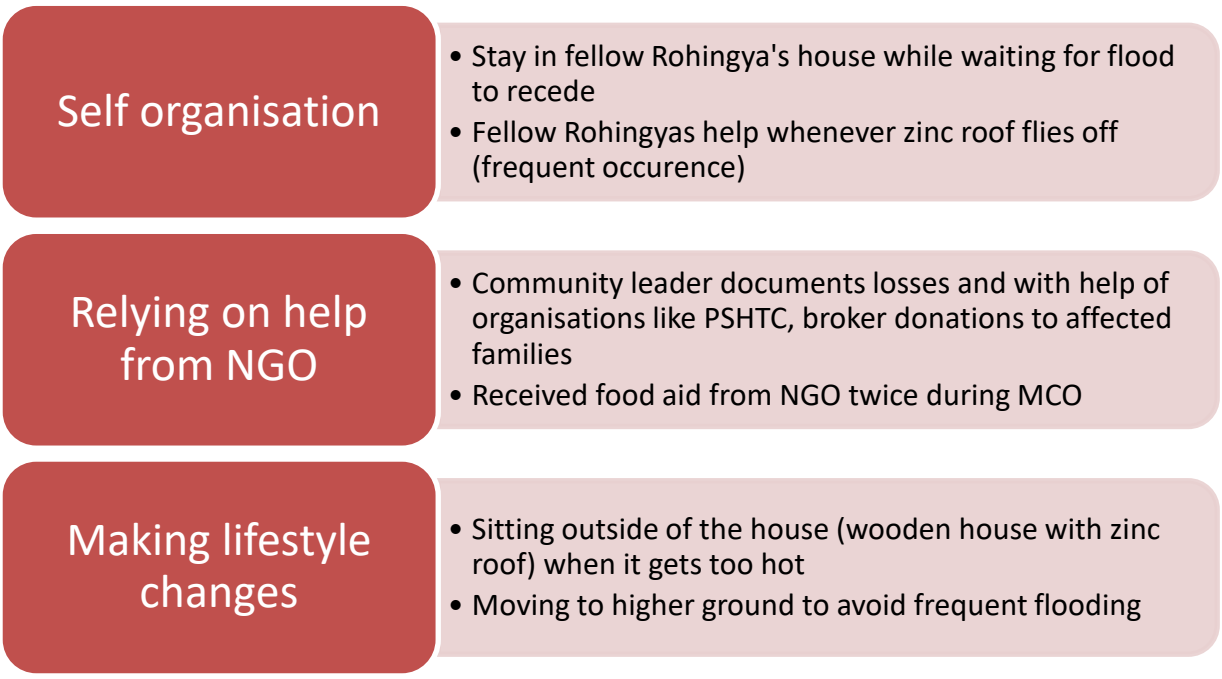
Environmental	Social	Economic
•Termite-infested house not safe during flood or strong wind •Zinc roof leaking, blown away by wind before •If it rains at night, they get wet from rain leaking in •Lack of ceiling causes extreme heat •Babies not able to sleep, cry a lot •Need to sit outside of the house under trees when it is too hot •Child/wife gets fever, cough, headache from heat, or fever and flu after flood	•They do not think weather affects behaviour or mood of people around them •Worry from not having work because of MCO	•Construction company has stopped hiring them during MCO •Refugees are the lowest priority in getting called back to work •No income during MCO causes fear of not being able to afford safe delivery of 4th child •Medical fees for illnesses caused by weather are expensive - charged foreigner fees •Lost bicycle (mode of transport) in flood •Run the risk of borrowing money from illegal syndicates

A minority of refugee interviewees said that they did not think the climate affected the health of their family members. When asked if they suffered financial loss, one interviewee said that all their furniture is scavenged, therefore if property is damaged in a flood, technically, there is no financial loss there. This statement serves as a strong indicator of their financial situation.

Coping mechanisms
Migrants interviewed displayed three ways of coping with climate change:



Refugees cope slightly differently. Having low, inconsistent income, they are not able to financially alleviate their situation but must rely on their own community for help, followed by aid from NGOs.



Barriers to resilience

Exclusion	Lack of legal status (exclusive to refugees)	Lack of employment
• Migrants and refugees not included in decision-making involving their welfare • Unaware of where to get help in crises • Often, aid given to Malaysians only	• No access to education, right to redress • Cannot go to authorities for anything • No way to seek justice if not paid or not fully paid for work	• Being in constant state of financial instability or poverty • Unable to move to safer, healthier living spaces • Financial desperation (esp. during MCO) leads to borrowing money from illegal syndicates

3.3 Recommendations

I. **Increase support for development of community-based, self-run initiatives** to empower migrant and especially refugee communities. There should be investment in organisations or individuals who have clear pathways to support them. Organisations like PSHTC has trained facilitators, coaches, teachers from within the Rohingya community itself for the purpose of growing self-organisation amongst the refugees.

II. Nature-based solutions are a chance or excuse to engage with migrant and refugee communities to **involve them in planning**, and in the process, **educating them in climate change awareness** as well.

4. Persons with Disabilities

Due to the time and resource limits of this consultation process, only those with physical disabilities were interviewed – mainly the visually impaired and wheelchair users.

4.1 Methodology

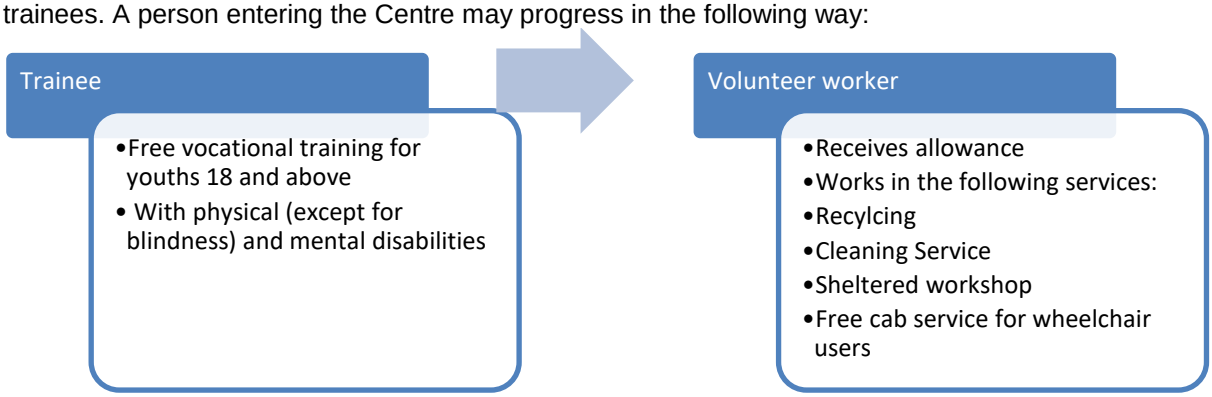
Type	Number of participants	Method of consultation
Representatives from organisation supporting persons with disabilities	3	Long, one-on-one or group interview
Persons with Disabilities	15	Mix of one-on-one interviews and Focus Group Discussions

i) Representatives from organisation supporting persons with disabilities

Two organisations were interviewed:
a) St Nicholas' Home for Blind (SNH)
Founded in 1926 in Malacca, the Home moved to its current location in Penang in 1938. It provides 4 training courses (bakery, basketry, IT skills and massage) to blind and visually-impaired (BVI) school leavers. After completing their courses, students may become trainees and then transition to being staff members.

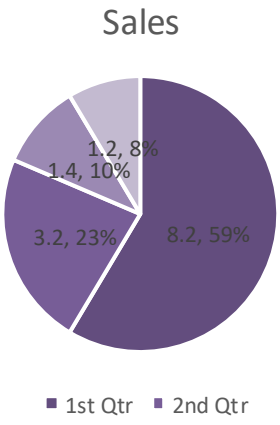
Staff and trainees run the Home's massage centre and bakery on Jalan Bagan Jermal, Pulau Tikus. The Home also acts as a dormitory for staff and trainees from outside of Penang. Currently, there are 6 BVI staff, 14 BVI trainees and 57 BVI students.
David Chiang, General Manager of the Home was interviewed.

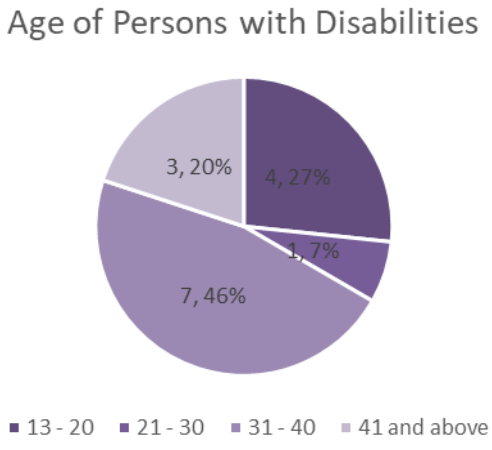
b) Eden Handicap Services Centre (EHSC)
Founded in 1991, the entire organisation has up to 180 persons including staff, volunteer workers and trainees. A person entering the Centre may progress in the following way:

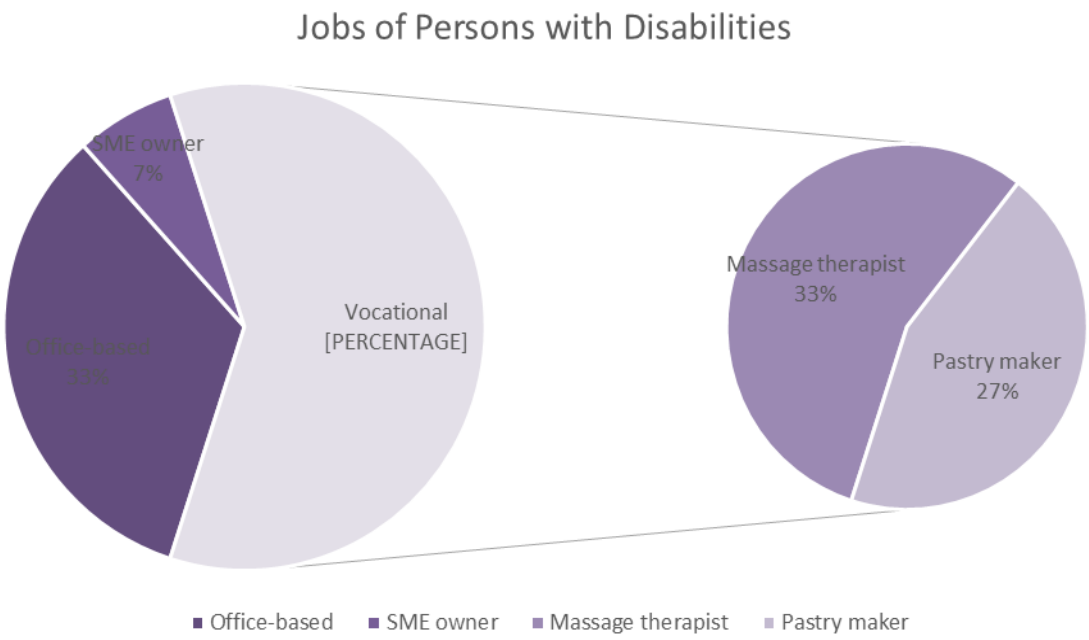


Lee Sin Kok and Lim Gim Chye (Rehabilitation/Vocational Unit Manager and Assistant Manager respectively) were interviewed.

ii) Persons with Disabilities (PwD)
In total 15 PwD were interviewed, this included 12 BVI staff and trainees from SNH (via Focus Group Discussion), and 3 wheelchair users who were interviewed individually based on recommendations from EHSC and consultant's personal contacts.







60% of them have jobs that require vocational skills and are BVI persons working out of the SNH's massage centre and pastry centre. Office-based workers (33%) are a mix of BVI persons and wheelchair users holding down jobs involving Braille transcription, IT, library management, clerical work, and writing. One wheelchair user owns a gift shop (SME owner).

4.2 Findings

Findings are categorised into 4 focus areas: awareness of climate change, impacts of climate change, coping mechanisms and barriers to resilience.

Data from BVI persons and wheelchair users have been consolidated as there are many similar issues and shared points. Views collected from organisation and individual interviews have also been merged.

Awareness on climate change

We can tell from the responses that climate change is not an issue that the PwD focus on. Pressing needs like finding employment for survival, finding affordable housing and issues related to accessibility and safety are priorities for them.

Accessibility and Safety	• Pedestrian walkways and crossings that are not designed or maintained for their safety • Hard to find affordable housing that has disabled-friendly designs
Employability	• Face competition from cheap foreign labour
Understanding	• Public transport operators and general public's lack of knowledge on when and how to assist PwD, especially on the streets

However, when questioned specifically about changes in the environment around them, they are able to point out that weather has become unpredictable and extreme and this has an effect on plants, insects and small animals. One Focus Group Discussion identified rapid and unsustainable development as a cause for climate change and even proposed upgrading or 'redeveloping' old buildings as a solution.

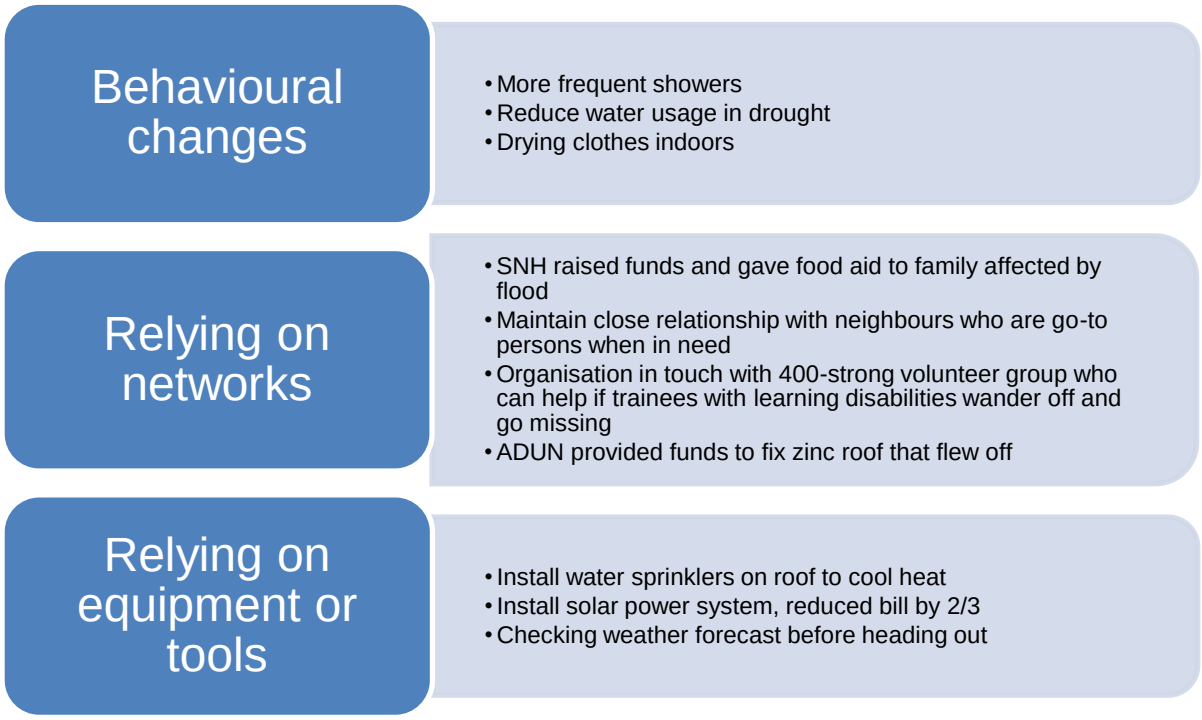
Impact of climate change

At one of the discussion groups involving BVI persons, it was mentioned that the weather does not affect their visits to the hospital or clinic. Majority of interviewees say that climate change does not influence their social lives. This notion is reinstated by SNH's General Manager as well. They are able to state these points below when asked specifically about changes in their behaviour or decisions in bad weather.

Environmental	Social	Economic
•More likely to get cough, flu, fever, skin problems, sore throat, headache, high blood pressure, shortness of breath due to extreme weather •Heat disrupts their sleep and productivity at work •Water rationing is hard during droughts for those living in flats •Fear of falling /injury when moving around in floodwaters •Wheelchair users have problems opening and closing shutter grills, casement windows in storms •Raining makes it hard for BVI pesons to hear vehicles when on the street, or when people enter the Centre	•Reluctant to head out because of heat, bad weather, facilties that are not wheelchair friendly, staff that are not trained to assist •Fear of potential injury from falling branches or signboards in storms! •Emotional instability and physical reactions amongst those with learning disabilities when heat is unbearable or disrupts their routine	•Less customers at massage centre during rainy days, had to close during MCO •Need to install air conditioning to maintain comfort of business areas •If they stay in because business is shut (MCO), they have no pay and yet have to foot higher electricity bills •Rainwater can damage wheelchair controller (high repair cost) •Unproductive when heat makes them drowsy or restless in non-airconditioned work spaces

Coping mechanisms

PwD have relied on their networks, equipment or digital tools, and changes in their behaviour and habits to cope with the challenges of climate change.

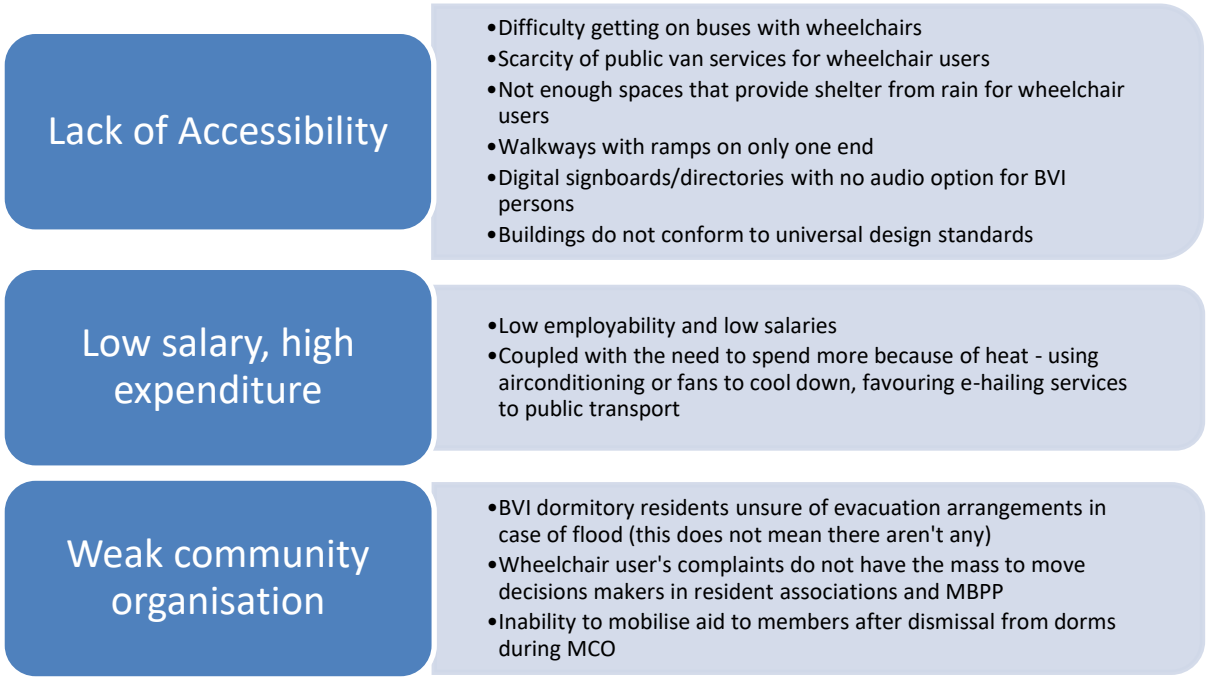


Barriers to resilience

PwD face **accessibility issues from the lack of universal design principles in buildings** and infrastructure. However, not all of them feel this way – one focus group involving BVI persons expressed that they did not perceive visual impairment as an obstacle to dealing with flooding as they have a warden looking after them at the Home.

Many **face difficulties finding employment and have jobs with low salaries**. To live within their means, they are limited to using public transport to move around. In extreme weather conditions, the need to utilise airconditioning to cool down (especially for wheelchair users) and e-hailing vehicles to get around can put a huge strain on their finances.

Community organisation for marginalised groups is crucial and the PwD interviewed raise concerns about their **struggles to form networks** that are strong enough to mobilise support and shift opinion of decision-makers.



4.3 Recommendations

I. Most accessibility issues that are faced by PwD like uneven sidewalks, unprepared public transport operators, non-disable-friendly building design stem from the lack of civic awareness. There is a need for education to **raise civic knowledge and understanding** of the basic needs of PwD both on a public level and policy level.

II. **Compliance to Malaysian Standards (MS) for accessibility** and understanding of universal design principles among designers and building professionals should be strengthened.

Connectivity of places and usability of facilities have to be prioritised to create a barrier-free environment for PwD (as well as for elderly, pregnant women, temporary-disabled person due to injury or illness) to have mobility independence, which is closely related to their employability and access to social and cultural activities.

This is also in respect of the PwD's rights to access to facilities, public buildings and public transport, amongst other aspects as stated in Akta Orang Kurang Upaya 2008[73].

III. **Continuous monitoring of the construction or building process** by designers, building professionals and government agency is also required, to ensure building compliance to Malaysian Standard for accessibility and universal design principles.

Based on an interviewee's experience and knowledge from the consultant's previous interaction with Penang Accessibility Action Group, it was learned that even though some building plans may comply to MS and universal design principles when submitted, the building may become inaccessible eventually, due to changes that occur during the building process.

[73] http://www.agc.gov.my/agcportal/uploads/files/Publications/LOM/MY/Akta%20685%20-%20Akta%20Orang%20Kurang%20Upaya%202008.pdf

IV. In the context of nature-based climate adaptation solutions, PwD are concerned about street canopies **reducing sidewalk width, tree roots cracking the pavement and overhanging branches obstructing the pathway**. The same spatial concerns apply to backlane greening efforts as well.

V. Interviewees urge for designs that maintain the minimum width for wheelchair users on sidewalks and that proper research be done to identify the right kind of trees to plant for connected canopies, so that roots and branches do not hinder pedestrians.

PwD see green facades as being a better solution that does not eat into the limited space they have on the pedestrian walkway.

VI. There is also a concern around the implementation of new nature-based solutions like swales. The BVI community – in view of their concerns about the safety moving around in novel physical spaces – would appreciate **audio or experiential introductions** to these new solutions.

Just like ensuring spaces are accessible to PwD, greening spaces should also be a requirement for all developers.

5. Women and Girls

5.1 Methodology

Women leaders and thought-leaders were consulted in the following ways:

Consultation Method	**Sessions**	**No. of Respondents**
One-on-one long interviews	9	9
Focus Group Discussion	2	21
TOTAL	**11**	**30**

Women who were chosen to participate in the one-on-one interviews are specialised in their fields, covering sectors in research, environment, policy, and welfare.

No.	**Name**	**Organisation**	**Role**
1	Ong Bee Leng	Penang Women's Development Corporation (PWDC)	CEO
2	Dr Lai Wan Teng	Centre for Research on Women and Gender (KANITA)	Senior Lecturer
3	Chan Lean Heng	Independent	Capacity Building
4	Christina R M Hunter	GreenSmiths	Co-founder
5	Faridah Abdul Samad	Jabatan Pembangunan Wanita & Keluarga (JPWK)	Pengerusi, Air Itam
6	Dr Wong Lai Yong	PWDC	Director Sustainability Consultant
7	Evelyn Teh	Third World Network	Senior Researcher
8	Dr Kam Suan Pheng	Penang Forum Penang Hills Watch	Researcher
9	Norhidayah Nadila Maulad Daud	Women's Centre for Change (WCC) Jaringan Ekologi dan Iklim (JEDI)	Liaison Officer Vice President

PWDC joined as a partner in organising the two Focus Group Discussions (FGD) and were in charge of recruiting participants via their network.

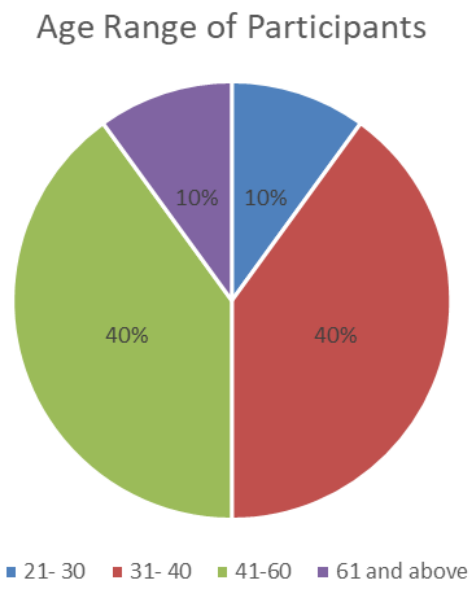
Session 1 and 2 of the FGDs were conducted on 1 and 8 August 2020 at Think City's office in George Town. Both sessions allowed participants to either join in-person or virtually. Facilitation was conducted in either English or Malay depending on participants' preference.

