PNBCAP
Penang Nature-based Climate Adaptation Programme

COMMUNITY HEATWAVE PREPAREDNESS TRAINING TOOLKIT

Supported By

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UN-HABITAT

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About Community Preparedness Training Toolkit
The Community Preparedness Training Toolkits offer step-by-step guidance and practical instructions to support community leaders, facilitators, and local organisations in enhancing local climate resilience. These toolkits are designed to build knowledge, foster local action, and promote sustainable, nature-based solutions in vulnerable communities.

Cover Image Credit: Bernama

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MAJLIS BANDARAYA PULAU PINANG

JABATAN PENGAIRAN DAN SALIRAN
NEGERI PULAU PINANG

PNBCAP
Penang Nature-based Climate Adaptation Programme

Penang Nature-based Climate Adaptation Programme
(PNBCAP)

Community **Heatwave** Preparedness Training Toolkit

List of Abbreviations

°C	Degree Celsius
CEMACS	Centre of Marine and Coastal Studies – USM
COPD	Chronic obstructive pulmonary disease
DID	Department of Irrigation and Drainage
DMU	Disaster Management Unit
FIZ	Free Industrial Zone
LED	Light-Emitting Diode
MBPP	Penang Island City Council
MOH	Ministry of Health Malaysia
MPKK	Village Community Management Council
NbS	Nature-based Solutions
PWD	Persons with Disabilities
PNBCAP	Penang Nature-based Climate Adaptation Programme
SPF	Sun protection factor
UHI	Urban Heat Island
UN-Habitat	United Nations Human Settlements Programme
UV	Ultraviolet

Table of Contents

How to use this Toolkit

The PNBCAP Community Preparedness Toolkit is designed for all members of the community and partner institutions involved in building resilience to climate impacts such as floods and heatwaves. It provides step-by-step guidance, practical exercises, and communication materials to support action and decision-making at multiple levels.

Community Members

(*Residents, youth, community groups, local associations*)

You can use this toolkit to:

- Understand the climate risks that affect your neighbourhood and daily life.
- Learn practical steps to prepare your household and community for floods and heatwaves.
- Participate in community-based preparedness training and early warning systems.
- Share feedback and ideas to strengthen local adaptation actions.
- Encourage neighbours, schools, and local businesses to take part in collective resilience activities.

Local Authorities and Community Leaders

(*Local Authorities, MPKKs, NGOs, and civil society groups*)

You can use this toolkit to:

- Plan, coordinate, and deliver community training sessions on flood or heatwave preparedness.
- Identify vulnerable groups and design targeted interventions (e.g., safe shelters, cooling spaces).
- Integrate local knowledge and community input into climate adaptation planning.
- Monitor and record preparedness activities and share outcomes with PNBCAP partners.

First Responders and Emergency Support Agencies

(*St. John Ambulans Malaysia, Red Crescent, APM, Bomba, Unit Pengurusan Bencana*)

These agencies can use the toolkit to:

- Support evacuation drills and community simulation exercises.
- Strengthen coordination between community volunteers and formal emergency responders.
- Promote public awareness on heat exhaustion, heat stroke, and flood-related health risks.
- Complement national disaster guidelines with community-friendly materials.

Technical Agencies and Partners

(*State Agencies*)

You can use this toolkit to:

- Strengthen technical collaboration between agencies and local communities.
- Align preparedness training with existing policies
- Identify pilot sites to demonstrate effective nature-based solutions (NbS) for urban resilience.
- Develop data and tools for scaling up community-based adaptation approaches.

Schools and Youth Groups

(*Students, teachers, youth clubs, and climate ambassadors*)

You can use this toolkit to:

- Learn about the science behind floods and heatwaves and their impact on communities.
- Carry out school preparedness activities such as emergency drills and awareness campaigns.
- Integrate the toolkit content into climate education and sustainability clubs.