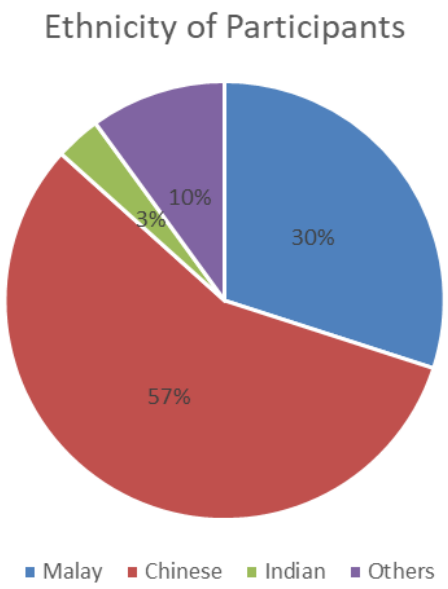
Session 1			
No	**Name**	**Organisation**	**Role**
1	Dr Florance Sinniah	PWDC	Director
2	Jane Tan	JWPK	Representative from KOMTAR
3	Survene Cheah Yu Im	Penang Women's Chamber of Commerce	Member
4	Tan Soo Siang	Majlis Perbandaran Pulau Pinang (MBPP)	Council Member
5	Arene Cheok	WomenBizSENSE	Committee Member

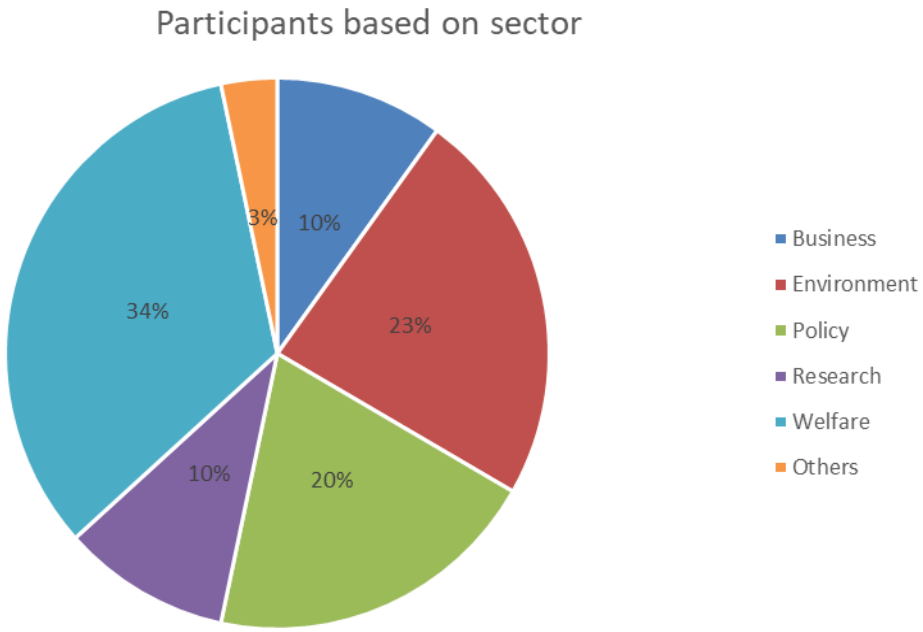
Session 2			
No	**Name**	**Organisation**	**Role**
1	Chan Xin Ying	PWDC	Head of Policy and Advocacy
2	Nurfarah Zafirah Foo Abdullah	PWDC	Director
3	Josephine Tan Mei Ling	Penang Green Council	General Manager
4	Nadhrah Kadir	USM	Social Science Lecturer
5	Kimberley Wong Jin Li	Penang Green Council	Project Executive
6	Wong Fen Fen	Penang Green Council	Senior Officer
7	Pat Lim	Circles of Angels	Co-founder
8	Jamilah Begam Bt Mohamad Nagorgani	JPWK	Representative from Pantai Jerejak
9	Fatihah Hussain	USM	Student, PA to Nor Afni Md Yusuff
10	Phang Wai Leng	Water Watch Penang	Project Coordinator
11	Nor Afni Md Yusuff	MBPP USM	Council Member Lecturer
12	Selvy Tan	JPWK	Representative from Mahsuri
13	Jalilah Bt Abdullah	JPWK	Representative from Pantai Jerejak
14	Zalina Binti Md Hassan	JPWK	Representative from Pantai Jerejak
15	Masniza bt Mohamd Rofik	JPWK	Representative from Pantai Jerejak
16	Rohana Abdul Ghani	PWDC	Director

In total, 30 women were engaged through interviews and FGDs. 3 (10%) are aged 21 – 30, 12 (40%) aged 31- 40, 12 (40%) aged 41-60, and 3 (10%) aged 61 and above.

Reflecting the demographics of Penang island, 17 (57%) women engaged are Chinese, 9 (30%) Malay, 4 (13%) are of other ethnicities including Indian, Indian Muslim, and Chinese Muslim. Women from a variety of sectors were engaged as well: 3 (10%) in business/investing, 7 (23%) in environment, 6 (20%) in policy, 3 (10%) in research, 10 (34%) in welfare, and 1(3%) university student.







5.2 Findings

Awareness of climate change

Interviewees and participants of the focus groups discussions were asked to identify, based on their observations, what Penang as a state, is seen to be prioritising.

I) State-level

The top three priorities according to participants were:

1. Infrastructure development (this included residential high-rise buildings and land reclamation)
2. Tourism development (ecotourism)
3. Risk management (in response to flood, landslides, and the COVID-19 pandemic)

Almost all women leaders mentioned the development of hard infrastructure and land development as the top priority for the state. In terms of planning in response to climate change or environmental sustainability, the efforts so far have been focused on managing crises or pollution instead of preventative measures.

Although the state's vision for Penang in 2030 is one that is family-focused and specifically mentions climate adaptation (aim D4), there is a sense that climate change is not viewed as a crisis and approached without the urgency it deserves.

There have been commendable efforts in rate of response to civic complaints, aid distribution, establishment of Penang Green Council and noticeable awareness campaigns against single-use plastics. But concrete policies and strategies need to be put in place to deal with widespread and big-scale issues like waste generated by tourism sector, or waste and drainage management in relation to flash floods.

II) Organisational/community-level

Women's groups are focused on increasing women's income, representation in leadership and safety (domestic abuse and sexual harassment). Organisations working with women also focus on these issues, with no explicit discussions on climate adaptation but immediate concerns like flooding and drainage might be raised as a discussion point.

On the ground, women leaders report that majority of the vulnerable women they work with do not link heatwaves or flooding to climate change but rather see it as natural disasters or in some Muslim communities, as 'god's will'. Those that work in fishing or own SME do not take a longer view of taking care of the environment and often choose convenient and cheap options over sustainable ones. However, young girls in urban schools that offer environmental programs display a higher awareness of green issues and are familiar with the SDGs.

Impact of climate change

Environmental	Social	Economical
• Coastal residents notice rising sea levels • Haze triggers allergies • Extreme difference in airconditioned offices and heat outdoors affects health as body needs to keep readjusting • When weather gets too hot, elderly might catch communicable disease easily because of lower immune system • Heat affects women who must remain covered up in dressing	• Carer and cared for are hot, unpleasant feelings • Anxiety caused by unpredictable weather (flood worries, travel plans cancelled) • Mentally tiring for those unable to escape effects of weather • Bearing heavier burden if disaster causes issues with food security • However, bonds between neighbours may strengthen as community self-organises to help each other *Impacts apparent during MCO:* • Stress of caretaking and working, many homemakers had to work for first time because husband lost job/experienced pay cut • Increase of depression, panic attacks, suicidal thoughts, especially if it affects livelihood • Increase of gender-based violence • Low self-esteem caused by decreased interaction with outside world • Struggle to relate to others due to lack of sharing	• Those in fishing, agriculture and roadside businesses feel direct loss in earnings and comfort • Soil pollution, erosion affect earnings of women in agriculture • Flood causes workers to get stuck in traffic • Haze might stop school and affect parents' work • Have to rush home from work to check on aging parents in old houses • Women prone to take lower paying jobs to remain closer to home • Electricity bills go up • Lack institutional funding to repair leakages or damages caused by elements • Steep learning curve for businesses forced to go online because of pandemic • Families with absent fathers especially burdened during pandemic

	platform *Impacts on girls:* • Warned about spending too much time outdoors (have to keep skin fair) • Have to rely on family to drive them around, less mobile because of public transport not being up to par (connectivity, cleanliness, frequency)	

Coping Mechanism

I. Community-support

- Informal chat groups on WhatsApp share practical tips on sustainable life, e.g. waste management solutions
- Bonds amongst villagers are tight-knit, most are connected to each other and will help when need arises
- Immediate support has mostly been self-organised: buying each other masks, relatives/neighbours helping out during floods, WhatsApp groups and social media platforms used to troubleshoot or connect

II. External support

a) Relief aid

- Aid hand-outs by YB and MPKK (MPKK having the local knowledge of who in the community needs support the most)
- An ADUN handed out sanitary pads as part of COVID-19 relief, rare case but sets a good example
-

b) Financial aid

- Aids such as PENJANA and PRIHATIN packages to support B40 and SME owners during the pandemic
- Deferment of rental or utilities payment for PPR residents

c) Welfare support

- WCC provides support for women at risk
- Organisations like D'Home and Befrienders provide free counselling or workshops on mental health

d) Capacity building and knowledge sharing

- PWDC has leadership development programmes aimed at empowering women to voice and make changes
- Penang launched Gender Inclusiveness Policy in 2019 to reduce gender inequality and ensure gender-balanced environment within state government
- Organisations like JEDI implement environmental education programming to reach public, especially young people around topics like food waste, turtle safety, logging, etc

Other Resources

Below is a list of other programmes, initiatives or reports named during consultations as efforts working towards sustainable development and living.

Level	Description	Reference
Global or regional	Asia Pacific Forum on Women, Law and Development's Climate Justice	https://apwld.org/our-programmes/climate-justice/

	Programme • Building capacity of the women most affected by climate change and collecting evidence on the impacts faced by communities.	
	The Enhanced Lima Work Programme on Gender • To achieve gender responsive climate policy and action	https://unfccc.int/topics/gender/the-big-picture/introduction-to-gender-and-climate-change/the-enhanced-lima-work-programme-on-gender
	Introduction of Task Force on Climate-related Financial Disclosures. • United Nations Environment Programme (UNEP) ran a pilot project to test-run its implementation	https://www.fsb-tcfd.org/ https://www.unepfi.org/climate-change/tcfd/
	Soroptimist International is a global volunteer movement working on • Grassroots projects that help women and girls achieve their individual and collective potential, realise aspirations and have an equal voice in communities worldwide	https://www.soroptimistinternational.org/ http://soroptimistmalaysia.org/what-we-do/
National or state	Ministry Of Energy, Science, Technology, Environment And Climate Change (now known as Ministry of Science, Technology and Innovation) publishes a national communication and biennial update report to the United Nations Framework Convention on Climate Change (UNFCC)	https://www.mestecc.gov.my/web/wp-content/uploads/2019/04/10.Malaysia-3rd-National-Communication-and-2nd-Biennial-Update-Report-to-UNFCCC-NC-3-BUR-21.pdf
	Smart Selangor initiative • To make Selangor a smart state by 2050, with an increase in productivity, liveability and sustainability.	https://www.smartselangor.com.my/
	Penang Green Council's Green School Awards: • Participating schools evaluated on resource efficiency, innovation & creativity, cleanliness & greening and community involvement.	https://www.buletinmutiara.com/more-schools-get-involved-in-green-projects/
Community	Sungai Ara Linear Park • Resident's association instrumental in helping Jabatan Pengairan dan Saliran (JPS) and MBPP on the upkeep of the park	https://www.thestar.com.my/metro/community/2017/08/19/joint-effort-to-upkeep-parks-sungai-ara-linear-park-sets-a-benchmark-for-involvement-of-local-reside https://www.facebook.com/sungaiarapark
	Sungai Kelian Project • Started off as a river awareness project and carries on as a neighbourhood effort that includes weekly plogging and improving access to park nearby, involving multiple stakeholders	https://www.thestar.com.my/metro/metro-news/2019/11/02/get-to-know-more-about-sungai-kelian For sample report see **Appendix 2**

Barriers to Resilience

Interviewees and FGD participants identified many barriers to resilience. The following section details them: from broad, national-level barriers that are non-gender specific, to ones that are focused and specific to women.

National-level, non-gender specific barriers

- National wealth distribution is still very conservative – money goes to oil, gas, etc
- Environmental solutions are usually short-term, targeted to specific problem rather than focusing on concerted efforts as urgent intervention like research, volunteer programs, policy change
- Decision makers are not well-equipped with knowledge on nature's importance within the built environment. This can be seen in examples like the lack of investment in public transport but prioritising development of more roads for private vehicles to smaller actions like paving up road verges
- The responsibility of dealing with climate change is relegated to the individual – it is seen as a burden to be coped with within personal capacity

Barriers in aid distribution

- Distribution of aid is politicised, with motivation of winning votes
- Unnecessary bureaucratic processes to release the aid resulting in delays and inefficiency
- Lack of coordination between government and NGOs in distributing the relief
- One-off aid only for short-term relief. There should be long term support that will sustain B40. Example: Women at PPR Sungai Pinang were trained in baking and business skills to increase income
- Aid automatically going to the man because he is perceived to be the head of household, whereas a woman will be more well-versed in using the aid well for domestic management. This arrangement also causes aid not to reach female-headed households (study by KANITA during Kelantan floods)
- Aid failing to consider basic personal hygiene needs of women – sanitary care
- Food aid given of low nutritional value

Barriers in civic participation

- Lack of culture of consultation by authorities' breeds feeling of helplessness and cynicism amongst civilians
- This feeling of apathy, not being able to influence decision-making is especially acute within underprivileged or marginalised communities
- Young women who head into politics face double judgement as female and as a young person.
- The number of female members is low, affecting the number of those in leadership positions
- Cultural and religious restrictions place limitations on certain groups of women. With men making the decisions on where a woman goes and how she spends her time.
- This also assigns women passive roles, promoting the idea that disaster management is decided on by men under banners of political parties

Barriers in education and access

- Curriculum that is not applied to realities makes knowledge about climate change separate from how it affects daily life
- Info on resources, aids not disseminated in a way that will reach B40 women

Gender-specific challenges for female students:

- Caretaking role usually falls on girls rather than boys. A girl from a B40 household might be required to help parents with work, take care of a sick family member, thus missing out on her studies

- Having no physical or social space for self-development
- Might be left alone to figure out self-care and health with little guidance and access to resources
- Lack of media literacy to differentiate reliable and unreliable information

Barriers at work

- Often have the extra burden of caretaking on top of maintaining full time work (this became very apparent during lockdown)
- Employers not sensitive to this extra burden will affect decisions surrounding application of leave or advanced pay
- Promotion or increase of work responsibilities viewed as a negative for women and by women. There is always the question of 'how will she cope?' which is never posed to a man

5.3 Recommendations

Recommendations made were based on insights collected from our discussions with women leaders, covering thoughts on governance/policymaking, community organisation, education, workplace policies, and the messaging and dissemination of climate change info and campaigns.

I. Governance and Planning

Efforts to increase **diversity and intersectionality** in top management at the state level must continue. There should not only be more women at the table, but also a fairer representation of the state's socioeconomic levels as well.

A. Development

Development on the island should be redistributed to the mainland. Reclamation projects surrounding the island will have ecological consequences and should be avoided. To increase, or at the very least, maintain the liveability of the island, more care should be put into **maintaining the ecosystem services** the island naturally possesses. With the development of ICT, there should be less need for commuting or the need to have all facilities concentrated in one geographical location.

B. Policies

Aim D4 in Penang's 2030 vision is to implement climate change adaptation plans. Concrete policies and strategies should already be in place to further this aim.

Policies should hold developers responsible for designing and building spaces that **include greening in their plans**. It should also hold corporations or commercial companies responsible in **maintaining a circular economy**, requiring them to think about eliminating waster and the continual use of resources. Bringing focus to **Environmental Social and Governance** (ESG) criteria will also help socially conscious investors identify and invest in companies with practices that are sustainable.

Because disaster relief seldom covers sanitary needs of those who menstruate, it is recommended that **a portion of aid funding be allocated to sanitary products and equipping evacuation centres with suitable washing facilities** for menstruating persons. Menstrual hygiene education should not only be given to girls but boys as well, promoting awareness and breaking of stigmas around this process.

C. Community-planning

Community initiatives should always start with consultation and research into local context. Successful planning is **sensitive to the needs and aspirations** of each distinct local community, which can be identified using approaches like the Participatory Action Research Framework during the consultations.

Data collected during research should also aim to **answer the 'why' of a problem**. E.g. Why are single mothers not coming forward to claim financial aid? Is it because info is not reaching them? Are they too burdened with work and caregiving to do so? Are they being held back by social stigma?

Community initiatives depend on a **strong social network and social rapport** as criteria for success. The identification, encouragement and equipping of the right champions to rally grassroot support and influence decision-makers are crucial for the sustainability of initiatives. Good rapport between the community leaders and the various authorities or department officers is vital to progress of initiatives. There should not only be complaints and criticism but also praise and acknowledgement when a job is well handled. Refer to **Appendix 2** for a sample of a written report that aims to do the above.

The capacity building of these champions and community leaders can be supported by a **climate change education toolkit** that can serve as a guide to leaders to manage successful community initiatives.

II. Education and capacity building

Education or awareness building programs should address the stereotype of caregiving work being secondary and deserving less respect than other types of work. The **acknowledgement of caregiving work's importance** is vital to rebalancing society's views on gender and authority. **Civic questioning** should also be nurtured, especially in students. Young people should not only apply critical thinking when evaluating decisions made by authorities, they must also feel they have the **autonomy to make decisions**. In order to support this process, young people need to be equipped with knowledge on how business and politics work, who to speak to, how to plan, communicate, and implement their visions for change.

Community ownership of nature-based solutions like parks and urban farms need to be supported with education surrounding nutrition and food security so that the **knowledge feeds directly into the actions** needed to maintain those initiatives. The initiatives should also provide the community with **opportunities to earn income**, e.g. recycling, composting and urban farming projects.

III. Workplace

To nurture socially resilient women, there should efforts to help them **diversify their household income** so that in events of disaster, there is more than one stream of income to rely on.

They should also be **equipped with digital literacy** so they have wider access to resources and help and are also able to make digital transitions like starting an online business or working from home during a flood or lockdown.

Workplaces with **flexi hours** and **childcare centres** in the building or nearby will also encourage mothers to return to the workforce (only 50% of women are in the workforce compared to 80% of men in Malaysia).

IV. Messaging

Environmental campaigns should take into account B40 groups and not just the M40. The concerns of the two are different as the B40 are mainly still dealing with economic challenges. Therefore, campaigns need to answer questions like '**Why do I need to care**?' or '**What's in it for me**?' for them to be relevant.

Women leaders involved in B40 welfare recommend messaging that is **practical** and **focused on legacy** (how the environment will be for children or grandchildren), conveyed in a **conversational**/non-pedantic tone, and **visually oriented**.

V. Dissemination

The frequent issue raised is that info about aid or support does not reach the most vulnerable groups of women. Consultation and research needs to be conducted to get to the reason for this happening. It is not enough to have numerical data showing how many missed out but rather, it is important to find out ***why*** **they missed out on aid**.

Consultations or outreach programs need to be **conducted in the targeted geographical** areas. There should also be **incentives for their participation**. In many cases, the best way to reach certain groups are women are through their husbands; disseminating info or program invitations **to men in hopes of reaching women** should also be considered as a means of communication. Disaster management info needs to be disseminated in a way that **reaches the masses**. This could mean broadcasting bite-sized info on how to handle crises after the news or popular TV programs, or putting up signboards with guidelines on how to use and care for nature-based solution facilities.

There should be **multiple ways to receive input** (application for aid, reports) and feedback from the public aside from filling up forms with text or calling a helpline. Incorporating photo, video and voice-note input should also be considered, with careful thought on how to verify input submitted.

Specific recommendations were also made regarding the women's program proposed by Think City involving the development of a mobile app and networking platform for women and girls. A group of 5 from an FGD expressed concern over spending money on something that most vulnerable women do not have access to (smartphone, internet connection, technological know-how). They urged for funds to be spent on school programmes for the young instead.

I. Feedback on Mobile App

The feedback from women leaders indicate that many do not see the connection between – for example – flash floods and the lack of permeable surfaces (like canalisation or paving over road verges). The app can help to make environmental education relevant to everyday life.

A. Info that should be on the app

- Practical ways of adapting or coping. This includes how to manage expenses and mental health in crises
- Resource list (financial aid, support for domestic abuse, etc) that gives contacts based on locality
- Sustainable options/choices related to work. E.g. Why one should switch to sustainable packaging – reasons, next steps, where to find affordable, eco-friendly options.

B. Functions that should be on the app

- A disaster alert system
- Map function showing nearest green facilities like recycling bins, package free shops, etc
- Reporting function to alert authorities of cases like littering, illegal logging, open air burning, etc
- Live chat function connected to contacts on resource list
- Automated quiz to help direct users to related resources that can solve their problem
- Section to post feedback, questions, etc
- Opportunity for one-on-one connection for certain cases

II. Ways of connecting women with each other

Virtual or in-person gatherings, activities, or events that are:

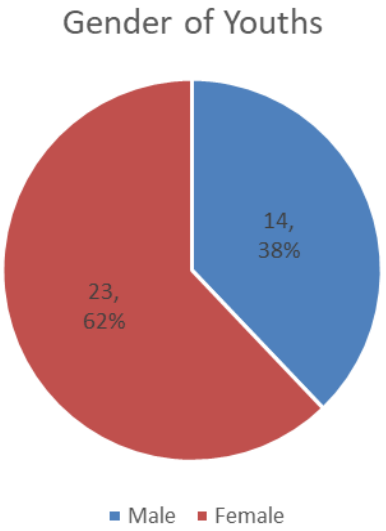
- Women-led
- Consistent
- Provide value to their lives (development of skills, knowledge and emotional support)
- Encourage civic involvement like plogging. These activities need to bear fruit and the results must be communicated back to participants. There should be written reports sent to relevant

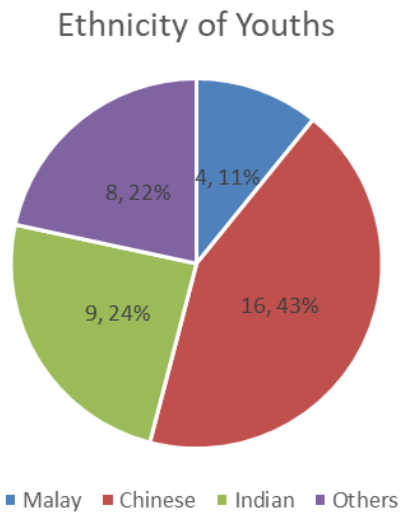
authorities or task lists sent to relevant stakeholders so that action can be taken, and parties can be held accountable. Refer to **Appendix 2** for a sample report from a river awareness project in Tanjung Bungah.

6. Youth

6.1 Methodology

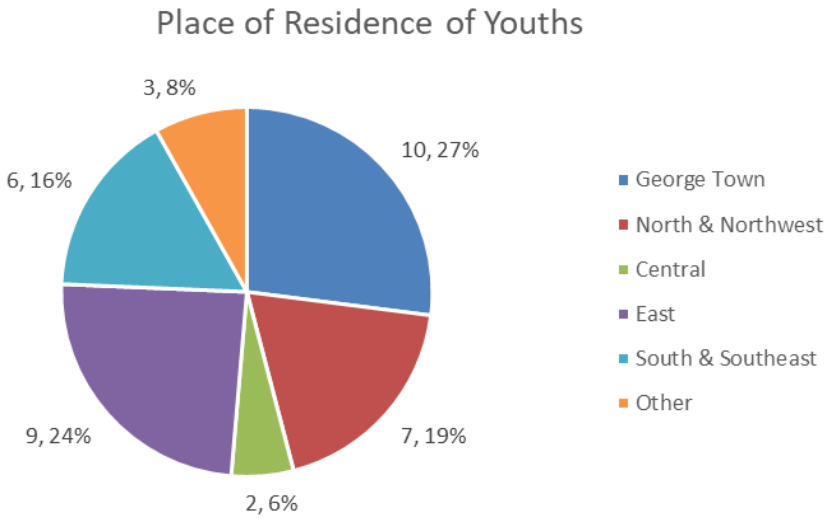
A total of 37 youths aged between 16 to 25 were interviewed in groups or individually. Out of 37, 14 are male and 23 female. The demographic consulted was a mix of Chinese, Indian, Malay and other ethnicities like Indian Muslim, Malay-Chinese and Filipino.





As the interviews were conducted during the Recovery Movement Control Order (RMCO), access to students were somewhat limited because schools were closed. Recruitment relied mostly on direct connections of the consultant and recommendations from friends or colleagues.

10 live in George Town (Northeast of Penang island), 7 from North and Northwest, 2 from Central, 9 from the East, 6 from South and Southeast and 3 from mainland Penang (Butterworth and Kepala Batas).



All youths engaged were either in secondary school or in college or university. They were a mix of those invested in green causes and those who were not or neutral about it. 8 out of 37 were involved in sustainability programmes or self-initiated green projects.

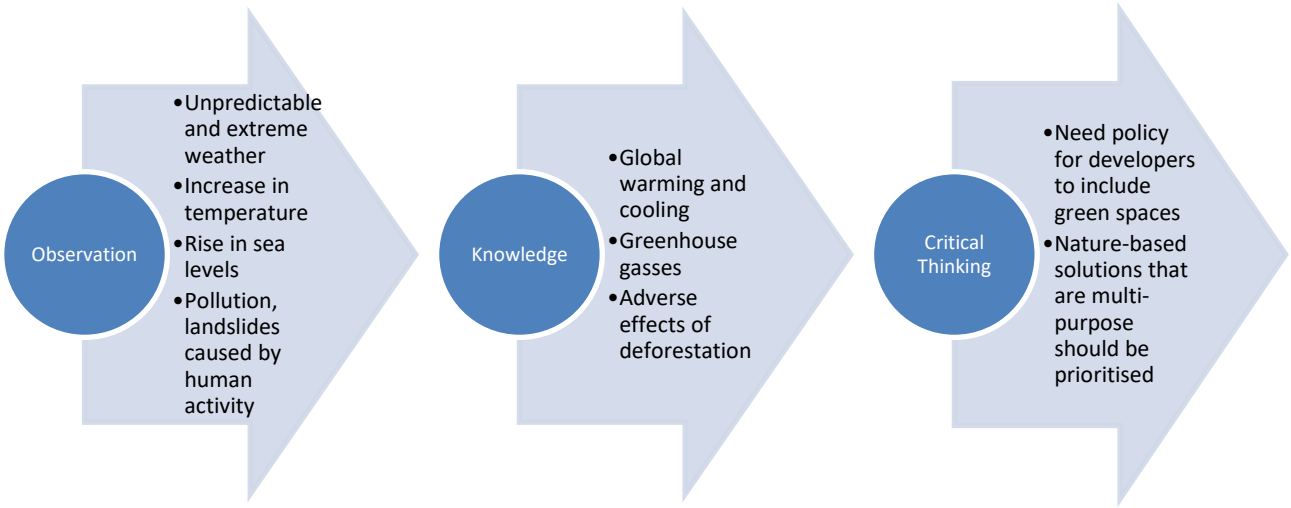
Youth engaged are either involved in organisational effort (a club, a project or a sports team) or have ready access to technology (18 interviewees were consulted phone or video call because of RMCO). Bearing these in mind, their opinions are therefore representative of those who are more environmentally aware and keen on civic participation.

6.2 Findings

Awareness of climate change

All youths, when consulted, were very aware of changes in climate that they experience first-hand. These are all **observations** that they have made of their changing surroundings, with references to specific development plans like reclamation near Queensbay Mall, expansion of the Penang International Airport and the introduction of Light Rail Transit (LRT) system.

Coupled with environmental education received via schooling, or their own pursuit, some are able to link **learned theory** to real life situations. Taking it to another level are the ones that are able to make **critical analysis** based on their knowledge and observations from life. The number of youths able to move from one level to the last gets smaller.



Impacts of climate change

Environmental	Social	Economical
• Not as windy now • Getting hotter • Increased flooding • First time seeing waterspout in Penang • Noticed fewer small animals around (monitor lizards, zebra doves, etc) • There were landslides where construction was happening twice this year • Easily tired • Migraines from exposure to heat and dehydration • Weight gain from staying home too much (to avoid sun)	All related to heat: • Too hot for sports, gets headache in heat • Not motivated to exercise • Choosing digital games over outdoor team sports because • Reluctant to go outdoors • Frustration, restlessness of having to stay indoors • Drowsiness after recess time • Hard to concentrate while revising at home • Head to places where airconditioning is available	• Heat increases usage of airconditioning and water • Having to lower airconditioning temperature even more now • Spend money to tint car windows • Affect fruit trees (observational) • Condominium management spending money to build shaded walkways • Need to have a variety of clothing for extreme weather: breathable material for heat, thicker clothing and waterproof shoes for downpours

Coping Mechanisms

Unlike other communities, young people have a narrower scope of coping mechanisms. While other groups have a variety of ways to cope – reaching out to their network, relying on external help, financially alleviating their situation – the young people consulted reported mostly changes in personal behaviour and habits as coping mechanisms to climate change. The changes mostly involved self-care, transportation and ways of socialising.

Self-care	• Depending on cultural context, either wearing less or covering up more in reaction to sun/heat • Showering more often
Transportation	• Choosing driving over walking, even though destination is a walkable distance, because of heat • Planning travel times to avoid long commutes when sun is hottest
Socialising	• Delaying outdoor play time to evenings • Favouring air-conditioned places as meet-up venues • Favouring places with cooler climates as family holiday destinations

Barriers to Resilience

I. Inefficient trash disposal and drainage systems

In terms of hard infrastructure, they perceive Penang as having **poor city planning** especially in **drainage systems** and **trash disposal**, which may affect each other and contribute to the cause for flash floods in urban areas. One also mentioned how community requests to widen drains in Sungai Pinang (a flood-prone area) went unheeded.

II. Education and mindset shift

Overall, the youth feel there is a general 'don't care' attitude when it comes to environmental concerns. Some feel like they have to **educate people from the older generation** in their lives who are not aware of the causes and effects of climate change and in particular plastic pollution. There is also a perception that even if there are people who know about the causes and effects, their understanding is **only in theory and not in practice**.

They point out examples of how rubbish dumping in drains exacerbates flooding, how usage of public transport is stereotypically associated with being poor or a migrant, and how efforts to get people to cut down on single-use plastic items were undone the moment MCO started.

III. Lack of sustainable planning

They were critical of the government's development plans, which most viewed as **unsustainable and worrying**.

In terms of transport plans, one pointed out that the lowering of car prices has resulted in the rise of vehicles on the road. However, another criticised plans for an LRT system (meant to alleviate traffic jams), which was perceived by the interviewee to affect the heritage areas in Penang, making it "become like Kuala Lumpur".

Other development plans called into question by them were the reclamation project near Queensbay Mall (Bayan Lepas) and the expansion of the airport (also in Bayan Lepas). These projects are seen by them as plans that **prioritise economy over environment**. They call for plans that hold developers responsible instead to plan and build with greening in mind.

There is a **strong sense of disillusionment** with those in charge. One young interviewee described an experience of her advising an older woman not to litter only to be chided to 'mind your own business'. One commented that parents and the government should be **better role models** when it comes to taking care of the environment. One noted critically that relying on individuals to change habits around single-use plastic usage is hard, perhaps realising that swift and lasting change requires political will as well. 'Economy is improving, but intelligence is not,' said another frustrated interviewee.

6.3 Recommendations

I. The young people interviewed displayed a preference in supporting solutions that are practical. They favoured tree planting, backlane and car park greening because those utilised existing infrastructures. They also showed an acknowledgement of space constraints, suggesting utilising vertical and underground space for solutions. Thus, **highlighting the practicality and multipurpose functions of nature-based solutions** should be a priority in gaining support and ownership from invested young people.

II. **Leveraging environmental clubs already in the schooling system**'s co-curriculum like Kelab Pencinta Alam (Nature Lovers' Club), student participation could be incorporated into the climate adaptation program in a meaningful way. Through capacity building and leadership workshops, young members can get involved in the ideation, planning and implementation of certain programs – translating theories they learn into real life application.

III. **Civic questioning** should be cultivated but it should also be paired with community action to combat overwhelming feelings of disillusionment. Young people should not only apply critical thinking when evaluating decisions made by authorities, they must also feel they have the **autonomy to make decisions**. Young people should be equipped with knowledge on how business and politics work, who to speak to, how to plan, communicate, and implement their visions for change.

IV. Youths should also be **empowered with resources and tools** that will aid them in educating those at home and in their communities. Enabling NGOs that support the processes mentioned above and encouraging private companies to invest in youth-led environmental leadership should be a priority for decision-makers.

V. Co-creating a **youth-owned digital platform** to discuss and share environment-related content amongst youths, with experts, and with decision-makers is a strong step forward in progressing the environmental education and civic participation of young people.

Conclusion

This report serves as a summative description of the realities of the various vulnerable groups consulted. There is a wealth of experience, knowledge, and skills yet to be fully explored through further engagement with them as the program progresses.
Community involvement should not stop after the consultation period. Individuals and organisation representatives whose names are included in the report may be re-contacted for collaborative or partnership efforts in the future.

Appendices

Appendix 1: B40 Survey

thinkCITY

Soal Selidik Kesan Perubahan Iklim Terhadap Komuniti

Kajian ini bertujuan untuk menilai tahap kesedaran perubahan iklim di kalangan masyarakat Pulau Pinang dan kesan yang dirasai terhadap kehidupan mereka. Hasil kajian akan digunakan untuk mengutamakan strategi bagi meningkatkan daya tahan Pulau Pinang terhadap perubahan iklim.

1. Berdasarkan pendapat anda, nyatakan sama ada setuju atau tidak.

	Sangat setuju	Setuju	Tidak setuju	Sangat tidak setuju
Cuaca semakin tidak menentu	○	○	○	○
Suhu bumi semakin meningkat	○	○	○	○
Untuk mengurangkan perubahan iklim, penggunaan tenaga perlu dikurangkan	○	○	○	○
Untuk mengurangkan perubahan iklim, alam semula jadi perlu dipelihara	○	○	○	○

2. Berdasarkan pengalaman anda, nyatakan sama ada setuju atau tidak.

	Sangat setuju	Setuju	Tidak setuju	Sangat tidak setuju
Kejadian banjir memberikan kesan negatif kepada saya	○	○	○	○
Kejadian gelombang haba memberikan kesan negatif kepada saya	○	○	○	○
Pandemik COVID-19 menjejaskan pekerjaan atau persekolahan saya	○	○	○	○
Saya menghadapi kesukaran untuk mendapatkan makanan semasa pandemik COVID-19	○	○	○	○
Perbelanjaan saya meningkat akibat keadaan cuaca. Contoh: bil elektrik naik, perabot rosak akibat banjir, dan lain-lain...	○	○	○	○
Kesihatan saya atau ahli keluarga saya terjejas kerana cuaca yang melampau	○	○	○	○
Saya merasai lebih tekanan untuk menjaga kanak-kanak atau warga emas akibat cuaca yang melampau	○	○	○	○

3. Sila nyatakan tahap persetujuan anda terhadap langkah-langkah penyelesaian berikut.

	Sangat setuju	Setuju	Tidak setuju	Sangat tidak setuju
Memperkenalkan pertanian bandar untuk memastikan orang Pulau Pinang mempunyai makanan yang cukup dan tidak hanya bergantung kepada import.	○	○	○	○
Menyediakan bantuan dan sokongan setempat kepada orang yang menjaga kanak-kanak dan warga emas.	○	○	○	○

4. Gambar rajah di atas menunjukkan penanaman lebih banyak pokok di bandar untuk mewujudkan tempat teduh dan mengurangkan suhu bagi menangani kesan gelombang haba. Nyatakan sama ada anda setuju atau tidak dengan keberkesanan cara ini.

Sangat setuju	Setuju	Tidak pasti	Tidak Setuju	Sangat tidak setuju
○	○	○	○	○

5. Gambar rajah di atas menunjukkan pembinaan longkang konkrit untuk pencegahan banjir semasa hujan lebat. Nyatakan sama ada anda setuju atau tidak dengan keberkesanan cara ini.

Sangat setuju	Setuju	Tidak pasti	Tidak Setuju	Sangat tidak setuju
○	○	○	○	○

6. Gambar rajah di atas menunjukkan aliran semula jadi dapat memperlahankan aliran sungai deras semasa hujan lebat untuk pencegahan banjir dan merangsang kepelbagaian flora dan fauna. Nyatakan sama ada anda setuju atau tidak dengan keberkesanan cara ini.

Sangat setuju	Setuju	Tidak pasti	Tidak Setuju	Sangat tidak setuju
○	○	○	○	○

7. Jantina

- ☐ Perempuan
- ☐ Lelaki

Lain-lain (sila nyatakan)

8. Umur

- ☐ 12 dan ke bawah
- ☐ 13-20
- ☐ 21-30
- ☐ 31-40
- ☐ 41-60
- ☐ 61 dan ke atas

9. Kewarganegaraan

- ☐ Malaysia
- ☐ Lain-lain (sila nyatakan)

10. Bangsa

- Melayu
- Cina
- India
- Lain-lain (sila nyatakan)

11. Sila nyatakan poskod tempat tinggal anda.

12. Siapakah yang berkongsi tempat tinggal dengan anda?

- Tinggal bersendirian
- Tinggal bersama kawan/rakan sekerja
- Tinggal bersama suami/isteri dan anak-anak
- Terdapat beberapa generasi di rumah saya

13. Sila nyatakan industri pekerjaan anda.

- Pertanian, perhutanan dan perikanan
- Pembinaan
- Pendidikan
- Kerajaan dan pentadbiran awam
- Penjagaan Kesihatan dan bantuan sosial
- Surirumah
- Hotel dan perkhidmatan makanan
- Tentera
- Perkilangan
- Perniagaan runcit
- Perkhidmatan teknikal
- Pengangkutan dan penggudangan
- Pemborong
- Utiliti
- Lain-lain (sila nyatakan)

Appendix 2: Sungai Kelian Project Sample Report

Friends of Sungai Kelian

On-site visit, Monday 06 July 2020, 10:00 a.m.

Attendees

Kam Suan Pheng (Hillside)
Tung Khoon Cheong (Hillside)
Zulfikar Aziz (Ahli Majlis MBPP, TBRA)
Joanne (DEE)
Hailmie (JPP-MBPP), in charge of Daerah Timur Laut
Bashir (JPP-MBPP), in charge of Tanjung Tokong-Tanjung Bungah
Saufi (JPP contractor for Taman Kejiranan Loh Poh Heng)
Taufik (JPP contractor for Taman Poket Lorong Sg Kelian 2
Shukor (JL-MBPP)
Other staff of JL-MBPP

Thanks to the effort of our Ahli Majlis Zulfikar Aziz we had the presence of key staff from MBPP Jabatan Landskap (JL-MBPP) and Jabatan Perkhidmatan Perbandaran (JPP-MBPP) for this on-site meeting. The respective responsibilities of JPP and JL MBPP were clarified. The 2 MBPP parks along Sg Kelian fall under the 'zon integrasi' whereby both JPP and JL have shared responsibilities in managing the parks.

Meeting the officers from Jabatan Perkhidmatan Perbandaran -MBPP
Left: En Mohamad Khairul Hailmie Bin Mohamad Zamzuri, Pen. Pegawai Kesihatan Persekitaran, in charge of Daerah Timur Laut
Second from left: En Bashir, in charge of Tanjung Tokong-Tanjung Bungah
Right: Another staff member of JPP-MBPP

Jabatan Perkhidmatan Perbandaran (JPP-MBPP) is responsible for maintaining cleanliness of the parks, whereby the work for the 2 parks is contracted out to different private companies.

Taman Kejiranan Loh Poh Heng	Contact person: En Saufi (h/p 018 4648926
Taman Poket Lrg Sg Kelian 2	Contact person: En. Taufik

The general schedule for cleanliness maintenance is as follows:
a. Parking lot: alternate days - Isnin,Rabu & Jumaat
b. Drains: alternated days - Selasa, Khamis & Sabtu
c. Grass cutting of road verge and park: 2 times a week
d. Clearing of garbage from park: daily

At the start of the month each contractor submits the schedule for the month to JPP, whose officers are responsible to carry out ground checks.

Meeting the officers from Jabatan Landskap-MBPP
En Shukor (third from right) with other officers from the JL

Jabatan Landskap MBPP maintains the trees (ref: Shukor) and the children's p exercise equipment (ref: Ayuni). The trees, which are tagged) are inspected tw information kept in a database.

Further clarification and issues raised are summarised below.

1. Taman Kejiranan Loh Poh Heng

1.1. JL-MBPP will bring in soil to cover the protruding surface roots of trees and shape the ground accordingly into gentle mounds for ease of pedestrian traffic. Arrangements will be made with Tiara View management (Mr Teoh hp 017 8698543) to give access to lorries bringing soil to the car park area. (**Attn: Shukor, JL-MBPP**)

1.2. The condition of the swing will be checked. We also suggest that it is moved closer to the playground equipment at the fringe of the park to give a bigger open space in the centre of the park. (**Attn: Ayuni, JL_MBPP**)

1.3. We also suggest that proper non-skid platforms be constructed at the foot of each exercise equipment for safety of users, and instructions for the use of the equipment are clearly posted. (**Attn: Ayuni, JL_MBPP**)

1.4. Lot 3583, which has been earlier confirmed to be 'Tanah Milik Kerajaan' (see Appendix) should be upgraded to a proper pathway for access to the park from Jalan Sentosa. Clarification is to be sought on the government agency that has jurisdiction and the procedure to construct a proper walkway to the park (**Attn: En Zul, JL_MBPP**)

1.5. In the meantime, JPP-MBPP will keep the pathway clean for ease of pedestrian access (**Attn: En Bashir**)

1.6. Lot 2904, which has been earlier confirmed to be 'Tanah Milik Kerajaan' (see Appendix) is the main access to the park from Jln Loh Poh Heng.

1.7. Clarification is to be sought on the government agency (JKR?) that has jurisdiction and the procedure to

a. have the paving upgraded;

b. parking along this narrow lane disallowed; and

c. place a directional sign to the park at the Jln Loh Poh Heng entrance

(**Attn: JL_MBPP** to facilitate; **En Zul** to follow up)

2. Taman Poket Lorong Sungai Kelian 2

Examining the grounds of the park with En Taufik from the contractor company of JPP-MBPP

2.1. The walkway along strip of land between the two parts of the pocket park is obscured and mossy, and needs to be cleaned (**Attn: Bashir, JPP-MBPP**)

2.2. Some plantings in pots by local residents need to be moved away from the walkway and neatly arranged linearly next to the lane (**Attn: Mr Lim of Hillview Garden**)

2.3. Buckled parts of the walkway need to be repaired (**Attn: Shukor, JL-MBPP**)

2.4. Overgrown bamboo grove needs trimming (**Attn: Shukor, JL-MBPP**)

2.5. The overgrown vegetation in Lot 4067 remains an issue and poses a health risk because of mosquitoes. JL_MBPP to raise this issue with MBPP Health Department to take action against the plot owner (**Attn: Shukor, JL_MBPP**)

3. Sungai Kelian river reserve area

JPS officials were not present at the meeting, but it is evident that wo
banks of the river using the 'rip-rap' method instead of constructing g
change, and we look forward to a future development when the slopi
ground cover to give a natural look to the river banks.

We also look forward to further improvements in the river reserve ar

3.1 Trimming overhanging bamboo and other tree branches;

3.2 Dredging the river bed to clear obstructions to water flow; and

3.3 Upgrading and extending the path along the right bank of the riv
slabs.

4. Residents doing their bit

In our previous outing we came across Mr Tjung making an individual effort at trimming and clearing the litter at Taman Poket Lorong Sungai Kelian 2. This time we came across Mr Thong single-handedly clearing the litter off the slope next to the bridge.

A one-person effort at cleaning the river bank

They are welcome to join and will be joined by the volunteer corps of FoSK to put in our community effort to complement the work that MBPP and JPS are embarking these coming weeks and months.

Appendix

List of lot numbers and ownership status (provided by Jabatan Landskap MBPP in February 2020)

LAMPIRAN A

Bil.	No.Lot	Bandar/Seksyen/Mukim	Daerah	Negeri	Status Tanah
1.	3055	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Tanah Milik Persendirian yang didaftarkan dengan jenis dan nombor hakmilik GRN 136824.
2.	1534	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Tanah Milik Persendirian yang didaftarkan dengan jenis dan nombor hakmilik HSD 11663. (PLOT 1)
3.	4067	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Tanah Milik Persendirian yang didaftarkan dengan jenis dan nombor hakmilik GRN 51640
4.	4458	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Kawasan Lapang yang telah diwartakan di bawah Seksyen 62 Kanun Tanah Negara 1965.
5.	3583	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Tanah Kerajaan Negeri
6.	4121	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Kawasan Lapang yang telah diwartakan di bawah Seksyen 62 Kanun Tanah Negara 1965.
7.	2904	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Tanah Kerajaan Negeri
8.	4459	Bandar Tanjung Bungah	Timur Laut	Pulau Pinang	Kawasan Lapang yang telah diwartakan di bawah Seksyen 62 Kanun Tanah Negara 1965.

Annex 2. Community Consultation via Roundtable Discussions from Programme Exhibition

12 October 2020 – 24 October 2020

Date	Name	Organisation / Institution	Feedback
12 October 2020	Nur Sharmimi	Penang State Museum	-
	Joe Sidek	Federation for Asian Cultural Promotion	• Prioritise planting of trees and maintenance • Mobilise small-scale community gardens (edibles) among the locals
	Gareth Richards	Gerakbudaya	• Interventions proposed are to prioritise and address maintenance issues that may arise

			• Programme and implementation to be fully transparent • Programme to have catalytic effect in mobilising future green initiatives • Focus on addressing the interrelations between public health and urban greening at a policy level
	Chen Yoke Pin	Arts-ed	• To look into Sungai Ara community initiatives • Programme to focus on promoting collective ownership among communities. Planning to ensure bottom-up approach to programme. • Incentivize community gardens
	Dato Begum Karim	Jawi Peranakan Community	• Programme to ensure continuity through proper maintenance • To look into Shah Alam's concept of 'green city' • Control car access and circulation in the heritage core zone of George Town
	Nurilkarim Razha		• Proposed for schools and urban farms to be connected • Implementation of urban greening to include long-term maintenance guidelines
13 October 2020	Dr Saw Leng Guan	Penang Botanic Gardens	• Programme to focus on building awareness and knowledge among low-income communities
	Mr Gunasilan Ramasamy	Arborist	• There needs to be urgency in addressing overdevelopment – unnecessary tree-cutting and removal for new developments
	Prof. Chan Ngai Weng	Water Watch Penang	• To have clear assessment and action plans for vulnerable communities, not only women and youth; focus on flood prone communities; add retention ponds near community areas • To enhance public awareness and understanding of climate change issues, sea level rise and how these will impact them
	Lingeshwarry	The Habitat	-
	Ethan Pang		-
	Evelyn Teh	Sahabat Alam Malaysia & JEDI (Jaringan Ekologi dan Iklim)	• Proposed for roadshows/ exhibitions related to climate change and ecology to be conducted in schools
	Tajul Arosh	Malaysia Nature Society	• Selection of Penang Climate Board committee s hould include individuals from grassroot level • Capacity building should also be

			targeted in Balik Pulau/ Batu Ferringhi/ Sungai Muda/ Junjung Park River/ Perai/ Sungai Pinang/ Sungai Keluang areas.
	Rexy Prakash	Penang River Awareness Project	• River monitoring could be carried out in Sungai Ara and Sungai Keluang as part of the programme • To promote systematic learning about river basins - water quality and sources of pollution, among students • Programme as a means to re-examine existing state and municipal policies and guidelines to ensure that they are climate-proof • Knowledge transfer component to include guidelines/user manuals for each activity
	Khatija	Consumers' Association of Penang (CAP)	-
14 October 2020	Priscilla Dawson	Malaysian International Chamber of Commerce and Industry, Penang	• Community engagements should be carried out in planning the street trees initiative • Implementation of new street trees should start as a pilot project near the port area
	Dato R. Sethupandian	Malaysian Indian Chamber of Commerce and Industry, Penang	• Suggested for a follow-through on existing green initiatives
	Datuk N Gopalakrishnan		• Highlighted the problems arising from the diversion of drains in Lebuh Pasar • Long-term planning required for maintenance of street trees • Considerations of view and building facades to be taken into account when proposing new street trees
15 October 2020	Ar. Laurence Loh	Arkitek LLA	• Highlighted the potential role of architects and landscape architects in climate adaptation
	Ar. Leow Kwong Choon	Pertubuhan Arkitek Malaysia (PAM), Northern Chapter	• Incentivize street rejuvenation projects
	Ar. Bee Eu Tan	Beta Architects	• Development of interventions to also consider improving walkability, reducing reliance on vehicles
	LAr. Teng Pe Yang	Permata Green Sdn Bhd	• Incentivize public transportation to reduce reliance on private vehicles
	LAr. Norfanty Shaarifin	Institute of Landscape Architects Malaysia (ILAM)	• Prioritise maintenance of green spaces
	LAr. Ang See May		-

	LAr. Loh Gim Hin		-
	Ar. Zalena	Arkitek Zalena/ Universiti Sains Malaysia	• Proposed permeable surfaces for back lanes
	Michael Yap	Perunding YAA Sdn Bhd	• Highlighted policy integration, dynamic parking system, and enforcement to support effective implementation of greening initiative.
	Ar. Tpr. Lee Siew Ang	Pertubuhan Arkitek Malaysia (PAM), Northern Chapter	• Highlighted that follow-through/ enforcement would be crucial for the effectiveness of the programme
	Ar. Ooi Bok Kim	Pertubuhan Arkitek Malaysia (PAM), Northern Chapter	• Implementation of street trees to consider orientation and placement with regards to building facades and cultural sensitivities
16 October 2020	Dato Dr Ooi Eng Hock	Federation of Malaysian Manufacturers (FMM)	• Proposed interlocking grasscrete besides trees • Implement holistic approach by considering policies to reduce reliance on private vehicles • Build awareness among youth
	Dato Jimmy Ong	Federation of Malaysian Manufacturers (FMM)	• Suggested plastic membranes for the tree pits for infiltration • Suggested utilisation of green rooftops as urban farms
	Mohd Faizal Hizam Mat Supri	Malaysian Investment Development Authority (MIDA)	• Incentivize green initiatives in buildings through tax exemptions
17 October 2020	Dato Peter Cheah	Peace Child Care	• Proposed potential site for urban farming in Pantai Jerjak, Bayan Lepas
	Jane Tan	JPWK	• Women & girls Apps for women would be useful for single moms; Women & girls App could provide emergency contacts
	Janice Wong		-
23 October 2020	Antoine Loncle	Local artist	-
	Dr Prem Chandrasekaran	Expert Neuropsychiatrist	• Suggested looking into the number of admissions during heatwaves in Penang General hospital
	Dr Veeramohan	Public Health Expert	• Suggested a mapping study of the combined effects of flooding and heatwaves • Highlighted potential health hazard with open drains. Suggested for better integration of the Urban Storm Water Management (MSMA) guideline