1

Introduction

Overview of PNBCAP

Overview of PNBCAP

The Penang Nature-based Climate Adaptation Programme (PNBCAP) is Malaysia's first comprehensive urban climate adaptation initiative. Funded by the Adaptation Fund and implemented under the guidance of the United Nations Human Settlements Programme (UN-Habitat), it leverages the expertise of the Penang Island City Council (MBPP), the Department of Irrigation and Drainage (DID), and Think City.

This heatwave preparedness module is designed to enhance awareness, preparedness, and resilience within communities to address extreme heat conditions. Rising temperatures, exacerbated by climate change, are expected to lead to more frequent and severe heatwaves. Vulnerable groups, such as the elderly, children, women, persons with disabilities, and outdoor workers, are among the most affected. The module equips communities with knowledge, skills, and strategies to reduce heatwave risks. It focuses on simple and practical solutions to protect health, minimise heat exposure, and strengthen community adaptation efforts.

Through practical methods, the module helps individuals and communities identify risks and build resilience, emphasising nature-based solutions. It also provides comprehensive guidance to ensure every segment of society can take effective action during prolonged hot weather.

This module covers five (5) main topics:

- **Topic 1** Introduction
- **Topic 2** Identifying Heatwaves
- **Topic 3** Heatwaves Impacts
- **Topic 4** Preparation for Heatwaves
- **Topic 5** Trainer Guide

2

Identifying Heatwaves

Heatwaves Definition

The Urban Heat Island Effect in Penang

Increase in Hotspot Distribution, Between 1993 and 2023

Heatwaves Definition

Heatwaves refer to a period of unusually hot weather, with temperatures exceeding the average daily temperature and persisting for several days or weeks. This phenomenon can significantly impact energy consumption, water resources, agriculture, and public health. In extreme cases, it can even lead to fatalities. According to the World Health Organization (WHO), a heatwave is a period of unusually hot days and nights that poses increased risks to human health, particularly for vulnerable populations.

Each country sets different temperature thresholds for classifying heatwaves based on long-term maximum daily temperature data and other climatological factors. In Malaysia, a heatwave is defined as a daily maximum temperature exceeding 37°C for three consecutive days. The daily maximum temperature typically occurs between 12:00 PM and 3:00 PM. The monitoring of maximum daily temperatures in Malaysia is categorised into four levels.

	Level 0	Normal and safe	<35°C
	Level 1	Alert	35°C–37°C
	Level 2	Heatwaves	>37°C–40°C
	Level 3	Extreme heatwaves	>40°C

Source: METMalaysia

For **Levels 2 and 3,** the public is advised to follow instructions issued by the relevant authorities and monitor weather updates provided by METMalaysia - www.met.gov.my

The hotter season in Malaysia typically occurs from **March to September,** with peak temperatures between **March and May**. This is primarily due to the El Niño phenomenon, which affects sea surface temperatures in the Pacific Ocean. El Niño causes a drastic rise in air temperature and can disrupt global climate patterns.

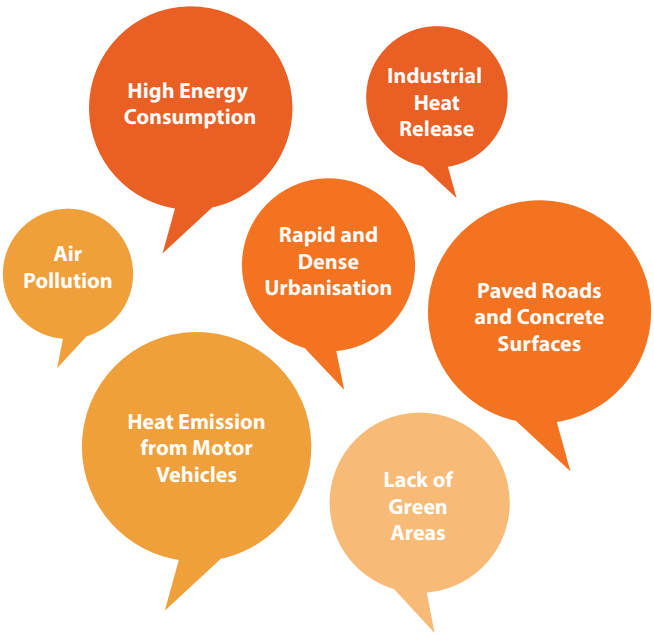
It is important for the public to stay informed about the latest weather updates and take precautionary measures, to reduce health risks and other negative impacts associated with heatwaves.