			• Suggested collaboration with Penang Free School through a youth programme.
24 October 2020	YBhg. Dato' Prof Dr Sohaimi	Persatuan Melayu Pulau Pinang (PEMENANG)	• Prioritise building awareness on climate adaptation in scientific institutions.
	YBhg. Dato' Kader Najmudeen	Liga Muslim	• Suggested Kampong Makam and Dato Keramat as potential sites for the programme. • Suggested building more reservoirs/ rainwater harvesting tanks
	Mr Kew Thin Choon	Church of Assumption	-
	Mohamed Rizwan Khan	Qariyah Masjid Kapitan Keling	• Suggested for more urban farming initiatives in schools.
	En, Bakri	Qariyah Masjid Lebuh Acheh	-
	Puan Widad	Badan Warisan Lebuh Acheh	-
	Adam Hamid	Persatuan Warisan Makam Dato' Koyah	-
	Dr Abdul Rashid Masooth	Persatuan Warisan Makam Dato' Koyah	• Highlighted concern of falling of trees into private properties • Suggested use of permeable materials for pavements at flood-prone areas

Annex 3. Project Planning Workshops

List of Attendees

No.	Name	Organisation
1.	YBhg. Dato'Ar. Yew Tung Seang	Mayor, City Council of Penang Island
2.	Dato' Ir. Addnan bin Mohd Razali	City Secretary, City Council of Penang Island
3.	Ms. Rashidah binti Jalaludin	City Council of Penang Island – Community Services Department
4.	Ms. Mokagathi a/p Ganesan	City Council of Penang Island – Community Services Department
5.	Mr. Amir Ali Bin Abdul Rahman	City Council of Penang Island – Community Services Department
6.	Ms. Nurnadia Md Isa	City Council of Penang Island – Community Services Department
7.	Mr. M. Mohamed Shariff Bin Mohamed Kassim	City Council of Penang Island –

		Community Services Department
8.	Ms. Sri Mageswari A/P Pattel	City Council of Penang Island – ICT Department
9.	Mr. Mohd Zamzuri B.Hussain	City Council of Penang Island – Urban Services Department
10.	Mr. Saiful Fahmi b. Norhani	City Council of Penang Island – Engineering Department
11.	Ms Tuti Azmalia Azai	City Council of Penang Island – Engineering Department
12.	Mr. Zainuddin Mohd Shariff	City Council of Penang Island – Engineering Department
13.	Mr. Mohd Nasrul Nizam bin Nasri	City Council of Penang Island – Engineering Department
14.	Ms. S. Bavani	City Council of Penang Island – Licensing Department
15.	Mr. Azman b Sirun	City Council of Penang Island – Licensing Department
16.	Mr. Azizul Fahmi Bin Muhammd,	City Council of Penang Island – Landscape Department
17.	Mr. Muhd Farezudin Syah bin Zafarin	City Council of Penang Island – Landscape Department
18.	Ms. Zuraini Binti Mat Rasit,	City Council of Penang Island – Landscape Department
19.	Mr. Muhamad Fadzli Bin Ismail,	City Council of Penang Island – Landscape Department
20.	Mr. Chandra Sagaran	City Council of Penang Island – Landscape Department
21.	Mr. Cho Ching Sin	City Council of Penang Island – Building Control Department
22.	Mr. Zaidi bin Ahmad	City Council of Penang Island – Building Control Department
23.	Ms. Lee Tit Kun	City Council of Penang Island – Building Control Department
24.	Ms. Crystal Chiam	City Council of Penang Island – Corporate Communications and Public Relations Department
25.	Ms. Mushirah binti Muhammad Badaruddin	City Council of Penang Island - Conservation and Heritage Department
26.	Mr. Danny Koay Hock Hsiang	City Council of Penang Island - Conservation and Heritage Department
27.	Ms. Raja Syazana Raja Shuib	City Council of Penang Island - Conservation and Heritage Department
28.	Ms. Fazreen Dharleila bt. Abdul Jalil	City Council of Penang Island - Conservation and Heritage Department
29.	Mr. Shahmi Azhan b Md Salleh	City Council of Penang Island - Planning Department
30.	Mr. Zulfiqar b. Badri	City Council of Penang Island - Planning Department
31.	Ms. Zaiton Hj Darus	City Council of Penang Island -

		Management Services Department
32.	Ms. Hajah Nor Rezan Haji Sulaiman	City Council of Penang Island
33.	Mr. Hashim Johan	City Council of Penang Island
34.	Ms. Zarina bt. Adnan	Department of Drainage and Irrigation
35.	Mr. Mohamad Rizal b. Salim	Department of Drainage and Irrigation
36.	Mr. Anas Bahaudin	Department of Drainage and Irrigation
37.	Ms. Vishanthini Kanasan	Penang2030
38.	Mr. Oh Chin Eng	Penang2030
39.	Mr. Matt Benson	Think City
40.	Mr. Murali Ram	Think City
41.	Ms. Sofia Castelo	Think City
42.	Ms. Nabilah Hazri	Think City
43.	Ms. Liyana Che Ismail	Think City
44.	Ms. Shi Ying Ooi	Think City
45.	Ms. Sazlin Sabri	Think City
46.	Ms. Aufa Abdul Rahman	Think City
47.	Ms. Audrey Tan	Think City
48.	Ms. Siti Nasiha Mohamad Ilias	Think City
49.	Ms. Rose Afrina bt. Mansor	Think City
50.	Ms. Nicole Thum	Think City

Summary of Meeting Notes

- Think City shared a presentation on the social, environmental and economic impacts of climate change in Malaysia and proposed that the city of Penang Island apply for the World Bank's Adaptation Fund. The purpose of the proposed programme will be to increase the community's resilience toward flooding and heat risks associated with climate change through nature-based solutions (NBS).
- It was agreed that the application for the Adaptation Fund would involve different agencies from the government and UN-Habitat would need to be engaged. Think City would be the local project manager while the City Council of Penang (MBPP) would form part of the execution team.
- Think City suggested several potential pilot projects which include establishing a waterfront connected corridor between Green Hall Street and Gurney Drive, improving the conditions of Sungai Bagan Jermal and Sungai Pinang, introducing new tree-lined streets in George Town and greening Bayan Lepas industrial zone.
- It was noted that the involvement of the Engineering, Building Control, Landscape, and Urban Services department of the local city council will be essential to development of the programme.

- MBPP suggested that the current initiative of planting 6500 trees along cycling paths by the Landscape department could be used as a pilot assessment of the cooling effects of trees.
- The existing Smart Cities framework by the city council which encompasses incentives for Green Building Index (GBI) to promote sustainable buildings could be expanded to include systematic assessment of climate adaptation interventions of the programme.

- Under MBPP's Low Carbon City project, a focus on GBI has seen 48 buildings being certified. It was understood that there is a strong commitment at a local level to implement GBI requirements. MBPP intends to work towards gazetting GBI requirements into the Uniform Building (Pulau Pinang) By-Laws 1986.
- MBPP shared that there are projects in the pipeline to revitalised 14 parks in Penang Island.
- Think City has requested for UN-habitat's collaboration as the Multi-lateral Implementing Entity.
- It was acknowledged that a monitoring and evaluation framework would be crucial for the programme. For temperature-reduction evaluation, remote sensing and thermal imaging could be used. This evaluation could be expanded to assess the cooling impacts of trees according to their growth and species. Other parameters for the evaluation of the effectiveness of NBS are flood control, stormwater management, air quality improvement, walkability, and energy savings.
- It was understood that the following would need to be established by all the working agencies:
  1. Existing landscape plans and criteria for tree planting
  2. Existing flood mitigation and hydrology plans
  3. Conservation guidelines for back lanes within the heritage core site
  4. Local planning policy

- It was agreed that 60% - 70% of the funding will be funnelled to project delivery.
- Think City shared that the goal of the programme is to pioneer the implementation of urban climate adaptation plans in Malaysia starting with the urban areas in Penang Island, in order to reduce threats to human life, infrastructure / private property, crop yields and biodiversity.
- Think City proposed that the built interventions for the programme be divided into two themes, namely for the reduction of urban heat island effect and surface temperatures as well as reduction of stormwater run-off and flooding.
- Some of the interventions proposed for reduction of urban heat island effect include introducing shaded walkways and streets, wind tunnels, pocket parks, blue-green corridors, green built structures, and establishing green areas in the industrial zone.
- Key principles to be established for strategic tree planting include its placement, spacing and species selection along streets for effective shading.
- It was discussed and agreed upon that the following set of actions would be crucial for the delivery of shaded walkways / streets and wind tunnels:
  1. Audits / surveys of underground utilities and conditions of existing streetscape to determine the limitations to the interventions
  2. Allocation for tree planting sites and tree pit requirements
  3. Selection of suitable tree species
  4. Public engagements
  5. Development of landscape plans
  6. Development of maintenance plan
  7. Implementation and construction

- It was acknowledged that the proposed built interventions would be prioritised according to a street's connection to other existing tree-lined streets, rivers, and open spaces so as to ensure continuity for biodiversity corridors and cohesion of the urban fabric.
- Think City highlighted that the funding from Adaptation Fund could only be utilised for works supporting the interventions such as tree planting, paving and drainage on the specific streets and relocation of utilities where required.
- The following sites are identified for the blue-green corridor intervention:
    1. Sungai Pinang – NBS could complement the existing RM150 million federal - funded masterplan to rejuvenate the river
    2. Sungai Bagan Jermal – Serves as an important connection, in terms of biodiversity, between the botanical gardens and the city
    3. Sungai Ara – Funding could complement existing MBPP's plans of upgrading parts of Sungai Ara which includes the creation of a linear park with retention areas to improve the biodiversity of the area. Public participation is envisioned to form part of this initiative.
    4. Prangin canal
- Bayan Lepas Free Industrial Zone was proposed as the site for establishing green areas in parking lots due to the large exposed surface areas. This could be an effective intervention for reducing the urban heat island effect and form a case study for monitoring and evaluating the impacts of green areas.
- Think City mentioned that the interventions in the Industrial Zone would require a strong buy-in from the private sector and at present, potential partnerships are being discussed with Penang Skills Development Centre and Penang Development Corporation.
- Green built structures are proposed to be implemented through grants which would allow for wider participation from building owners. These could include green rooftops, green facades, back lanes improvement and urban farming.
- Some of the interventions proposed for reduction of stormwater runoff and flooding include constructing upstream retention areas, infiltration wells, and swales.
- It was discussed and agreed upon that the following set of actions would be crucial for the delivery of upstream retention areas, infiltration wells, and swales:
    1. Conduct in-depth territorial analysis which includes existing retention mapping and flood studies.
    2. Conduct targeted site analysis
    3. Develop masterplan
    4. Develop maintenance plan
    5. Implementation and construction
- Concerns were highlighted regarding the maintenance of infiltration wells and ponding issues (breeding of mosquitoes).
- Think City suggested the extension of tree-lined streets (connected canopies) as a pilot project. This is due to its high feasibility and impact as well as its cost-effectiveness.
- Remote sensing will be used to identify the most heat-stressed areas as priority for interventions, monitor the development of the project and identify effective strategies for replication.
- Thermal imaging will be used to identify heat stress at street level, evaluate the impacts of the pilot interventions and assess heat-absorbing characteristic of different materials used.
- It was suggested that the climate adaptation programme include components on increasing public awareness and building capacity at institutional level.

- MBPP highlighted concerns on the width of certain streets and its limitations in terms of scale to accommodate connected canopies.
- It was highlighted that Bayan Lepas has experienced significant temperature increase over the last 32 years and such increase will lead to heat stress in urban areas, with public health consequences.
- MBPP to share the cost estimates of tree-planting and details of existing street utilities.
- It was recommended by UN-Habitat that an endorsement from the National Designated Authority – Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) be secured.

- Think City provided an overview of the World Bank's Adaptation Fund submission guidelines as follows:
  - Funding only applicable to climate adaptation projects
  - Programme must be submitted and managed by a Multi-lateral Implementing Entity (MIE) - UN-Habitat
  - Programme requires approval of the National Designated Authority - MESTECC
  - Funding of USD 10,000,000 only applicable to one application per country
  - Application is conducted in two phases; i) Concept Note ii) Full Proposal
- Think City shared that due to the nature of the programme and requirement by the Adaptation Fund, 70% of the fund will be directed for built projects while the other 30% will be utilised for strategies and actions.
- UN-Habitat as the main project manager will receive the funding from the Adaptation Fund and distribute accordingly to the executing entities. 8% of the total budget is allocated to UN-Habitat for project management.
- It was proposed that Think City manage the funding for social resilience and institutional capacity strategies which represent 30% of the total budget. This will include the budget for Think City's project management at local level and codification of knowledge.
- Think City shared that focus group discussions, workshops, and community outreach are among some of the community/ stakeholder engagements planned for the 1st phase of the submission.
- Some of the proposed sites of outreach include Sungai Pinang upstream area, Clan Jetty community, Kedah Road flat, and Air Itam (linear park).
- It was understood that community engagements would be an on-going process throughout the 1st and 2nd phase of the application to develop awareness and sense of ownership among the communities.
- Think City shared that the programme will be carried out over a 5-year duration.

- Think City updated that the concept note has been submitted in March 2020 and has undergone technical review. Further clarifications to two requests from the Adaptation Fund were submitted in April 2020.
- Think City updated that the funding from Climate-KIC for the Climate Resilient Street Tree Species Study for Malaysia (CRST) will be disbursed in two instalments. The first disbursement will be made following the completion of the award agreement letter and the second on the achievement of the milestones, to be agreed by both parties – Climate-KIC and Penang City representatives. Regular monitoring and evaluation reports are required to be submitted for Climate-KIC's approval
- The following National and International Partners were enlisted for CRST:
  1. Project Manager – Think City
  2. Policy Partner – Jabatan Landskap Negara

3. Scientific Partners – National Landscape Department of Singapore
4. Scientific Advisors – Crowther Lab, IUCN
5. Reviewer – Perhilitan, Perhutanan

- CRST will encompass the selection of street tree species for spatial typologies such as urban green spaces and waterways in Malaysia. The study will also include typical construction details for tree pits, specifications for tree-planting, and maintenance guide.
- Think City shared that CRST will form part of the Nature-based Climate Adaptation Programme for the Urban Areas of Penang Island.
- The funding from Climate-KIC will be used for the development and publishing of the CRST research, a book publication and policy documentation.

- Think City proposed that the social resilience component of the programme extend beyond the Bayan Lepas and Georgetown mukim to leverage on the potential impacts of the programme on Penang Island.
- Think City presented the proposed organisational chart, explaining the roles and responsibilities of the following bodies:
  1. Steering Committee – Comprises representatives from the Ministry of Environment and Water, MBPP, Department of Drainage and Irrigation (JPS), National Hydraulic Research Institute of Malaysia (NAHRIM), Think City, and other relevant stakeholders. They will be responsible for the project results, workplan / budget approval as well as monitoring and evaluation.
  2. Project Director – Elected from within the Steering Committee.
  3. Local Project Manager – Comprises representatives from Think City who will oversee the programme scope, schedule and budgeting. They will manage the overall delivery of the project and act as liaison between the Scientific Support Team, Technical Coordination Team, and Project Implementation Team.
  4. Project Implementation Team – Comprises representatives from MBPP Landscape Department, Engineering Department, Think City and different implementation partners as the programme progresses in time. They will function as operational support.
- It was highlighted that the mapping of proposed street trees should take into account the Penang Transport Master Plan particularly the proposed LRT line along Jalan Sultan Azlan Shah.
- It was suggested that utilities mapping be done at specific sites where new trees are proposed to be planted.
- Think City shared that 2 focus group discussions with women leaders and approximately 300 B40 targeted surveys have been carried out thus far to gain feedback on the impacts of climate change in their communities. An exhibition is also planned to gain public interest in the programme and engage with potential partners.

- It was proposed that the suitability of existing trees in providing sufficient shade be reviewed as part of establishing new connected canopies.
- The framework for the planting of new trees will include guidelines and considerations of height and distance in relation to heritage buildings and facades.
- Think City suggested a pilot project could be implemented to establish a network of green connectors along the route from Botanical Gardens to Gurney Wharf and Green Hall Street.

- It is understood that at present, the challenges to establishing green spaces in car parks are in its implementation as its requirement has been outlined in Jabatan Landskap Negara's guideline.
- Buy-in from industry players (i.e. Penang Skills Development Centre) would be crucial for the implementation of green spaces in car parks in Bayan Lepas due to the ownership of land.

- Think City shared that the programme has been endorsed by the Adaptation Fund board in September 2020 and an invitation has been issued to the Ministry of Environment and Water for the submission of the full proposal between December 2020 and January 2021.
- It was explained that the proposed tree-line streets will be based on the rule of thumb of tree planting at 1/3 of the street's width, on the southern side to maximize shading. These interventions would be carried out with minimal disruptions to traffic flow.
- The following were suggested for the implementation of each component and its work packages:
  1. New tree-lined streets / Connected canopies & Pocket parks/ vacant spaces
     - Its implementation to be carried out in several packages according to area zoning.
  2. Green parking spaces
     - To be carried out as a grants programme by MBPP, when in private land.
  3. Green facades & Green rooftops
     - To be carried out as a grants programme by Think City.
     - Awarding of grants to take place twice a year.
     - It was noted that any additional structure proposed for these interventions would require submission to the local council.
  4. Urban farming programme
     - To be carried out as a grants programme by MBPP.
     - To be targeted at public institutions and housing.
  5. Blue-green corridors
     - Potential connected corridor from Botanical Gardens to Gurney Wharf.
     - Coordination between MBPP and JPS would be required for drawing up the scope of work.
     - A total of 18 months is proposed for preliminary planning which includes utilities mapping and feasibility and another 6 months for tender process.
  6. New upstream and retention ponds
     - A total of 36 months is proposed for the overall project duration which entails 18 months for planning (survey study, drawing up of scope and packages) and another 18 months for project implementation.
  7. Swales and infiltration wells
     - Its implementation to be carried out in Year 3 and 4 of the programme.

- Think City shared that the list of tree species developed under CRST (approximately 25 species) to be used for the programme will need to be verified by both Perhilitan and Perhutanan. This is to ensure species proposed are not damaging to wildlife in Malaysia.
- The following programme organisational structure and roles were reiterated:
  1. Technical Coordination Team – Reviewers for design and construction tender bids
  2. Scientific Support Team – Provide identification of upstream retention areas and estimates of climate change impacts in Malaysia (REDAC & NAHRIM)

3. MBPP and JPS' relevant representation in the Steering Committee throughout the duration of the programme.
4. MBPP and JPS' role in the Project Implementation Team in relation to the specific projects (Component 1 & 2)
5. Role of the Project Implementation Team in risk monitoring and evaluation with the support of the Project Manager.

- The following were further discussed:
  1. New tree-lined streets / Connected canopies
     - To include both design and construction tender bids
     - Community engagement to be carried out after preliminary studies / scoping of work.
     - Each mukim (George Town and Bayan Lepas) to implement 3 packages over the span of 3 years.
     - Each package to include several streets.
     - Preliminary studies to encompass traffic analysis and phasing plan of streets to ensure alternative routes for vehicular movement.
  2. Pocket parks / Vacant spaces
     - To include both design and construction tender bids
     - Community engagement to be carried out after preliminary studies / scoping of work.
     - To comprise 6-8 packages over the duration of the programme.
  3. Green parking spaces
     - 3 rounds of grants to be awarded; 1 round per year.
     - Project sites will mostly be in Bayan Lepas.
  4. Green facades & Green rooftops
     - Awarding of grants to take place twice a year with review by a Technical Review Board. Co-investment by property owners is encouraged.
  5. Urban farming programme
     - 4-5 typologies (schools' initiatives, etc) of urban farming to be developed.
     - Awarding of grants to take place twice a year.
  6. Blue-green corridors
     - To include both design and construction tender bids
     - Stakeholders engagement to be carried out after preliminary studies / scoping of work.
     - Potential overlay with the Youth and Schools programme in creating internship opportunities for river monitoring for young people.
  7. New upstream retention areas
     - Implementation to be assessed in view of the development of blue-green corridors.
     - Stakeholders engagement to be carried out after preliminary studies / scoping of work.
  8. Swales and infiltration wells
     - Stakeholders engagement to be carried out after preliminary studies / scoping of work.
     - To incorporate / complement existing JPS plans. Interventions along Solok Van Praagh was highlighted as an example.
     - Implementation to take place after the construction of blue-green corridors and new upstream retention ponds.

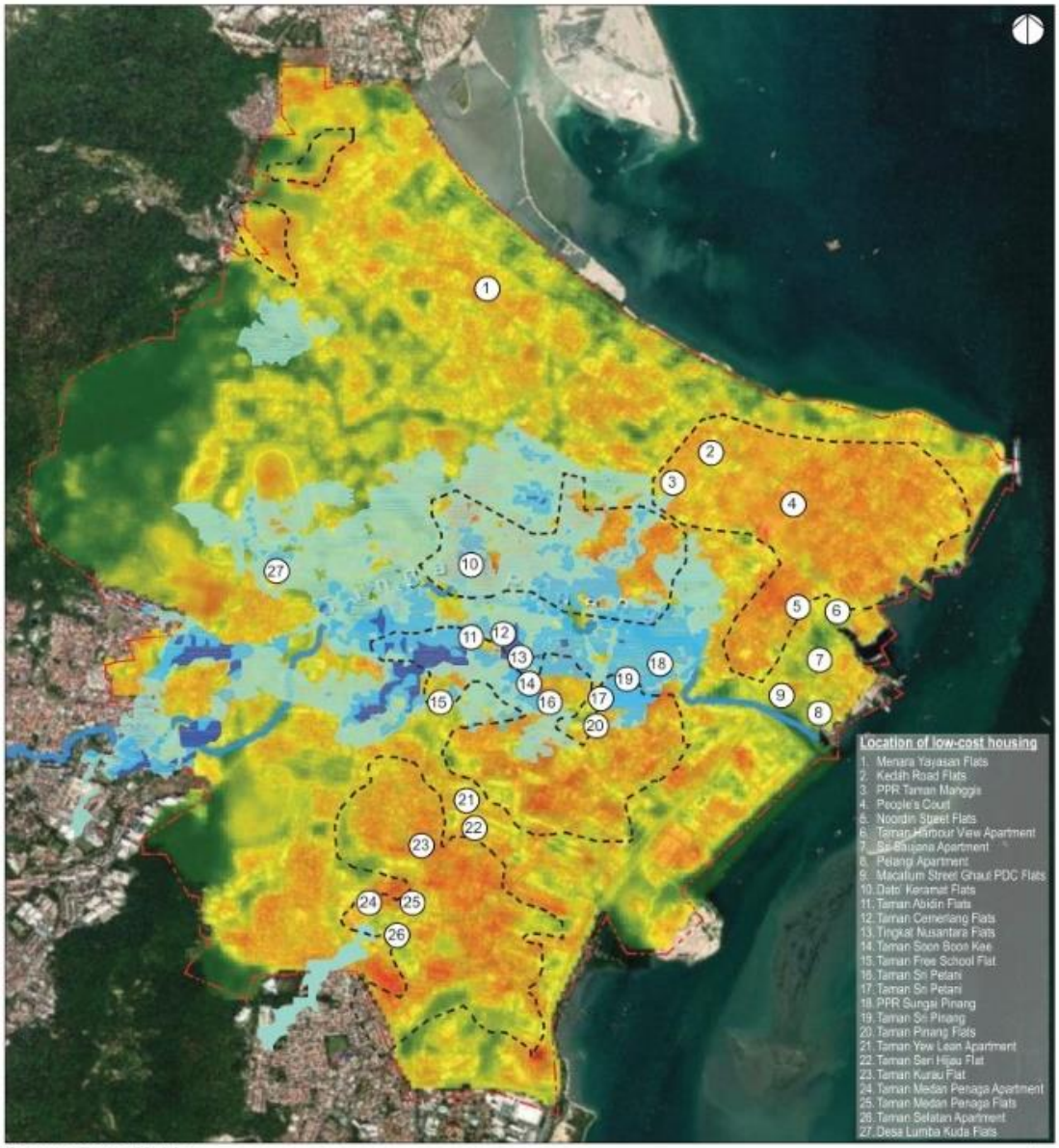
Annex 4. Alignment of Project Objectives / Outcomes with Adaptation Fund Results Framework

Project Outcome	Project Outcome Indicator	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD
Adaptation to the urban heat island effect through urban greening	Temperature reduction in the surrounding areas, 5 -7 years after project implementation.	Increased ecosystem resilience in response to climate change and variability induced stress	Ecosystem services and natural resource assets maintained or improved under climate change and	3,175,000

			variability-induced stress	
Improved storm water management	Increased water retention capacity of rivers in the urban areas of Penang Island.	Increased ecosystem resilience in response to climate change and variability induced stress	Ecosystem services and natural resource assets maintained or improved under climate change and variability-induced stress	2,725,000
Comprehensive vulnerability / baseline assessment and action plans for social resilience strengthening developed for George Town and Bayan Lepas mukims	Percentage of targeted population with increased level of awareness on systems assessment, including private property, infrastructure and natural assets, and improved planning for adaptation.	Reduced exposure to climate-related hazards and threats	Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	160,000
Strengthening social resilience	Number of schools and youths equipped with awareness and knowledge of climate change and its mitigation/adaptation strategies.	Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	975000
Building institutional capacity to adapt to climate change	Availability of information on strategies and projects to other municipalities in Malaysia and in the Southeast Asian region.	Strengthened institutional capacity to reduce risks associated with climate-induced	No. of targeted institutions with increased capacity to minimize exposure to climate	1,306.014

		socioeconomic and environmental losses	variability risks	

Annex 5. Preliminary Vulnerability Assessment



George Town Mukim

0 0.25 0.5 1 km

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

GEORGE TOWN MUKIM

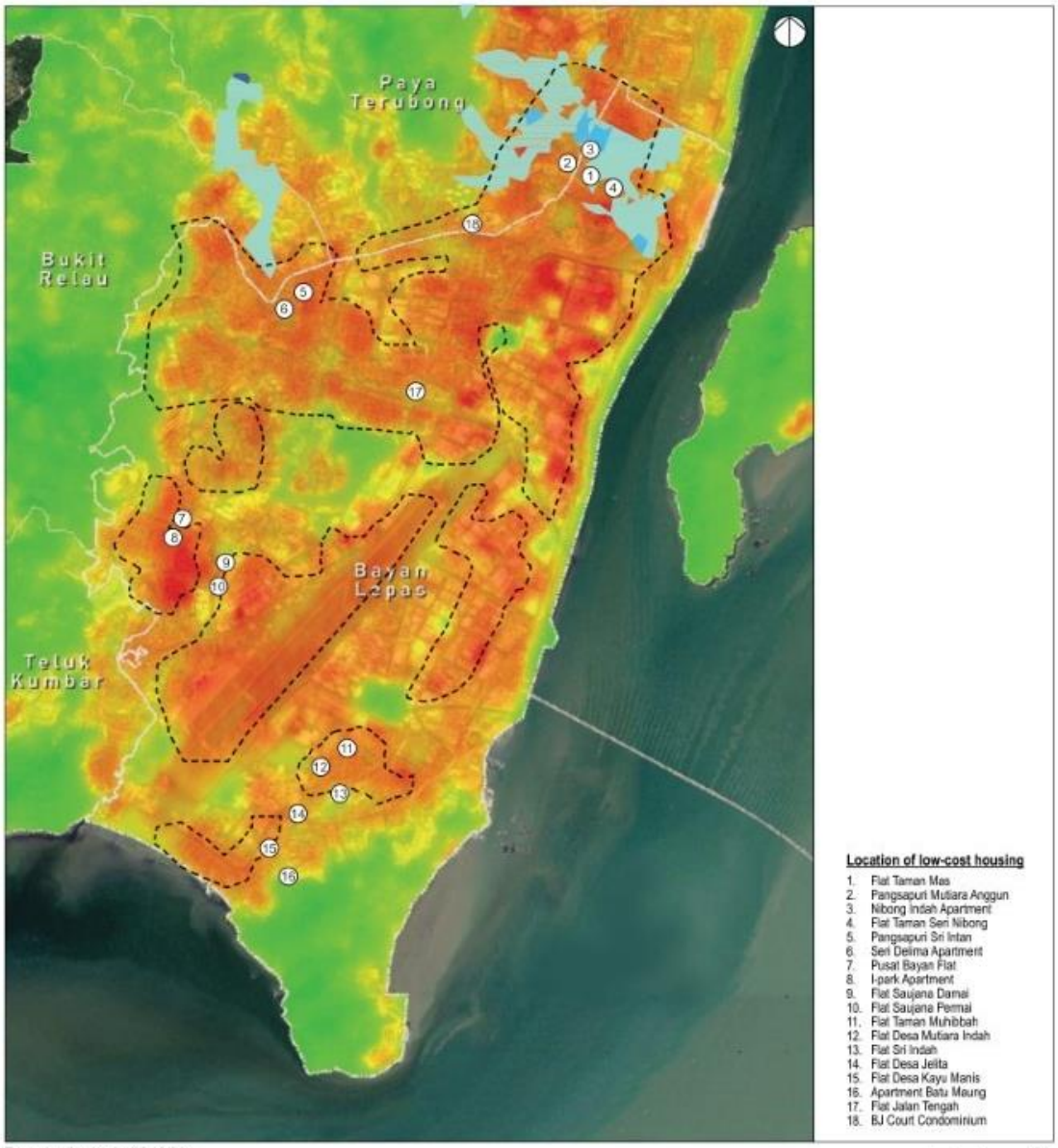
PRELIMINARY VULNERABILITY ASSESSMENT

High surface temperature : 37.2 °C
Low surface temperature : 23.6
Source : Remote Sensing on 5 March 2019 (Landsat 7) by Think City

Low (flood depth)
Moderate (flood depth)
High (flood depth)
Source : RBM (2018) Flood Mitigation Report for Penang Island

Areas with high flood risk and heat stress

Drawing no. : GT.A.2.dwg



Location of low-cost housing

1. Flat Taman Mas
2. Pangsapuri Mutiara Anggun
3. Nibong Indah Apartment
4. Flat Taman Seri Nibong
5. Pangsapuri Sri Intan
6. Seri Delima Apartment
7. Pusat Bayan Flat
8. I-park Apartment
9. Flat Saujana Damai
10. Flat Saujana Permai
11. Flat Taman Muhibbah
12. Flat Desa Mutiara Indah
13. Flat Sri Indah
14. Flat Desa Jelita
15. Flat Desa Kayu Manis
16. Apartment Batu Maung
17. Flat Jalan Tengah
18. BJ Court Condominium

Bayan Lepas Mukim

0 0.25 0.5 1 km

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

BAYAN LEPAS MUKIM

PRELIMINARY VULNERABILITY ASSESSMENT

High surface temperature : 37.2 °C
Low surface temperature : 23.6
Source : Remote Sensing on 5 March 2019 (Landsat 7) by Think City

Low (flood depth)
Moderate (flood depth)
High (flood depth)
Source : RBM (2018) Flood Mitigation Report for Penang Island

Areas with high flood risk and heat stress

Drawing no. : BL.A.2.dwg

Annex 6. Environmental and Social Management and Monitoring Plan

1. Introduction and Purpose

The purpose of this Annex is to demonstrate the project's compliance with the Environmental and Social and Gender Policies of the Adaptation Fund. It provides an analysis of the potential environmental and social risks of the project's physical activities and highlights opportunities, concluding in an Environmental and Social and Gender Policy Compliance Plan. The contents of this plan will be made available to the PSC before the project commences, and it will be used as a basis to brief beneficiary communities before the project commences.

2. Compliance with environmental and social safeguards

Environmental and social safeguards are essential tools to prevent and mitigate the potential for undue and unintended harm that could arise from project activities. In line with the Adaptation Fund's ESP and GP and UN-Habitat's Environmental and Social Safeguard Policy (ESSP), UN-Habitat and its partners are required to conduct risk screenings and impact assessments of all activities that have even a negligible risk of causing unintended harm.

To ensure compliance with the Environmental and Social Policy of the Adaptation Fund, all project activities are screened against the 15 environmental and social principles, as defined in the Environmental and Social Policy of the Adaptation Fund. Where risks have been identified, this annex analyses the potential for impact and describes the measures that have been built into the project to avoid or mitigate risks and their impacts.

To ensure compliance with the Adaptation Fund Gender Policy, a gender baseline approach was taken, and Gender Acton Plan has been prepared. (This analysis also sets the baseline that informs the project's results framework and monitoring. Where possible, this gender baseline approach identifies possible additional benefits that can be achieved for women (as well as children and youth).

Checklist of environmental and social principles	No further assessment anticipated required for compliance	Potential impacts and risks – further assessment required for compliance	Explanation why principle has been triggered (or not)
Compliance with the Law	X		All issues relating to compliance with the law have been described in Part III, Section K - table 18.
Access and Equity		X	The project provides infrastructure that reduced vulnerabilities such as flooding, storm surge, high urban heat island effect/extreme heat. There would be potential, without risk avoidance or reduction measures, for the target beneficiaries to benefit inequitably, or for some groups to be excluded altogether.
Marginalized and Vulnerable Groups		X	While the target area doesn't have many marginalised or vulnerable groups in terms of migrants or indigenous people, there are some refugees in the Bayan Lepas area who are vulnerable to discrimination such as other forms of racial discrimination.
Human Rights	X		Aside from the aforementioned risks of discrimination under Marginalise and Vulnerable Groups, Gender Equality and Women's Empowerment, there are no discernible human rights risks. The protection of basic human rights is enshrined in Constitution of Malaysia. The project itself works on public land (thus mitigating any risk of resettlement), the project will not use the labour of anyone under the age of 18, or any forced labour (and labour issues are considered in Core Labour Rights).
Gender Equity		X	Malaysia ratified the Convention on the Elimination of All

and Women's Empowerment			Forms of Discrimination Against Women (CEDAW) in August 1995 with reservations. Although increased positions of leadership within the workforce are being partaken, gender inequality is still being experienced.
Core Labour Rights		X	The project will ensure proper contracts, in compliance with ILO standards and occupational health and safety standards in line with international best practices are used by all implementing partners. Relating to use of some community labour to do unskilled construction tasks, in accordance with UN-Habitat's proven People's Process approach. However, without appropriate risk mitigation measures, there is a possibility that there could be exploitation of people providing their labour to the project
Indigenous Peoples	X		There are no indigenous people in the target area (which is highly urbanised/densely populated), and as such this risk has not been triggered.
Involuntary Resettlement		X	Proposed interventions only on state land. No resettlement anticipated. However, Because the project will construct retention ponds, swales and drainage systems involuntary resettlement could be a risk without mitigation measures. Not because they would be evicted from their homes, but because there could be damage to their homes, or prevention of access, or other temporary structural alteration to homes
Protection of Natural Habitats		X	Damage to local ecosystems due to introduction of dangerous species of flora could be a risk without mitigation measures. Department of Wildlife and National Parks (Perhilitan) and Department of Forestry (Perhutanan) to review all projects to make sure no dangerous species is proposed.
Conservation of Biological Diversity		X	Damage to local ecosystems due to introduction of dangerous species of flora could be a risk without mitigation measures. Department of Wildlife and National Parks (Perhilitan) and Department of Forestry (Perhutanan) to review all projects to make sure no dangerous species is proposed.
Climate Change		X	Inefficient sourcing of materials may generate emissions. Poor construction/planning may lead to "mal-adaptation". Preferring local materials in the procurement process. Multi-stakeholder consultation and approval process for designs.
Pollution Prevention and Resource Efficiency	X		The construction activities associated with the project could lead to some small-scale pollution of non-hazardous materials (such as plastics and basic construction materials). The project will not use any hazardous materials in its construction. Incorporate waste management and disposal into design.
Public Health		X	Construction sites pose a risk to the public if not properly managed and demarcated. Water-related activities pose contamination risks. Zero-accident construction site management. Practices to ensure water sources are not contaminated
Physical and Cultural Heritage		X	Penang old town is a UNESCO World Heritage Site. Consultation with UNESCO, Department of Heritage Conservation (MBPP) and George Town World Heritage Incorporated about implementing the project in accordance with heritage preservation principles.
Lands and Soil Conservation	X		No risks identified beyond those highlighted in Protection of Natural Habitats

3. Screening and examination process

ESS consultations have conducted through screening, examination and review with feasibility of implementing identified activities. The designed activities especially for, infrastructure investments, were assessed to identify the potential risk and impact. After identification, mitigation measures were set up, and risks for social and environmental impacts were analysed. Based on those measures, monitoring plans were arranged and probability of risk was determined. With mitigation measures, monitoring plans, and probability of risk, mitigation action plans were developed below.

AF Environmental and social principles	Environmental and Social impacts and risks / Activity	Monitoring / Probability of Risks	Mitigation measures	Mitigation Action Plans
Compliance with the Law	Failure to comply with laws and guidelines relating to procurement procedure and Plan Malaysia's planning guidelines include standards related to green neighbourhoods , rooftop gardens and back lanes Activities under output 1.1, 1.2, 1.3, 1.4, 1.5. 2.1, 2.2, and 2.3	PM and PO will monitor all IPs and their contractors and workers follow and comply safety standards, construction guidelines and labour laws and have consultation with local communities to ensure no negative impact due to project work Low	Construction works of flood retention ponds swales and infiltration water wells installation of water treatment system required to follow safety standards, construction guidelines and labour laws	- Include legal clauses into to all implementing agreements to ensure all IPs and their contractors and workers follow and comply safety standards, construction guidelines and labour laws - Consult the legal procedures to establish Penang Climate Board created
Access and Equity	There would be potential, without risk avoidance or reduction measures, for the target beneficiaries to benefit inequitably, or for some groups such as disable to be excluded altogether. Activities under output 1.1, 1.2, 1.3, 1.4, 1.5. 2.1,2.2, and 2.3	PM and PO will monitor during all project activities address issues related to marginalized groups and ensure equal access, benefits and inclusion in all actions including planning an designing. Low	All activities more importantly infrastructure improvement and creation process should be inclusive and consultative ensuring right to access to such infrastructure is ensured for all.	- Include legal clauses into to all implementing agreements to ensure all IPs and their contractors and workers follow inclusive consultative process with all stakeholders and communities - UN-Habitat's proven People's Process approach provides number of tools and methodologies for stakeholder and community consultations and applies such tools.
Marginalized and Vulnerable Groups	There are small number of vulnerable groups mainly refugees in the Bayan Lepas area who are vulnerable to discrimination such as other forms of racial discrimination. Activities under output 1.1, 1.2, 1.3, 1.4, 1.5. 2.1,2.2, and 2.3 -	Consultations have and will continue to capture all issues and needs of "marginalized and vulnerable groups" and particular impacts on- and needs of marginalized and vulnerable groups will be assessed throughout the project. Low	- Marginalized and vulnerable group could have lack of information about the use public infrastructure created by the project - Marginalized group can be denied to access the infrastructures - Construction work may be given to skilled workers; women and unskilled workers may not be able to participate in the construction work.	- Community co-management with rules ensuring of equal access and information is guaranteed and community based engagement will be applied to encourage the participation from marginalized and vulnerable group - Make sure that the information about the infrastructures will be announced to marginalized groups.

Human Rights	- Human rights breaches can arise from denying access to infrastructure created by the project	The project Team will monitor that international and national human rights laws Low	See Access and Equity and Marginalized and Vulnerable group There would be no specific human rights issues	In line with UN-Habitat's Project Management Cycle and Work Flow policy, the Human Rights focal point of UN-Habitat will monitor and ensure that the project is implement to respect and adhere to the requirements of all relevant conventions on human rights.
Gender Equity and Women's Empowerment	Women could be denied access to infrastructure, or excluded from making critical decisions Activities under output 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 3.1, 4.1, 5.1, 5.2 and 5.3	The project has specific components targeting women and girls. However the project team will actively pursue of Gender Equity and Women's Empowerment participation in all project activities and stakeholder consultation, e.g. through quota systems and /or organization of separate working groups during the implementation of Components. Low	Construction work may be given to skilled workers that women may not be able to participate in the construction work.	The project design considered that gender issues are included in all project interventions, with a specific focus on capacity building on the all levels as well as activities on the ground, besides output 4.2 which is directly focus on Women and girls. During the implementation the Gender focal point of UN-Habitat and project manager will monitor to ensure that the project follows best- practice guidelines. - Involving women and Local Women organizations along process and especially during the implementation and after the end of the project - There will be low risk that women could be denied to access to infrastructure. - The activities under Component 1 and 2 will create employment enabling some marginalized and vulnerable groups including unemployed youth and women to access employment.
Core Labor Rights	Labour rights may not be respected when contracting contractors Activities under output 1.1, 1.2, 1.3, 1.4, 1.5. 2.1,2.2, and 2.3 -	The project will monitor that international and national labour laws for any work that may be carried out in relation to the project Low	During construction, safety measures may not follow or violate national and international labour standards.	- All community contracts must be scrutinized to ensure they comply with both Malaysian law and international standards. - The relevant national labour laws guided by the ILO labour standards will be followed throughout project implementation. - The safety manual and instruction will be provided.

Indigenous Peoples	- There are no indigenous people in the target area (which is highly urbanised/densely populated), and as such this risk has not been triggered.	There are no indigenous people in the target area	No mitigation measures required	- No mitigation actions required
Involuntary Resettlement	- The project itself does not require any involuntary resettlement. While the physical relocation is very unlikely to occur, and the land acquisition from private ownership are not required (as 100% of the sites are in public land),	However, Because the project will construct retention ponds, swales and drainage systems involuntary resettlement could be a risk without mitigation measures. Not because they would be evicted from their homes, but because there could be damage to their homes, or prevention of access, or other temporary structural alteration to homes Low	AoCs and contracts will include standard clauses stating that target communities will not be 'involuntary resettled', also after the project.	- In accordance with the IFC PS and other international safeguard standards on involuntary resettlement, unregistered business holders as well as informal setters/wenders, if any, shall be provided with the appropriate compensation and livelihood restoration program implementing activities under component 1 and 2. .
Protection of Natural Habitats	- Damage to local ecosystems due to introduction of dangerous species of flora could be a risk without mitigation measures. Activities under output 1.1, 1.2, 1.3, 1.4, 1.5. 2.1 , 2.1, 2.2 and 2.3	Relevant policies and guidelines to be explained to understood by project personnel prior to implementation and monitored by implementing partners Low	- The planted mangrove species are not indigenous ones which may affect existing local ecosystem Department of Wildlife and National Parks (Perhilitan) and Department of Forestry (Perhutanan) to review all projects to make sure no dangerous species is proposed.	- Expert consultations and involvement in identifying tree species - List of tree species will be developed under CRST (approximately 25 species) to be used for the programme and will need to be verified by both Perhilitan and Perhutanan - Educate communities on list of trees that are used

Conservation of Biological Diversity	- While damage to natural habitats and threats to biological diversity are unlikely, there is a possibility that construction work undertaken may adversely impact on local biodiversity Activities under output 1.1, 1.2, 1.3, 1.4, 1.5. , 2.1, 2.2 and 2.3	Relevant policies and guidelines to be explained to understood by project personnel prior to implementation and monitored by implementing partners Low	- Planting trees along streets and creating green corridors are good measure not only conserving the biodiversity loss due to climate change impact and development initiatives but also protecting community from HIE. - However, there are potential risks of planted species are not indigenous ones, which might decrease the survivor rate of new planted. -	- Community consultation and involvement in project actions under component 1 and 2 - Community co-management mechanism is in place to ensure the survivor of new planted trees.
Climate Change	- This project is inherently an adaptation project and as such no maladaptation is foreseen. The project will not provide or install infrastructure or appliances that result in increased emissions	N/A Low	N/A	Best practices which reducing cost and emission are promoted and ensured in all project activities, particularly under component 1 and 2 .
Pollution Prevention and Resource Efficiency	- Construction activities associated with the project could lead to some small-scale pollution of non-hazardous materials (such as plastics and basic construction materials).. Activities under output 1.1, 1.2, 1.3, 1.4, 1.5. 2.1 , 2.1, 2.2 and 2.3	PM and PO will set up the manual for waste disposal specially for waste and pollution generated through construction and have consultation with stakeholders for capturing the relevant issues throughout the project Medium	Waste from the construction of hard infrastructures need to be managed. The project team will ensure that the project will not use any hazardous materials in its construction.	- Incorporating waste management and disposal into design and implementation process based on legal compliance - Strictly follow the handling procedure when using chemicals if any . - Appropriate tests will be conducted prior to disposal of any waste if such waste materials can be harmful to human or biodiversity. Results will be shared or , will be provided upon request
Public Health	The project has specific focus on Climate-related public health under Component 5. However Construction sites may pose risks to the public if not properly managed and demarcated. Water-related activities pose contamination risks. Activities under Output 5.3.	PM will monitor the actions in close coordination with experts working on Climate-related public health programme and share reports with respective health authorities. PM will monitor how effectively health and safety measures are followed by all implementing partners Low	Public health need to be ensured in all aspects such as health and safety of workers, neighborhoods, general public.	- In order to mitigate the potential risks to public health, user guideline/procedure should be followed and onsite Environmental Management Plan is deployed during the construction phase. - Promote Zero-accident policy as a part of the construction site management. - Practices to ensure water sources are not contaminated

Physical and Cultural Heritage	Penang old town is a UNESCO World Heritage Site. If adequate consultations are not held with key focal agencies such as Department of Heritage Conservation and UNESCO, there may be risks to preservation of heritage sites.	PM will monitor the actions in close and continuation of coordination with Department of Heritage Conservation and UNESCO. Low	Consultation with UNESCO, Department of Heritage Conservation (MBPP) and George Town World Heritage Incorporated about implementing the project in accordance with heritage preservation principles.	- Heritage preservation principles are incorporated into work procedures through guidelines and manuals., - Heritage preservation principles are Incorporated as part of conditions/clauses of all implementation agreements with partners
Lands and Soil Conservation	- No risks identified beyond those highlighted in Protection of Natural Habitats. However, special attention will be given under component 1 and 2	Consultations have and will continue to capture issues if any , and this will be monitored throughout the project. Low	Project anticipates no risks beyond those highlighted in Protection of Natural Habitats. Under component 1 and 2, soil erosion will be monitored.	- Monitoring erosion rate of the target areas under component 1 and 2, and the surrounding locations.

4. General environmental and social risks management reduction measures

In addition to the risk management measures identified above, the following elements will be put in place to ensure the compliance with the Environmental and Social Plan:

(i) All Memories of Understanding (MoUs) and Agreements of Cooperation with the Executing Entity will include detailed reference to this ESMP and in particular the 15 ESP Principles.

(ii) The Term of References (ToR) of Committees and Working Groups, project personnel and focal points will include detailed reference to this ESMP and in particular the 15 ESP Principles.

(iii) All key Executing Entity Partners will receive training/capacity development to understand the 15 Principles, the ESMP and in particular their responsibilities. This will include members of the Project Steering Committee, Project Management Unit, local Project Offices the Working Groups and the Communities.

(iv) A Monitoring and Evaluation Framework, including monitoring of risks and mitigation measures, will be developed by the PMU and presented for approval to the Project Steering Committee and UN-Habitat Team Leader (HQ: Monitoring and Evaluation).

(v) The UN-Habitat Human rights officers and Project Review Committee will check project compliance with the AF ESP and the Environmental and Social Safeguard System of UN-Habitat during the project (besides the project manager).

5. Grievance Mechanis

i) The grievance mechanism will apply to all the project's target areas and will be open to beneficiaries and non-beneficiaries alike. It will allow them accessible, transparent, fair and effective means to communicate with the project management (UN-Habitat and Project Steering Committee) if there are any

concerns regarding the project design and implementation. All employees, executing entities and contractors and people in the target areas will be made aware of the grievance mechanism to lodge any complaint, criticism, concern or query regarding the project's implementation

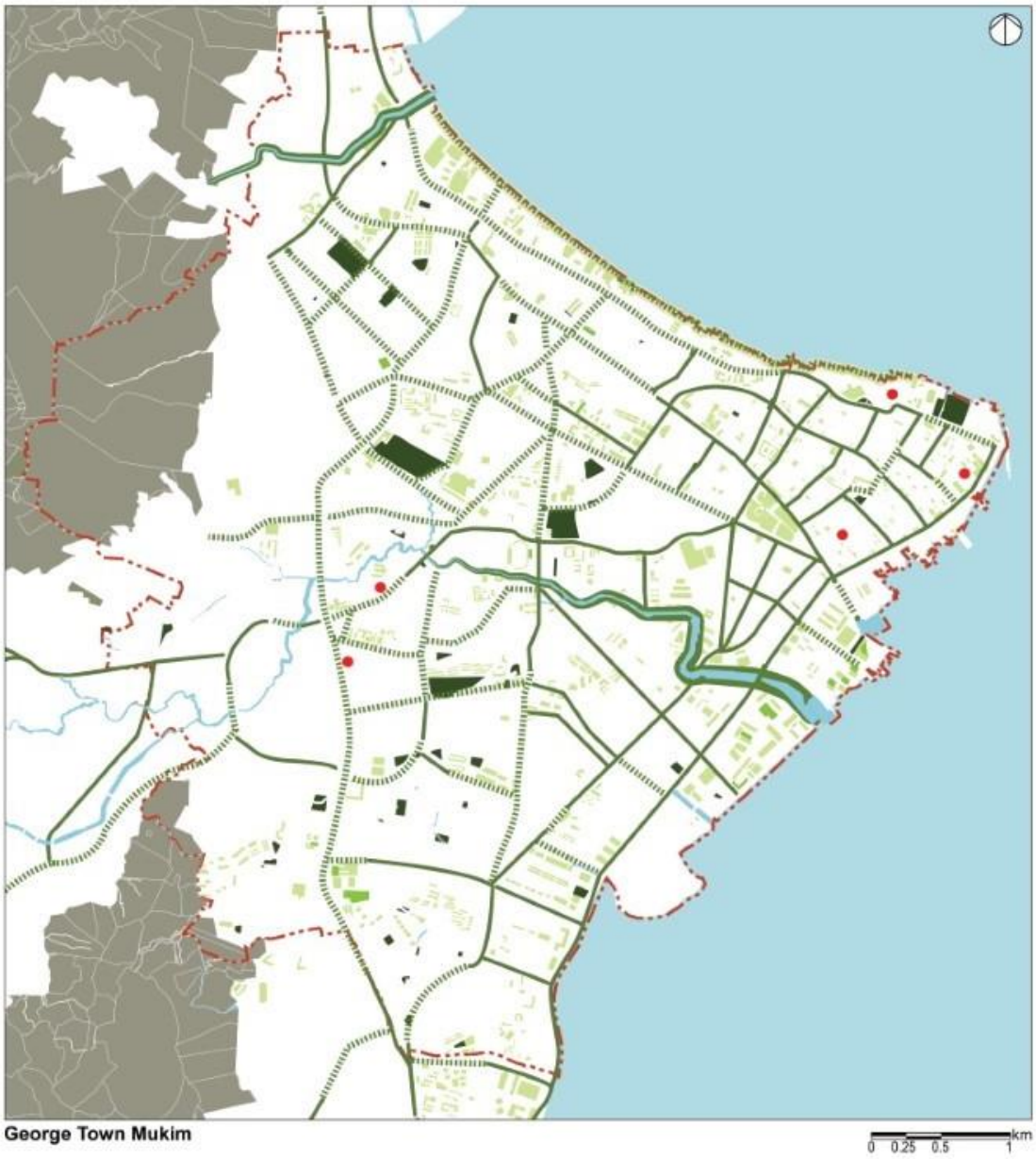
ii) The mechanism considers the particular needs of different groups in the target communities. It combines anonymous mailboxes at community level, a trained local facilitator in each community who can listen to grievances while assuring anonymity and a telephone number that enables people to call anonymously. These options allow people to make their grievance in whichever language they choose, offer options for illiterate people or people with low levels of literacy, and recognize that internet penetration is still low in the target area.

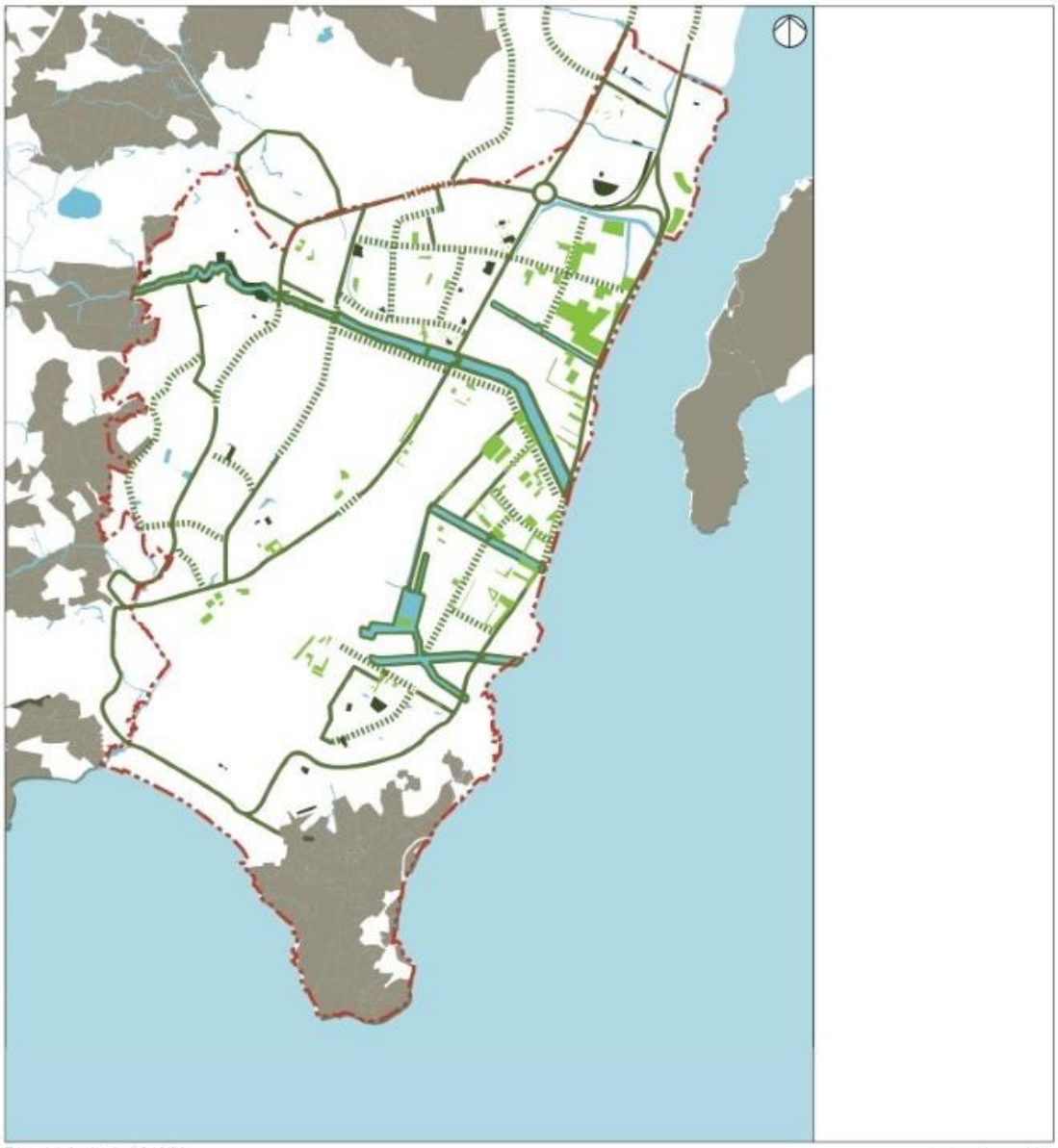
iii) Project staff will also be trained to recognize grievances from community members and how to deal with grievance reports. The local facilitators in each community will also be trained on to recognize dissatisfaction and on how to report grievances. In addition, monitoring activities will also provide an opportunity for beneficiary communities to voice their opinions as they wish.

iv) All grievances will be anonymized and presented to the Project Steering Committee.

v) The address and email address of the Adaptation Fund will be made public (i.e. project website, Facebook and mailbox) for anyone to raise concerns regarding the project:

Annex 7. Programme Mapping





Bayan Lepas Mukim

0 0.25 0.5 1 km

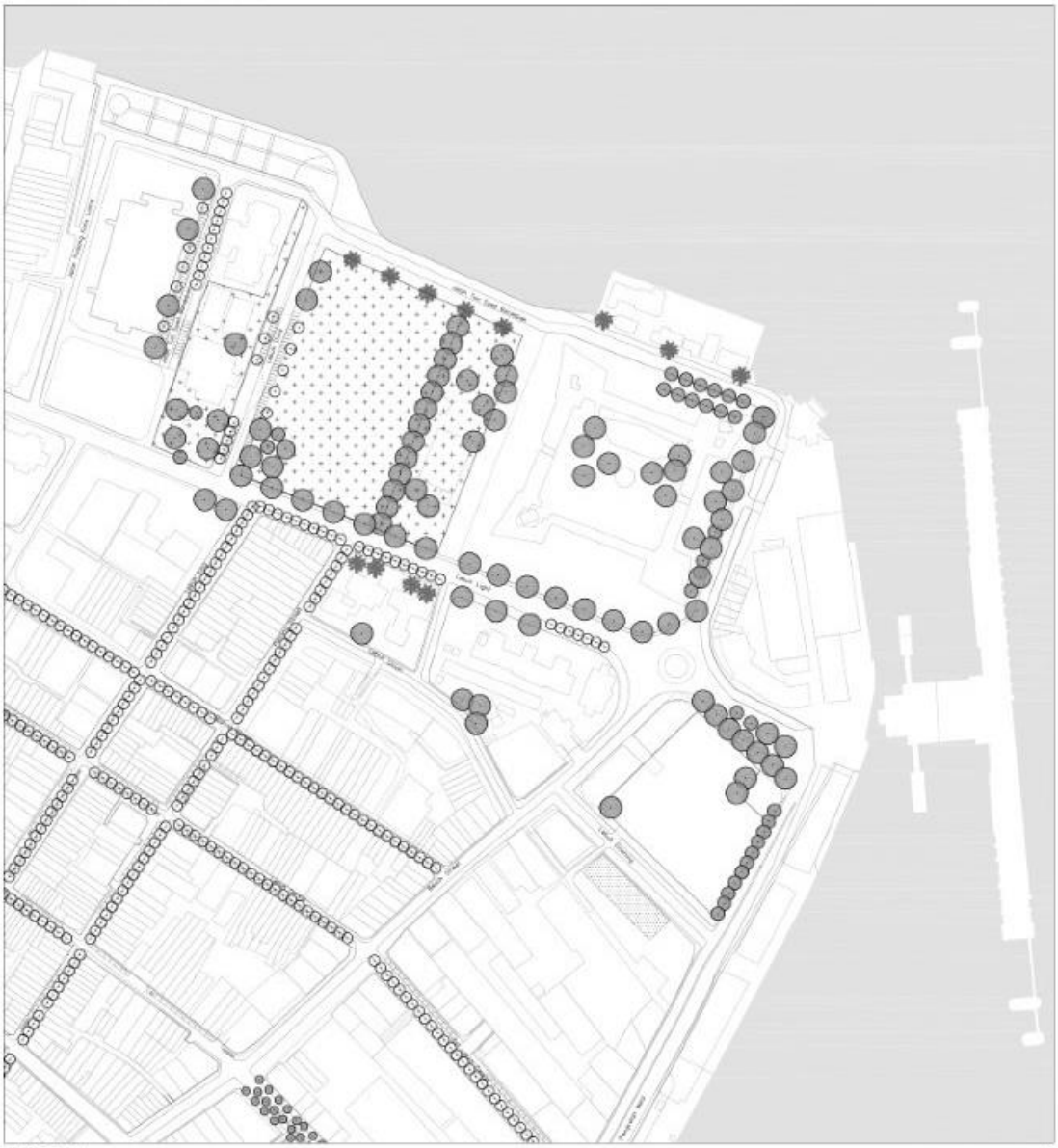
NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND PROJECT

GEORGE TOWN MUKIM

GREEN INFRASTRUCTURE

- 1.1 New Street Trees/ Connected canopies
- 1.2 Pocket parks/ vacant spaces
- 1.3 Green parking spaces
- 1.5 Green rooftops
- 1.6 Urban agriculture programme
- Existing tree lined street
- Existing green spaces

Note : Green facades sub-component is not shown in this map
Drawing no. : BL.A.3.dwg



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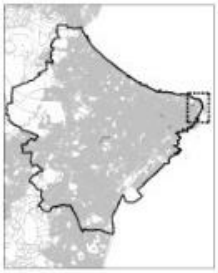

NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND PROJECT

GEORGE TOWN MUKIM

URBAN GREENING COMPONENT

- 1.1 New Tree-lined streets/ Connected canopies
- 1.2 Pocket parks/ vacant spaces
- 1.3 Green parking spaces
- 1.5 Green rooftops
- 1.6 Urban agriculture programme
- Existing tree lined street

Note : Green facades sub-component is not shown in this map
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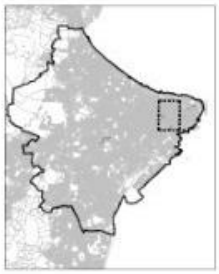

NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND PROJECT

GEORGE TOWN MUKIM

URBAN GREENING COMPONENT

- 1.1 New Tree-lined streets/ Connected canopies
- 1.2 Pocket parks/ vacant spaces
- 1.3 Green parking spaces
- 1.5 Green rooftops
- 1.6 Urban agriculture programme
- Existing tree lined street

Note : Green facades sub-component is not shown in this map
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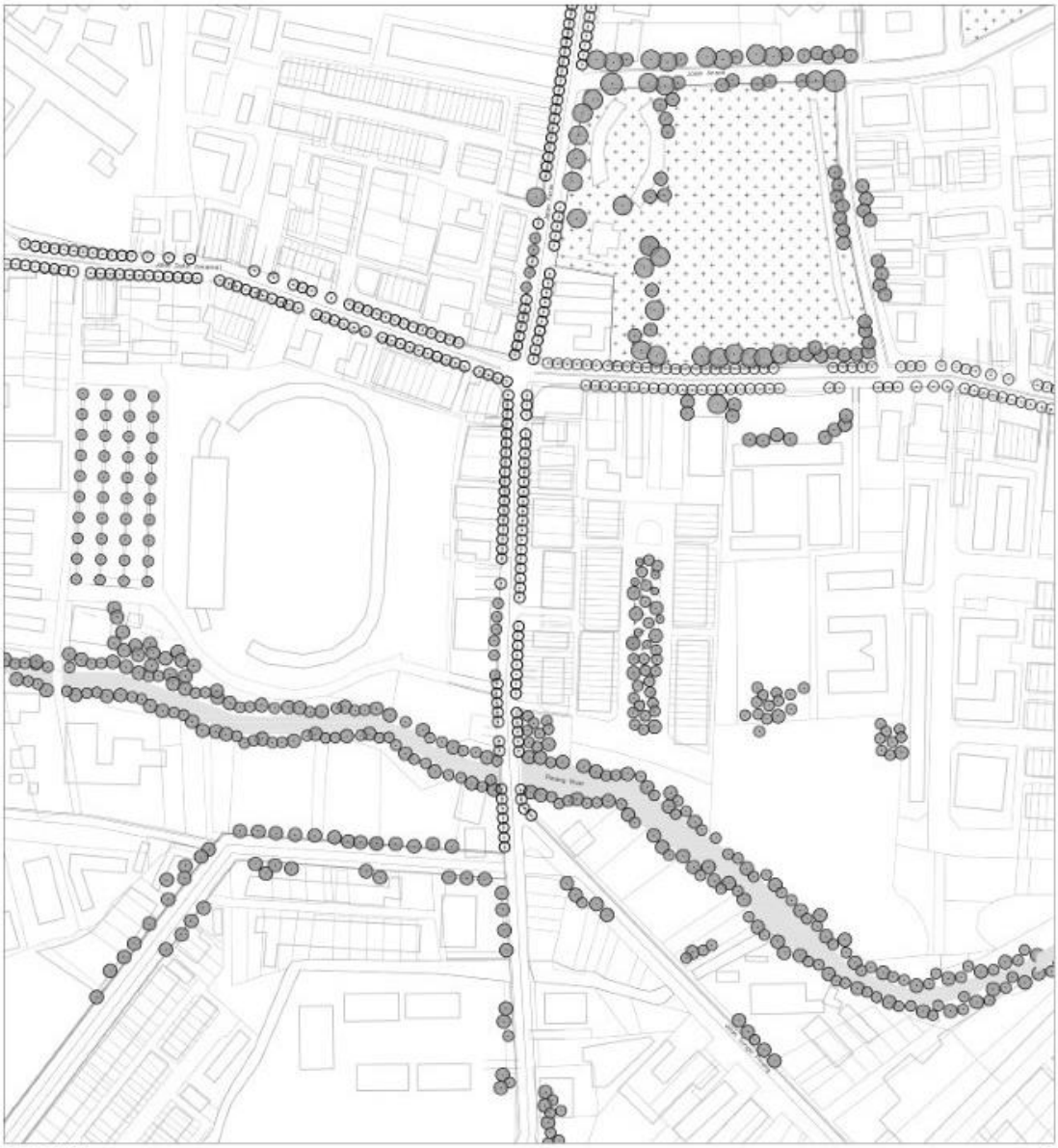

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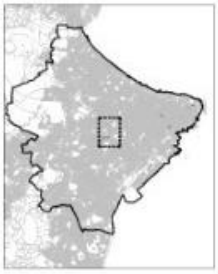


NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND PROJECT

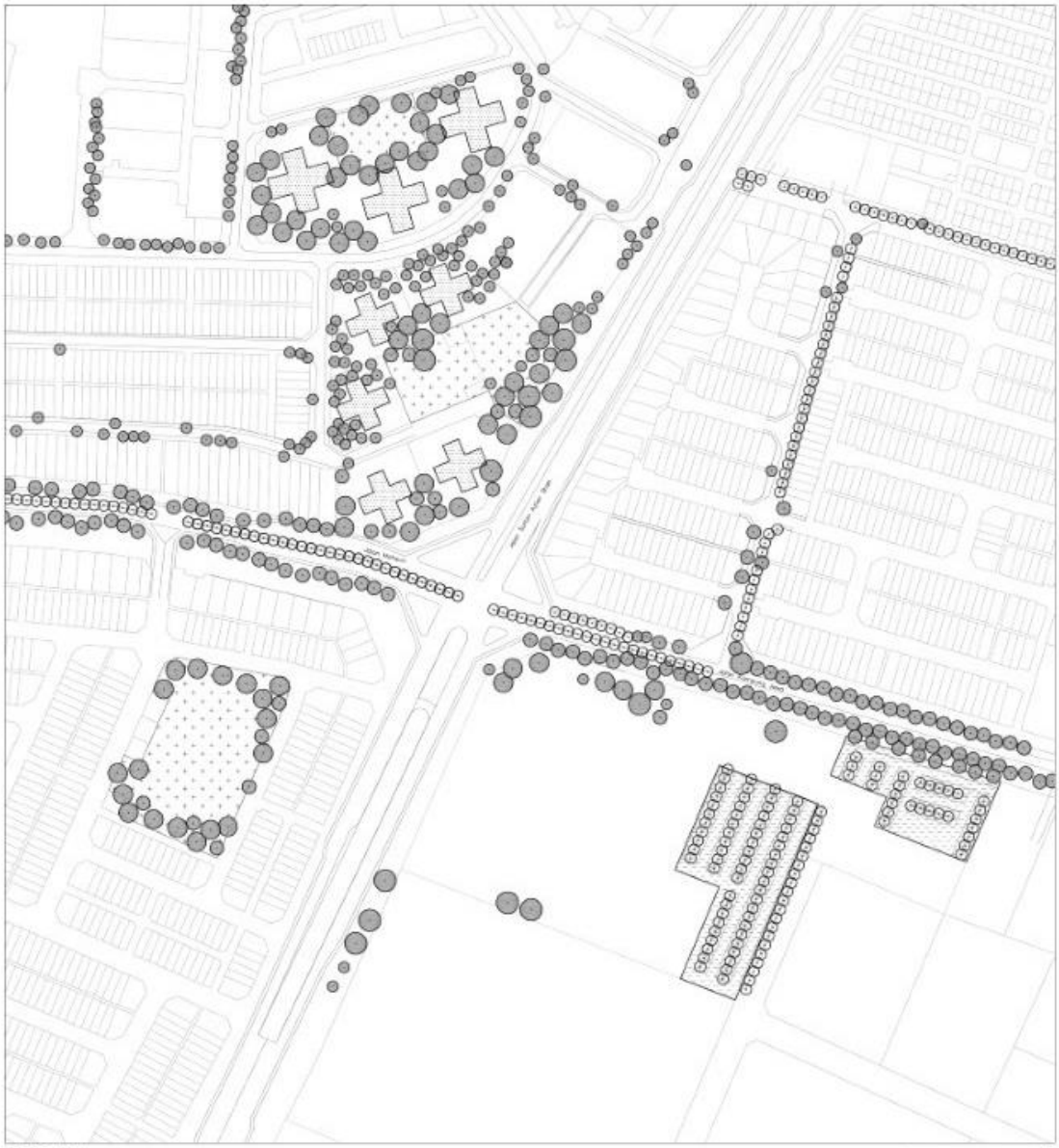
GEORGE TOWN MUKIM

URBAN GREENING COMPONENT

- 1.1 New Tree-lined streets/ Connected canopies
- 1.2 Pocket parks/ vacant spaces
- 1.3 Green parking spaces
- 1.5 Green rooftops
- 1.6 Urban agriculture programme

Existing tree lined street

Note : Green facades sub-component is not shown in this map
Drawing no. : GT.C.1.dwg



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

BAYAN LEPAS MUKIM

URBAN GREENING COMPONENT

- 1.1 New Tree-lined streets/ Connected canopies
- 1.2 Pocket parks/ vacant spaces
- 1.3 Green parking spaces
- 1.5 Green rooftops
- 1.6 Urban agriculture programme
- Existing tree lined street

Note : Green facades sub-component is not shown in this map
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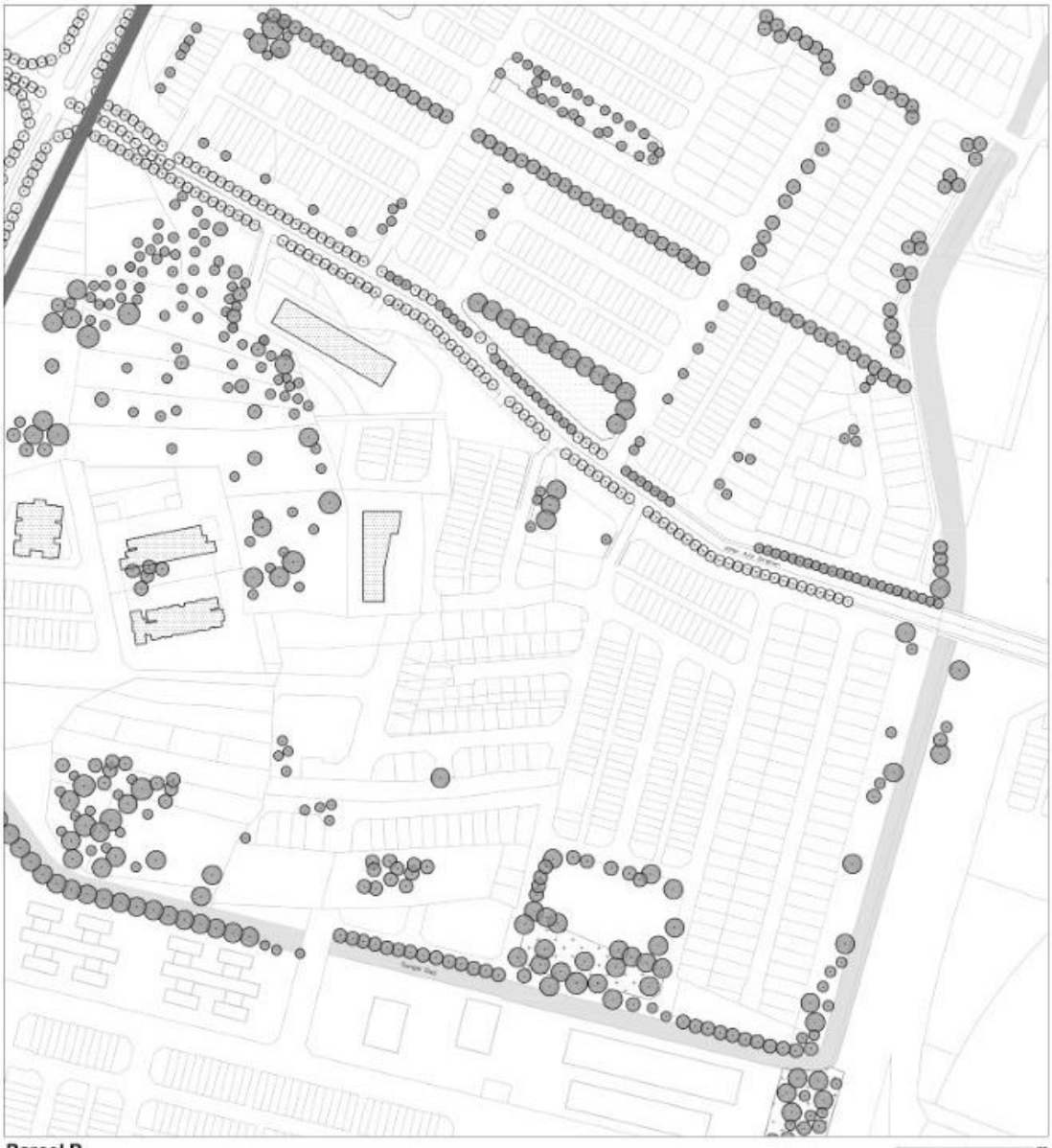

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NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND PROJECT

BAYAN LEPAS MUKIM

URBAN GREENING COMPONENT

- 1.1 New Tree-lined streets/ Connected canopies
- 1.2 Pocket parks/ vacant spaces
- 1.3 Green parking spaces
- 1.5 Green rooftops
- 1.6 Urban agriculture programme
- Existing tree lined street

Note : Green facades sub-component is not shown in this map
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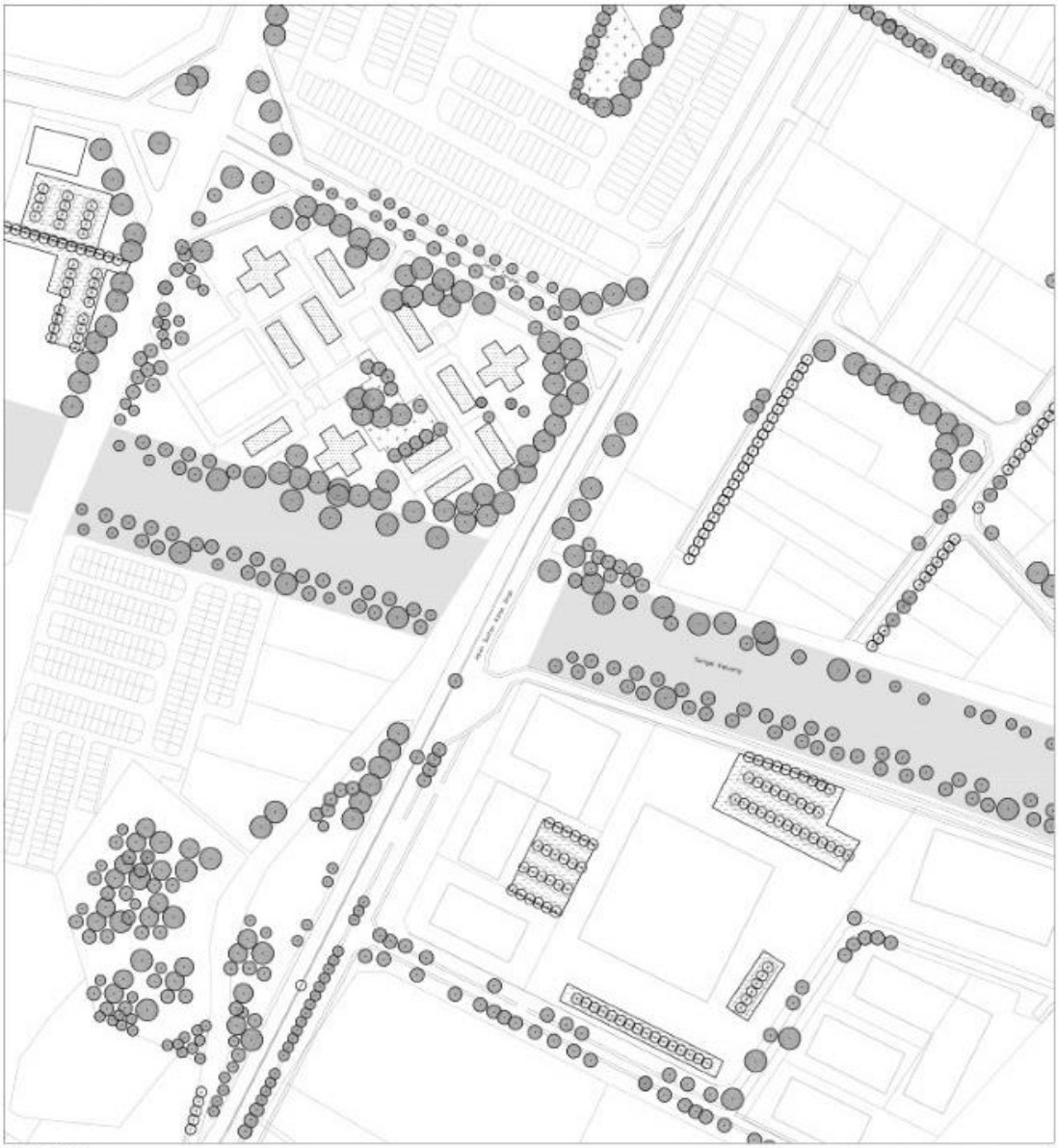

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NATURE-BASED CLIMATE ADAPTATION PROGRAMME FOR THE URBAN AREAS OF PENANG ISLAND PROJECT

BAYAN LEPAS MUKIM

URBAN GREENING COMPONENT

- 1.1 New Tree-lined streets/ Connected canopies
- 1.2 Pocket parks/ vacant spaces
- 1.3 Green parking spaces
- 1.5 Green rooftops
- 1.6 Urban agriculture programme
- Existing tree lined street

Note : Green facades sub-component is not shown in this map
Drawing no. : BL.C.1.dwg

MAPPING OF QUANTITIES

Component 1. Adaptation to the urban heat island effect through urban greening

1. New tree-lined streets / Connected canopies

Number of street trees in George Town

No.	Road	Total Length of street (m)	Nos. of rows of street trees line	Total length of street with tree lined (m)	No. of street trees
1	Gat. Lebuh Gereja	215	1	215	
2	Lebuh Gereja	350	1	350	
3	Lebuh China	300	1	300	
4	Gat. Lebuh Chulia	100	2	200	
5	Lebuh Chulia	570	1	570	
6	Gat. Lebuh Acheh	169	1	169	
7	Lebuh Acheh	320	1	322	
8	Lebuh Pasar	280	1	280	
9	Penang Street	393	1	393	
10	Lebuh King	382	1	382	
11	Lebuh Queen	280	1	280	
12	Lebuh Buckingham	180	1	180	
13	Lebuh Campbell	490	1	490	
14	Lebuh Kimberley	490	1	490	
15	Lebuh Carnovan	300	3	900	
16	Jalan Dato' Keramat	1700	2	3400	
17	Jalan Perak	710	1	710	
			Total	9631	1376

Number of street trees in Bayan Lepas

No.	Road	Total Length of street (m)	Rows of street trees line	Total length of street with tree lined (m)	No. of street trees
1	Jalan Aziz Ibrahim	565	2	1130	
2	Jalan Tun Dr. Awang	860	2	1720	
3	Sg. Nibong Highway	650	2	1300	
4	Jalan Dato' Ismail Hisham	280	2	560	
5	Jalan Bayan	580	2	1160	
			Total	5870	838

Total number of street trees in George Town and Bayan Lepas = **2214 nos**

2. **Pocket parks / vacant spaces**

Proposed vacant spaces in George Town Mukim

No.	Name of vacant space	Lot number	Location	Area (sqm)
1	Tanah Lapang Halaman Murni	Mukim 12 Daerah Barat Daya	Bayan Lepas	416
2	Tanah Lapang Tingkat Pantai Jerejak	Lot 4046 mukim 12 Daerah Timur Laut	Pantai Jerejak	882
3	Taman Jajar Sungai Ara Fasa 1	Lot 71386 Mukim 12 Daerah Barat Daya	Sungai Ara	3,239
			Total area	**4,537**

Proposed vacant spaces in Bayan Lepas Mukim

No.	Name of vacant space	Lot number	Location	Area (sqm)
1	Tanah Lapang Jalan Hamilton	Lot 2048 sek 6 Georgetown Daerah Timur Laut	Batu Lanchang	607
2	Tanah Lapang Taman Jelutong	Lot 778 sek 3 Jelutong Daerah Timur Laut	Batu Lanchang	999
3	Tanah Lapang Taman Air Rajah	Lot 2310 sek 1 Georgetown Daerah Timur Laut	Pulau Tikus	464
			Total area	**2,071**

Total area of vacant spaces= 6,608m²
Cost of vacant spaces = USD 115/m²

3. **Green parking spaces constructed**

Total nos of grants = 22
Average cost of grant per unit= USD 22,700/ unit

4. **Green facades constructed**

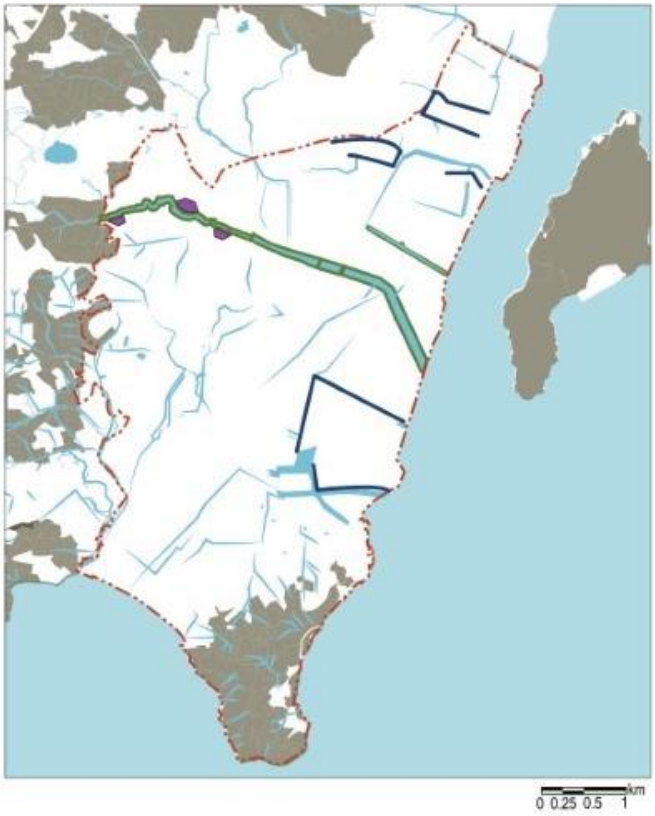
Total nos of grants = 40
Average cost of grant per unit= USD 4,000/ unit

5. **Green rooftops constructed**

Total nos of grants = 22
Average cost of grant per unit= USD 8,180/ unit

6. **Urban farming programme initiated**

Total nos of grants = 26
Average cost of grant per unit= USD 15,000/ unit



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

GEORGE TOWN & BAYAN LEPAS MUKIM

STORMWATER MANAGEMENT

Blue-green corridor
Upstream retention
Swales

Existing green spaces

Drawing no. : BL.A.3.dwg

MAPPING OF QUANTITIES

Component 2. Built projects for storm water and flood management

2.1 Blue-green corridors developed

Mukim	Catchment	Rivers/ Tributaries	Length (km)	Width of empty spaces of 1 side of river (km)	Total area
George Town	Sungai Pinang	Sungai Pinang	3.1	0.01	0.062
		N20	1.6	0.006	0.0192
Bayan Lepas	Sungai Keluang	Sungai Keluang	4.1	0.02	0.164
	Sungai Tiram	Sungai Tiram	3	0.02	0.12
	Sungai Nipah	Sungai Nipah	2.9	0.02	0.116
	Sungai Nibong Kecil		2.4	0.02	0.096
				Total area	**0.5772**

Total area of vacant spaces for blue-green corridor =10,782m²
Cost of developing blue-green corridor = USD 115/m²

2.2 New upstream retention ponds constructed

Total area = 4,462 m²
Cost= USD 130/ m²

2.3 Swales and infiltration wells restored and constructed

Infiltration wells

Proposed 20 infiltration wells in high-risk flood areas
1 unit of infiltration well = USD 560

Swales

Cost of a linear metre of swales= USD 210/ linear metre
Proposal= 1,660 linear metre of swales

Annex 8. Project Implementation Schedule / Gantt Chart

Component	Sub-component	Activity	2021				2022				2023				2024				2025				2026			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1.0 Adaptation to the urban heat island effect through urban greening	1.1 New tree-line streets / Connected canopies constructed	1.1.1 Preliminary studies / Scope of work																								
		1.1.2 Community engagement																								
		1.1.3 Launch of design tender bids (for design consultants)																								
		1.1.4 Design development / process																								
		1.1.5 Launch of construction tender bids																								
		1.1.6 Construction / Project implementation																								
		1.1.7 Maintenance / Surrender (1-2 years)																								
	1.2 Pocket parks / vacant spaces constructed	1.2.1 Preliminary studies / Scope of work																								
		1.2.2 Community engagement																								
		1.2.3 Launch of design tender bids																								
		1.2.4 Design development / process																								
		1.2.5 Launch of construction tender bids																								
		1.2.6 Construction / Project implementation																								
		1.2.7 Maintenance / Surrender																								
	1.3 Green parking spaces constructed	1.3.1 Launch and initiation of the grants programme																								
		1.3.2 Review and processing of applications																								
		1.3.3 Awarding of grants																								
		1.3.4 Monitoring of project implementation																								
	1.4 Green facades constructed (Built structures greening)	1.4.1 Launch and initiation of the grants programme																								
		1.4.2 Review and processing of applications																								
		1.4.3 Awarding of grants																								
		1.4.4 Monitoring of project implementation																								
	1.5 Green rooftops constructed (Built structures greening)	1.5.1 Launch and initiation of the grants programme																								
		1.5.2 Review and processing of applications																								
		1.5.3 Awarding of grants																								
		1.5.4 Monitoring of project implementation																								
	1.6 Urban agriculture programme initiated	1.6.1 Launch and initiation of the grants programme																								
		1.6.2 Review and processing of applications																								
		1.6.3 Awarding of grants																								
		1.6.4 Training and workshops																								
		1.6.5 Monitoring of project implementation																								

Component	Sub-component	Activity	2021				2022				2023				2024				2025				2026			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2.0 Built projects for storm water and flood	2.1 Blue-green corridors developed	2.1.1 Preliminary studies / Scope of work (Utilities mapping & Feasibility)																								
		2.1.2 Stakeholders engagement																								
		2.1.3 Launch of design tender bids																								
		2.1.4 Design development / process																								
		2.1.5 Launch of construction tender bids																								
		2.1.6 Construction / Project implementation																								
		2.1.7 Maintenance / Surrender																								
	2.2 New upstream retention ponds constructed	2.2.1 Preliminary studies / Design development / Scope of work (Utilities mapping & Feasibility)																								
		2.2.2 Stakeholders engagement																								
		2.2.3 Launch of construction tender bids																								
		2.2.4 Construction / Project implementation																								
		2.2.5 Maintenance / Surrender																								
	2.3 Swales and infiltration wells restored and constructed	2.3.1 Preliminary studies / Design Development / Scope of work (Utilities mapping & Feasibility)																								
		2.3.2 Stakeholders engagement																								
		2.3.3 Launch of construction tender bids																								
		2.3.4 Construction / Project implementation																								
		2.3.5 Maintenance / Surrender																								
Component 3. Comprehensive vulnerability / baseline assessment and action plans in targeted communities		3.1 Capacity development support for vulnerability assessment and climate change-related planning provided to the two mukims																								
		3.2 Plan and develop communications / social engagement strategy																								
		3.3 Conduct 20 public engagements and 10 training workshops																								
		3.4 Prepare final comprehensive report																								
Component 4. Strengthening social resilience Programme	School-level awareness programme developed and implemented	4.1.1 Create an awareness and communication campaign to promote the advocacy of women empowerment and awareness of gender-specific risks																								
	Women and girls programme developed and implemented	4.2.1 Develop education programmes with women NGOs and local climate leaders at both institutional and community level, on the gender-specific climate threats and disaster preparedness																								
		4.2.2 Promote co-production of training modules, tools, and adaptation resources on various topics from extreme heat to urban agriculture for community women NGOs, climate experts and women leaders																								
		4.2.3 Create a Flexible Peer Support Network on mobile application which will have multiple modalities capable of responding to different environmental threats																								
		4.2.4 Provide support, access to information, and training for women leadership in the skills that they need to influence climate discussions and activism, including training on how to train other women in the community																								
		4.2.5 Adopt the 40:40:20 ratio, whereby a benchmark allocation of 40% women representation in the committee of the Penang Climate Board is implemented																								
		4.2.6 Create a climate and environmental women activitist forum to discuss gender-specific risks, policies, and actions, and to further raise awareness on the issue																								

Component	Sub-component	Activity	2021				2022				2023				2024				2025				2026			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Component 5. Institutional capacity and knowledge transfer platform	5.1. Communications and knowledge platform developed and implemented	5.1.1 Conduct school visits to selected natural environments																								
		5.1.2 Climate awareness exhibition																								
		5.1.3 Facilitate lectures on climate change at seven participating schools, conducted by partner organisations once every four months																								
		5.1.4Conduct Nature through Art and story-telling competitions culminating in an exhibition at the Youth for Nature Forum for the winners																								
		5.1.5 Conduct a Makers' Workshop once every four months for youths to address urban challenges and energy transitions																								
		5.1.6Conduct a Sustainable School Programme for five participating schools over a duration of 2 - 6 weeks																								
		5.1.7 Initiate 6-month internships for young people aged between 18 - 22 in monitoring the rivers, sponsored by MBPP and JPS																								
		5.1.8 Provide 2 one-day training sessions for 15 youths to monitor, sample, and test air, soil, and water for environmental pollution at two survey sites in Sungai Ara/ Sungai Keluang river basin																								
		5.1.9. Initiate Youth for Nature Forum as a youth-oriented platform for nature advocacy building																								
		5.1.10 Establish the Penang chapter of the Malaysian Youth Delegation																								
		5.1.11 Create database of the programme's scientific and technical framework																								
		5.1.12 Monitor and collate results in a database																								
		5.1.13 Create a website for collecting all programme information and disseminate it upon registration to cities' authorities																								
	5.2 Penang Climate Board created	5.2..1 Representative selection																								
		5.2.2 Develop operational framework																								
		5.2..3 Develop standard proceedings and policy integration																								
		5.2..4 Establish Penang Climate Board																								
	5.3 Climate related-public health programme developed and initiated	5.3.1 Undertake study of hospital admissions and deaths during heat waves over the past 5 years in at least 3 hospitals and continue an annual assessment																								
		5.3.2 Identify trends in selected climate-sensitive communicable diseases particularly those linked to flooding																								
		5.3.3 Set up a set of workshops with health professionals and hospital administators on heat impact on hospital admissions																								
		5.3.4 Provide professional development for Penang-based medical doctors on climate and health, focussing on heat, flooding, and managing at-risk patients																								
		5.3.5 Raise community awareness campaigns and calls to action to support the public health interventions																								
		5.3.6 Set up a Technical Advisory Group made up of epidemiologists, health department and urban heat researchers																								
		5.3.7 Develop a Heat-Health Plan for Penang and communicate to stakeholders																								

Annex 9. Think City's Grants Programme Policies and Procedures

Think City was established in 2009 by Khazanah Nasional Berhad, the Malaysian federal government's strategic investment arm, to spearhead urban regeneration in George Town, Penang upon its inception as a UNESCO World Heritage Site. Its initial operations revolved around grant management and the provision of technical support. Under the George Town Grants Programme, Think City has disbursed 240 grants worth USD 4,024,626 in special projects related to improving the public realm, conservation, capacity building and content development. In 2014 the grants programme was expanded to other Malaysian cities. To date, Think City has disbursed a total of 324 grants worth USD 4,928,032 in the following cities/states:

City / State	Total Grant	Amount (USD)
Kuala Lumpur	46	599,615
Penang	263	4,237,329
Johor Bahru	15	91,088
TOTAL	324	4,928,032

With over 10 years of experience in conducting grant programmes, Think City has an established set of policies and procedures which guides each grant process through processing of applications, monitoring and disbursement, and closure. Additionally, each grant programme is guided by a programme manual that outlines the objectives and outcomes, strategic areas of intervention, and types of grant according to scale of implementation. The diagram below outlines the grants programme process, disbursements, and monitoring mechanisms.

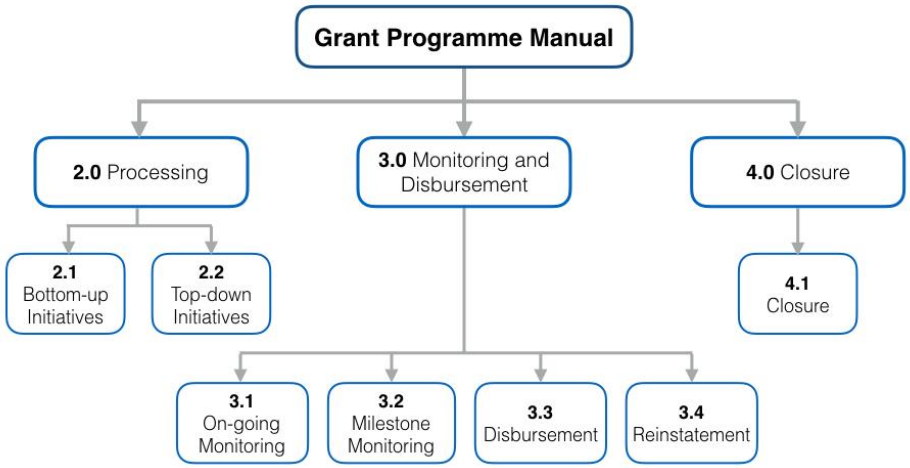


Diagram 1: Overview of process *(adapted from Think City's George Town Grants Programme Manual)*

2.0 Processing of Grants

Policies *(extracted from Think City's George Town Grants Programme Manual)*

- **Project selection** shall be on a competitive basis and could be made to:
  i. Organisations or individuals who are direct and indirect stakeholders in the George Town World Heritage Site (GTWHS);
  ii. There should not be any preference shown based on gender, ethnicity, class or political affiliation.
  iii. All physical projects must be located in the core and buffer zones of GTWHS
- **Assessment criteria** shall include, but not be limited to the following factors:
  i. Catalyst – Be a catalyst of positive change;
  ii. Partnership – Build partnerships between communities, spark synergies and forge collaborations;
  iii. Developmental – Promote developmental strategies that leads to sustainable futures;
  iv. Inclusive – Encourage inclusive cooperation in a multi-ethnic context;
  v. Sustainable – Build sustainable communities;
  vi. Creativity and Innovation – Encourage creativity and innovation
- **Priorities** for grant application are as follows:
  i. Significance in promoting the Outstanding Universal Values;
  ii. Need for conservation
  iii. Sustainable impacts to communities
  iv. Knowledge and skills development
- **Management** which includes the following personnel:
  i. Executive Director;
  ii. Programme Director;
  iii. Programme Manager;
  iv. Programme Executive:
  v. Executive Assistant
- **Technical Advisory Panel** which comprises experts in various fields (Conservation and Restoration, Planning and Architecture, Economics, History, Urban Studies, and Social Studies).

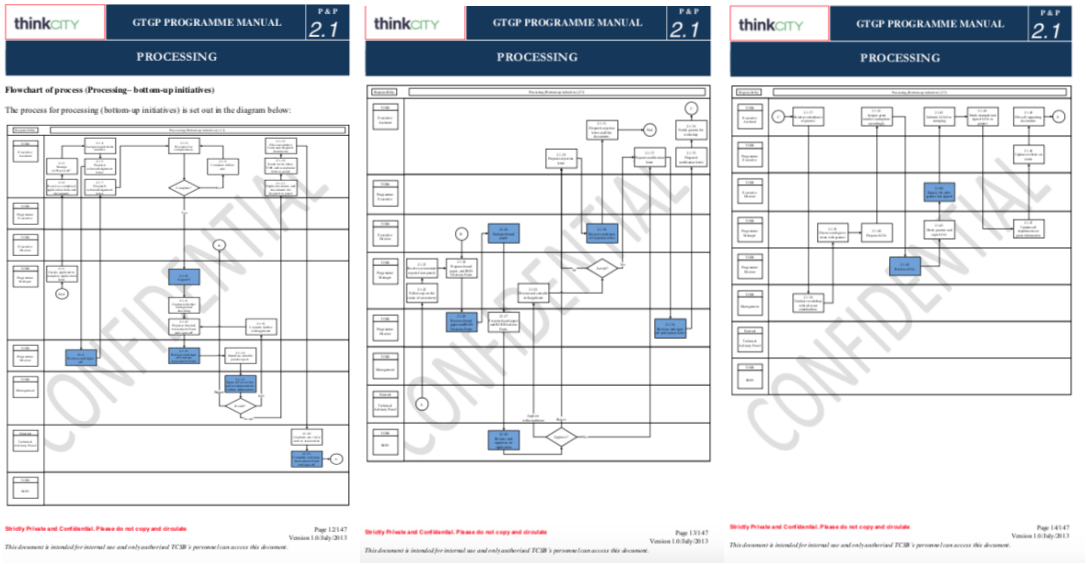


Diagram 2: Flowchart of Processing *(extracted from Think City's George Town Grants Programme Manual)*

3.0 Monitoring and Disbursement

Scope *(extracted from Think City's George Town Grants Programme Manual)*

The process covers:

- On-going monitoring (project monitoring log);
- Milestones monitoring (milestone report);
- Disbursement;
- Reinstatement of terminated projects

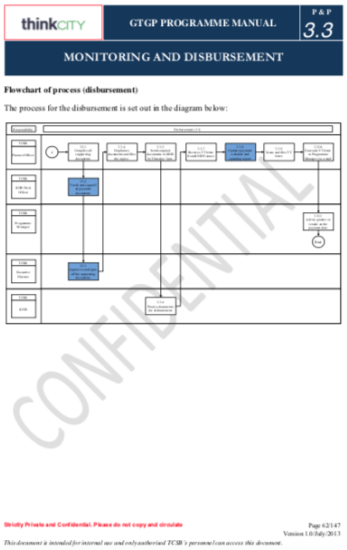


Diagram 3: Flowchart of Disbursement *(extracted from Think City's George Town Grants Programme Manual)*

4.0 Closure

Policies *(extracted from Think City's George Town Grants Programme Manual)*
The effectiveness of the grants programme should be measured by Management annually based on the following key performance indicators:

- **Economic measures** – how the grants stimulate economic activity in the area;
- **Social Capital** - how programmes help build capacity for interpretation of heritage products that will improve the site's value as a heritage tourism destination;
- **Public Good** - programmes that build bridges between different ethnic and religious communities;
- **Improvement in administration and management –** programmes that help stimulate better governance of the site and encourage public-private cooperation;
- **Privately driven conservation –** programmes that encourage private owners to open their properties to public participation;
- **Sustainability agenda** – projects that provide new ways of thinking about the site and have a sustainable model.

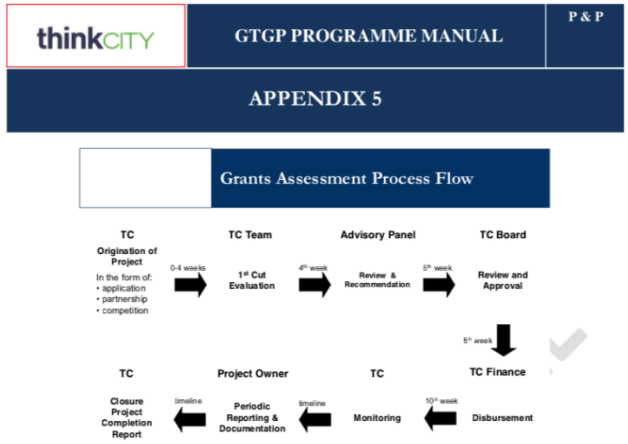
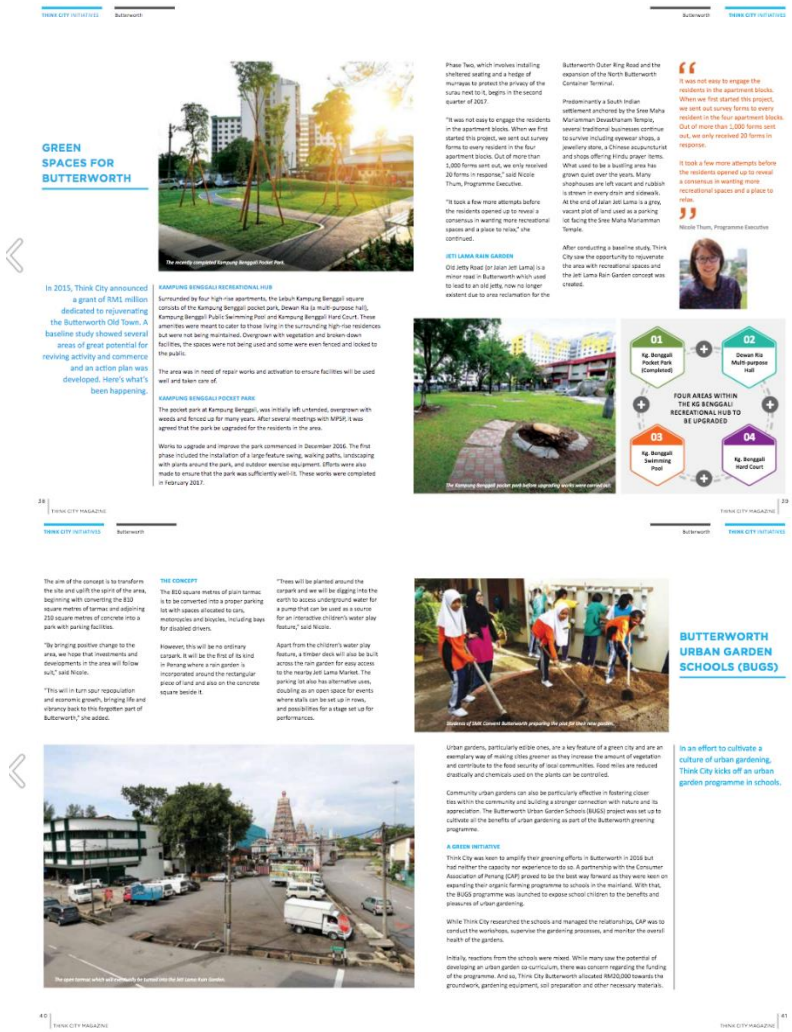


Diagram 4: Grant Assessment Process Flow *(extracted from Think City's George Town Grants Programme Manual)*

Annex 10. Think City's Capacity in Community Engagement

As a grants manager and multi-stakeholder facilitator of urban regeneration, Think City adopts a bottom-up approach to democratise the process of ideation and widen community participation. The following excerpts document the process of public engagement carried out across various projects.



GREEN SPACES FOR BUTTERWORTH

In 2015, Think City announced a grant of RM1 million dedicated to rejuvenating the Butterworth Old Town. A baseline study showed several areas of great potential for reviving activity and commerce and an action plan was developed. Here's what's been happening.

The recently completed Kampung Benggali Pocket Park.

KAMPUNG BENGGALI RECREATIONAL HUB

Surrounded by four high-rise apartments, the Lebuh Kampung Benggali square consists of the Kampung Benggali pocket park, Dewan Ria (a multi-purpose hall), Kampung Benggali Public Swimming Pool and Kampung Benggali Hard Court. These amenities were meant to cater to those living in the surrounding high-rise residences but were not being maintained. Overgrown with vegetation and broken-down facilities, the spaces were not being used and some were even fenced and locked to the public.

The area was in need of repair works and activation to ensure facilities will be used well and taken care of.

KAMPUNG BENGGALI POCKET PARK

The pocket park at Kampung Benggali, was initially left untended, overgrown with weeds and fenced up for many years. After several meetings with MPSP, it was agreed that the park be upgraded for the residents in the area.

Works to upgrade and improve the park commenced in December 2016. The first phase included the installation of a large feature swing, walking paths, landscaping with plants around the park, and outdoor exercise equipment. Efforts were also made to ensure that the park was sufficiently well-lit. These works were completed in February 2017.

Phase Two, which involves installing sheltered seating and a hedge of murrayas to protect the privacy of the surau next to it, begins in the second quarter of 2017.

"It was not easy to engage the residents in the apartment blocks. When we first started this project, we sent out survey forms to every resident in the four apartment blocks. Out of more than 1,000 forms sent out, we only received 20 forms in response," said Nicole Thum, Programme Executive.

"It took a few more attempts before the residents opened up to reveal a consensus in wanting more recreational spaces and a place to relax," she continued.

JETI LAMA RAIN GARDEN

Old Jetty Road (or Jalan Jeti Lama) is a minor road in Butterworth which used to lead to an old jetty, now no longer existent due to area reclamation for the Butterworth Outer Ring Road and the expansion of the North Butterworth Container Terminal.

Predominantly a South Indian settlement anchored by the Sree Maha Mariamman Devasthanam Temple, several traditional businesses continue to survive including eyewear shops, a jewellery store, a Chinese acupuncturist and shops offering Hindu prayer items. What used to be a bustling area has grown quiet over the years. Many shophouses are left vacant and rubbish is strewn in every drain and sidewalk. At the end of Jalan Jeti Lama is a grey, vacant plot of land used as a parking lot facing the Sree Maha Mariamman Temple.

After conducting a baseline study, Think City saw the opportunity to rejuvenate the area with recreational spaces and the Jeti Lama Rain Garden concept was created.

"It was not easy to engage the residents in the apartment blocks. When we first started this project, we sent out survey forms to every resident in the four apartment blocks. Out of more than 1,000 forms sent out, we only received 20 forms in response.

It took a few more attempts before the residents opened up to reveal a consensus in wanting more recreational spaces and a place to relax."

Nicole Thum, Programme Executive

The Kampung Benggali pocket park before upgrading works were carried out.

FOUR AREAS WITHIN THE KG BENGGALI RECREATIONAL HUB TO BE UPGRADED

01 Kg. Benggali Pocket Park (Completed)
02 Dewan Ria Multi-purpose Hall
03 Kg. Benggali Swimming Pool
04 Kg. Benggali Hard Court

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The aim of the concept is to transform the site and uplift the spirit of the area, beginning with converting the 810 square metres of tarmac and adjoining 250 square metres of concrete into a park with parking facilities.

"By bringing positive change to the area, we hope that investments and developments in the area will follow suit," said Nicole.

"This will in turn spur repopulation and economic growth, bringing life and vibrancy back to this forgotten part of Butterworth," she added.

THE CONCEPT

The 810 square metres of plain tarmac is to be converted into a proper parking lot with spaces allocated to cars, motorcycles and bicycles, including bays for disabled drivers.

However, this will be no ordinary carpark. It will be the first of its kind in Penang where a rain garden is incorporated around the rectangular piece of land and also on the concrete square beside it.

"Trees will be planted around the carpark and we will be digging into the earth to access underground water for a pump that can be used as a source for an interactive children's water play feature," said Nicole.

Apart from the children's water play feature, a timber deck will also be built across the rain garden for easy access to the nearby Jeti Lama Market. The parking lot also has alternative uses, doubling as an open space for events where stalls can be set up in rows, and possibilities for a stage set up for performances.

Students of SMK Convent Butterworth preparing the soil for their new garden.

BUTTERWORTH URBAN GARDEN SCHOOLS (BUGS)

The open tarmac which will soon be turned into the Jeti Lama Rain Garden.

Urban gardens, particularly edible ones, are a key feature of a green city and are an exemplary way of making cities greener as they increase the amount of vegetation and contribute to the food security of local communities. Food miles are reduced drastically and chemicals used on the plants can be controlled.

Community urban gardens can also be particularly effective in fostering closer ties within the community and building a stronger connection with nature and its appreciation. The Butterworth Urban Garden Schools (BUGS) project was set up to cultivate all the benefits of urban gardening as part of the Butterworth greening programme.

A GREEN INITIATIVE

Think City was keen to amplify their greening efforts in Butterworth in 2016 but had neither the capacity nor experience to do so. A partnership with the Consumer Association of Penang (CAP) proved to be the best way forward as they were keen on expanding their organic farming programme to schools in the mainland. With that, the BUGS programme was launched to expose school children to the benefits and pleasures of urban gardening.

While Think City researched the schools and managed the relationships, CAP was to conduct the workshops, supervise the gardening processes, and monitor the overall health of the gardens.

Initially, reactions from the schools were mixed. While many saw the potential of developing an urban garden as curriculum, there was concern regarding the funding of the programme. And so, Think City Butterworth allocated RM20,000 towards the groundwork, gardening equipment, soil preparation and other necessary materials.

in an effort to cultivate a culture of urban gardening, Think City kicks off an urban garden programme in schools.

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Urban gardens were set up in Sekolah Menengah Kebangsaan (SMK) Convent Butterworth, SMK St. Mark, SMK Taman Indrawasih and SMK Mak Mandin. Workshops by CAP took place during co-curricular hours, training the students in the different techniques of preparing soil, planting and how to handle gardening tools. For many students, it had been their first time holding a tool!

SCHOOLS THAT HAVE ADOPTED BUGS

01 SMK Convent Butterworth
02 SMK St. Mark
03 SMK Taman Indrawasih
04 SMK Mak Mandin

Seeds and materials for planting were supplied by CAP, while students were introduced to over 20 types of vegetables and herbs such as cat's whiskers, basil, king of bitters, eggplant, turmeric and many more.

The size of the gardens varied according to the amount of space provided by the school. For instance, SMK Convent Butterworth had little land available, thus a small section of a wall was devoted for vertical gardening to complement the natural garden bed.

HARVESTS AND BUYERS

Both students and teachers were excited upon seeing the results of their labour, particularly during the harvest period, as they hadn't anticipated that there would be ready buyers for their produce! Teaching staff and canteen operators were happy to buy the vegetables and herbs from the students.

"The reactions from students, teachers and even parents were most pleasing. When we first started this programme, we noticed there was a clear disconnect between people and their natural environment. By being outdoors and learning how to plant produce that the students themselves would eventually eat, we hoped that students would be more conscious of the relationships and cycles between human beings and nature," said Daniel Lee, Programme Executive and project owner of BUGS.

Students also learnt the dangers of using chemical pesticides and fertilisers, and how these substances are detrimental to both human well being and the planet's health. They were made aware of food security issues and how this can be addressed by growing produce.

WHAT'S NEXT

"We hope that the programme will continue to run sustainably in all participating schools, and that the garden will become embedded in the DNA of the school and keep running long after Think City Butterworth's work is done. We also hope that more schools will adopt similar programmes which we hope are inspired by our ideas."

Students of SMK Convent Butterworth preparing the plot for their new garden.

> "We hope that the programme will continue to run in all participating schools, and that more schools will adopt similar programmes."
>
> Daniel Lee,
> Programme Executive

Participants mapping their neighbourhood by collecting data through interviews and observations. Photo credit: Goh Choon Lian.

MYBUTTERWORTH MAPPING PROJECT

MyButterworth is a community asset mapping project involving students, cameras and the old town of Bagan. This place-based project was a collaborative effort between Think City and Arts-ED Penang, a non-profit organisation running community-based educational programmes on the theme of arts, culture and heritage.

Supported by the Think City Grants Programme, groundwork for the project began in February 2016 culminating in a final presentation and exhibition of the students' exploration with the camera in June.

The aim of the project was to encourage students to explore the cultural assets surrounding their schools such as historical buildings, landmarks or businesses typically found in their vicinity.

Two schools in the Bagan area – Maktab Wan Jah and Sekolah Jenis Kebangsaan Cina Chung Hwa Pusat – were identified and after the initial briefings, 31 students spanning primary and secondary school were selected to participate.

Lee Que Lin, Programmer and Facilitator at Arts-ED, who managed the MyButterworth Mapping Project said, "Even though the schools were in Bagan, we found that a lot of the students were not familiar with the area. We saw a need to create a platform for them to go on-site and learn about the place – to explore cultural assets in the area, and to interact with the local community."

Students explore the old town of Bagan with their cameras resulting in a heartwarming photo exhibition and new appreciation for the cultural assets and heritage of their neighbourhoods.

"Through this place-based learning project, the students were given an opportunity to be on the ground, using their five senses to explore and engage with people," she added.

CREATIVE LEARNING METHODS

Fun learning methods were deployed to engage the students including a treasure hunt to familiarise themselves with the neighbourhood. The next step was to map the buildings and shophouses in the area, noting who the occupants were and their vocations. When this was complete, the students were then able to fully survey the cultural assets in the area and select the subject matter for their photo essays.

Skills-building was a big part of the project and the students were taught the foundations of photography – working the camera, learning the terminology and framing shots, among other aspects. They were also taught interviewing skills with role-play exercises before they embarked on the data collection phase where they actively visited the cultural assets of their choice for interviews, photos and information.

From the work accumulated, the students then began creating their photo essays in groups, which resulted in the exhibition at the end of the six months.

NEW PERSPECTIVES

"MyButterworth was an opportunity to understand and explore the tangible and intangible cultural heritage that surrounds the students. It was our hope that they would learn to appreciate the importance of preserving culture at a young age so that they can bring this attitude with them and advocate it throughout life," said Nicole Thum, Programme Executive.

"The students enjoyed the process very much as they were able to express their creativity through photography and learn about their town, discovering places they had never seen before and even trying some different food for the first time," she said.

Nicole added that the reaction from the students was initially a surprise. The project puzzled them at first but after they learnt about the history and significance of each site, their enthusiasm kicked in.

"We were quite sceptical with the idea of students getting excited about the programme. We expected them to say, 'It's heritage – it's going to be very boring.' So the level of enthusiasm and commitment shown to the project was very surprising and inspiring," said Nicole.

Students showcasing their photos during the exhibition.

Facilitators guiding the students in photo selection and editing skills. Photo credit: Arts-Ed

> On the whole, though it is billed as a cultural mapping exercise, the intangible rewards of this project are not just the sense of pride and appreciation for the cultural assets, but also the new bonds created among the community's kids, the vendors, the teachers and the parents.
>
> Nicole Thum,
> Programme Executive

"The students developed an appreciation and deeper understanding of the history of the place after interviewing some of the old traders in the area, such as the Loh Mee stall, the dry goods supplier at the godowns on Jalan Jeti Lama, and also a mini market on Jalan Pasar.

"They were excited to be out and about, and there were 'aahs' and 'aahs' whenever they found out the vendors they interviewed had been running their businesses even before they were born," Nicole added.

"They learnt that there are things out there beyond the classroom – local history that is not taught to them in school or by their parents."

Many of the students also came away with knowledge of how different businesses were conducted, from running a hardware store, to making bamboo blinds or operating a food stall.

COMMUNITY TIES

Meanwhile, the business owners felt a sense of pride in sharing the history of their businesses and were more than willing to share their knowledge with the students. Some students, having forged new friendships, even went back with their parents to patronise the local stores and coffee shops that they had interviewed.

Feedback from the teachers, parents and students was also encouraging, with the schools requesting for the programme to be run annually, and to even be officially included as an extra-curricular programme.

"On the whole, though it is billed as a cultural mapping exercise, the intangible rewards of this project are not just the sense of pride and appreciation for the cultural assets, but also the new bonds created among the community's kids, the vendors, the teachers and the parents," added Nicole.

"It is relationships like these that ultimately give a city soul and make it liveable."

PARKS FOR THE PEOPLE
BUILDING COMMUNITY TIES

Parks play a vital role in the city, providing respite and recreational space for busy city dwellers. Think City identified three neglected parks and engaged three architecture firms to design the revival of these parks. The parks were subsequently reinstated for development. ADELA ASKANDAR of Studio Bikin, tells us about discovering inner city communities and bringing them closer to nature.

PILOT PROJECTS
GARDENS FOR COMMUNITY BONDING AND THE SAFE CITIES PROGRAMME

Looking to resolve specific problems in Malaysian cities, Urban Solutions runs pilot projects so that the feasibility of a programme can be evaluated and improved. Two recent projects look at improving living conditions in low cost housing, and making our cities safer, both through low cost interventions involving the community.

<u>The Safe Cities Programme</u>

The Safe Cities programme was initiated in 2017 to make downtown Kuala Lumpur more liveable, where people can go about their daily activities without fear and risk of harm/injury. The programme was guided by the following three main indicators:

1. Diversity and inclusion – A greater variety of people representing different groups in society comfortably occupy the area

2. Economic vibrancy – Greater variety of businesses attract activity at all hours
3. Night time population – Increased residents and visitors in the area at night

Some of the approaches to the programme included engagement with vulnerable groups (homeless, women, and youth at risk), situational-based improvements on the streets, and institutional interventions.




KMC Flats Precinct – Urban Renewal Framework

In 2019, the city council of South Kuching (MBKS) on behalf of the Ministry of Local Government and Housing Sarawak commissioned Think City in partnership with Arkitek JFN Sdn. Bhd. to develop an overarching urban renewal framework. This stemmed out of the need for a comprehensive and balanced approach to the rejuvenation of the precinct.

The framework seeks to demonstrate an urban renewal process of historic and low-cost housing that is both sensitive to local values and unlocks economic potential. It will also form the basis for wider discussions with various stakeholders and policy makers.

Penang Climate Action Week 2019

In 2019, Think City hosted the first Climate Action Week in Malaysia. Together with several local partners, the inaugural Penang Climate Action Week was held between 16 – 24 November with the aims of creating public awareness on climate change as well as promoting sustainable production and consumption. The programme also served as a platform to support ground-up climate actions and elevate discussions on the climate agenda.

Arresting the climate crisis

Forum provides chance to share issues on saving Mother Earth

Penang Nature-Based Climate Adaptation Programme Exhibition

In October 2020, Think City organised a month-long exhibition on the Penang Nature-Based Climate Adaptation programme to engage with potential partners, stakeholders and the general public. The main aim of the curated exhibition was to raise awareness on the climate change impacts in Penang and the use of nature-based solutions as an adaptation strategy. During the exhibition, a total of 40 government agencies, non-governmental organisations, community leaders, institutions, and individuals were engaged and their feedback were documented to further guide the planning of the programme.






Annex 11. Part 2 Plan Summary Table

Project/Programme Components	Expected Concrete Outputs	ACTIVITIES	Indicator/Target	Responsible Party
Component 1. Adaptation to the urban heat island effect through urban greening	Output 1.1. New tree-line streets / Connected canopies constructed	1.1.1 Preliminary studies / Scope of work 1.1.2 Community engagement 1.1.3 Launch of design tender bids (for design consultants) 1.1.4 Design development / process 1.1.5 Launch of construction tender bids 1.1.6 Construction / Project implementation 1.1.7 Maintenance / Surrender (1-2 years)	At least 40% women of targeted population will participate in community engagement At least 40% of women's idea can be reflected for design development and process	UN-Habitat and executing entity, with support from target commune councils and MBPP, JPS and Think City
	Output 1.2. Pocket parks / vacant spaces constructed	1.2.1 Preliminary studies / Scope of work 1.2.2 Community engagement 1.2.3 Launch of design tender bids 1.2.4 Design development / process 1.2.5 Launch of construction tender bids 1.2.6 Construction / Project implementation 1.2.7 Maintenance / Surrender		
	Output 1.3. Green parking spaces constructed	1.3.1 Launch and initiation of the grants programme 1.3.2 Review and processing of applications 1.3.3 Awarding of grants 1.3.4 Monitoring of project implementation	At least 50% of women would participate in grants programme, application review, and monitoring process Trainings of 26 community group, at least 50% of women	
	Output 1.4. Green facades constructed (Built structures greening)	1.4.1 Launch and initiation of the grants programme 1.4.2 Review and processing of applications 1.4.3 Awarding of grants 1.4.4 Monitoring of project implementation		

	Output 1.5. Green rooftops constructed (Built structures greening)	1.5.1 Launch and initiation of the grants programme 1.5.2 Review and processing of applications 1.5.3 Awarding of grants 1.5.4 Monitoring of project implementation	will be trained	
	Output 1.6. Urban agriculture programme initiated	1.6.1 Launch and initiation of the grants programme 1.6.2 Review and processing of applications 1.6.3 Awarding of grants 1.6.4 Training and workshops 1.6.5 Monitoring of project implementation		
Component 2. Built projects for storm water and flood	Output 2.1 Blue-green corridors developed	2.1.1 Preliminary studies / Scope of work (Utilities mapping & Feasibility) 2.1.2 Stakeholders engagement 2.1.3 Launch of design tender bids 2.1.4 Design development / process 2.1.5 Launch of construction tender bids 2.1.6 Construction / Project implementation 2.1.7 Maintenance / Surrender	At least 40% of women would participate for stakeholders' engagement. At least 40% of women's idea can be reflected for design development and process.	UN-Habitat and executing entity, with support from target commune councils and MBPP, JPS and Think City
	Output 2.2. New upstream retention ponds constructed	2.2.1 Preliminary studies / Design development / Scope of work (Utilities mapping & Feasibility) 2.2.2 Stakeholders engagement 2.2.3 Launch of construction tender bids 2.2.4 Construction / Project implementation 2.2.5 Maintenance / Surrender		
	Output 2.3. Swales and infiltration wells restored and constructed	2.3.1 Preliminary studies / Design Development / Scope of work (Utilities mapping & Feasibility) 2.3.2 Stakeholders engagement 2.3.3 Launch of construction tender bids 2.3.4 Construction / Project implementation 2.3.5 Maintenance / Surrender		

Component 3. Comprehensive vulnerability / baseline assessment and action plans in targeted communities	Output 3.1. Capacity development support for vulnerability assessment and climate change-related planning provided to the two mukims.	3.1 Plan, conduct, and provide reports for the comprehensive social/ community vulnerability assessment associated with climate change impacts in George Town and Bayan Lepas mukim 3.2 Plan and develop communications / social engagement strategy 3.3 Conduct 20 public engagements and 10 training workshops 3.4 Prepare final comprehensive report	At least 50% of women will participate in communication / social engagement strategy development. 20 public engagement in total, 50% of the eventual total are female 10 training workshops in total, 50% female participation	UN-Habitat and executing entity, with support from target commune councils
Component 4. Strengthening social resilience	Output 4.1. School-level awareness programme developed and implemented	4.1.1 Create an awareness and communication campaign to promote the advocacy of women empowerment and awareness of gender-specific risks	At least 50% youth and women would participate the campaign	UN-Habitat and executing entity, with support from target commune

	Output 4.2. Women and girls programme developed and implemented	4.2.1 Develop education programmes with women NGOs and local climate leaders at both institutional and community level, on the gender-specific climate threats and disaster preparedness 4.2.2 Promote co-production of training modules, tools, and adaptation resources on various topics from extreme heat to urban agriculture for community women NGOs, climate experts and women leaders 4.2.3 Create a Flexible Peer Support Network on mobile application which will have multiple modalities capable of responding to different environmental threats 4.2.4 Provide support, access to information, and training for women leadership in the skills that they need to influence climate discussions and activism, including training on how to train other women in the community 4.2.5 Adopt the 40:40:20 ratio, whereby a benchmark allocation of 40% women representation in the committee of the Penang Climate Board is implemented 4.2.6 Create a climate and environmental women activitist forum to discuss gender-specific risks, policies, and actions, and to further raise awareness on the issue	(5,000 youth and women student) At least 25% of B40 women and girls of George Town and Bayan Lepas, equivalent to approximately 16,000 women and girls, are aware of climate-related risks and given tools to deal with gender-specific challenges. Approximately 6,479 single mothers benefit from the peer support network and disaster-preparedness programmes. Adoption of a 40:40:20 ratio, whereby a benchmark allocation of 40% women representation in the committee of the Penang Climate Board is implemented	councils and MBPP, JPS, Think City, and Local NGOs

Component 5. Institutional capacity and knowledge transfer platform	Output 5.1. Communications and knowledge platform developed and implemented	5.1.1 Conduct school visits to selected natural environments 5.1.2 Climate awareness exhibition 5.1.3 Facilitate lectures on climate change at seven participating schools, conducted by partner organisations once every four months 5.1.4Conduct Nature through Art and story-telling competitions culminating in an exhibition at the Youth for Nature Forum for the winners 5.1.5 Conduct a Makers' Workshop once every four months for youths to address urban challenges and energy transitions 5.1.6Conduct a Sustainable School Programme for five participating schools over a duration of 2 - 6 weeks 5.1.7 Initiate 6-month internships for young people aged between 18 - 22 in monitoring the rivers, sponsored by MBPP and JPS 5.1.8 Provide 2 one-day training sessions for 15 youths to monitor, sample, and test air, soil, and water for environmental pollution at two survey sites in Sungai Ara/ Sungai Keluang river basin 5.1.9. Initiate Youth for Nature Forum as a youth-oriented platform for nature advocacy building 5.1.10 Establish the Penang chapter of the Malaysian Youth Delegation 5.1.11 Create database of the programme's scientific and technical framework 5.1.12 Monitor and collate results in a database 5.1.13 Create a website for collecting all programme information and disseminate it upon registration to cities' authorities	50% of the eventual total are female (exhibition, lectures, workshop, and forum) 50% of girl would attend for school programme Half of internship will be placed for female At least 50% of women will have an opportunity to have interviews for internship 2x trainings completed with 50% female participation 50% of women will participate in the Penang chapter of the Malaysian Youth Delegation	Executing entities, UN-Habitat,Technical Advisory Team NAHRIM, USM, and REDAC
	Output 5.2. Penang Climate Board created	5.2.1 Representative selection 5.2.2 Develop operational framework 5.2.3 Develop standard proceedings and policy integration 5.2.4 Establish Penang Climate Board	50% of women will participate in the Penang Climate Board	

	Output 5.3. Climate related-public health programme developed and initiated	5.3.1 Undertake study of hospital admissions and deaths during heat waves over the past 5 years in at least 3 hospitals and continue an annual assessment 5.3.2 Identify trends in selected climate-sensitive communicable diseases particularly those linked to flooding 5.3.3 Set up a set of workshops with health professionals and hospital administators on heat impact on hospital admissions 5.3.4 Provide professional development for Penang-based medical doctors on climate and health, focussing on heat, flooding, and managing at-risk patients 5.3.5 Raise community awareness campaigns and calls to action to support the public health interventions 5.3.6 Set up a Technical Advisory Group made up of epidemiologists, health department and urban heat researchers 5.3.7 Develop a Heat-Health Plan for Penang and communicate to stakeholders	Trainings completed with 50% female participation At least 50% of women will participate in community awareness campaigns At least 50% of women will join a technical advisory group At least 40% of women support a plan development	