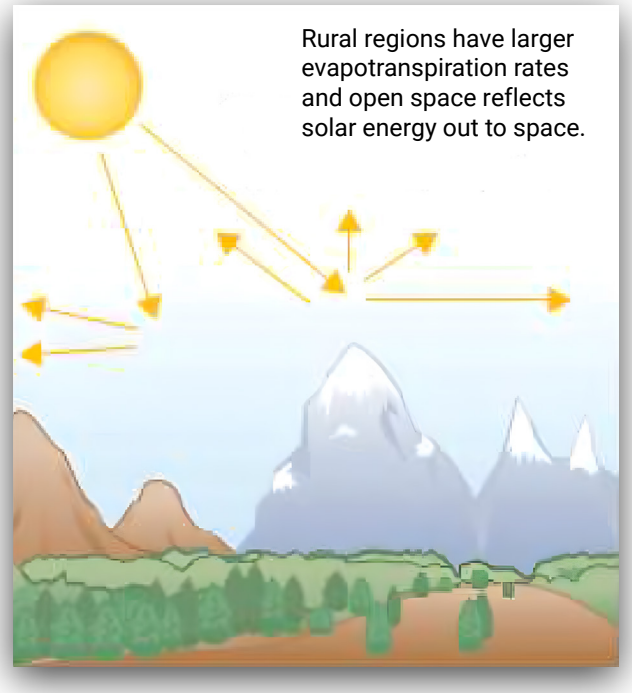
The Urban Heat Island Effect in Penang

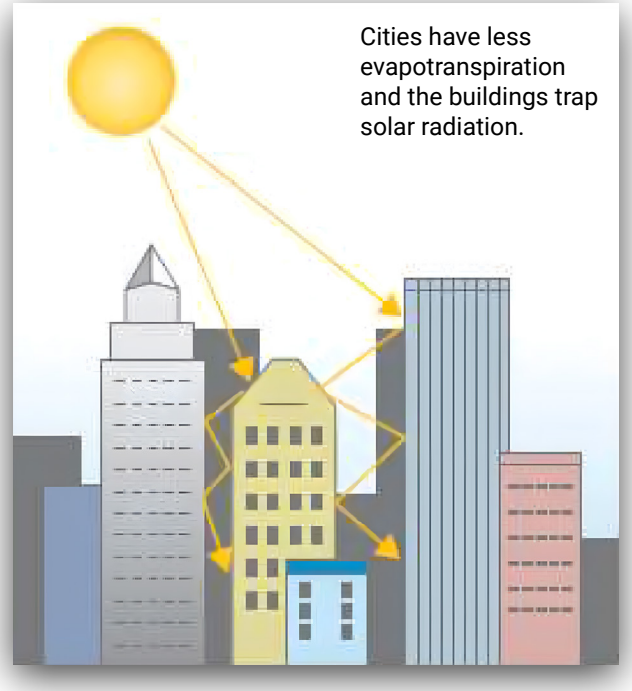
The Urban Heat Island (UHI) phenomenon refers to a situation where urban areas experience higher temperatures compared to surrounding rural areas. In Penang, this phenomenon has become more pronounced due to rapid urbanisation, increased use of paved surfaces, and a lack of green spaces.

As a state in northern Peninsular Malaysia, Penang is not exempt from this issue. The impacts of heatwaves in Penang are evident through significant temperature increases, which affects public health infrastructure and daily activities. For instance, in February 2024, two districts in Penang recorded heatwave conditions at the alert level, with temperatures ranging between 35°C to 37°C.

These factors contribute to the growing intensity of urban heat islands in Penang, especially in densely populated areas such as George Town and Bayan Lepas.



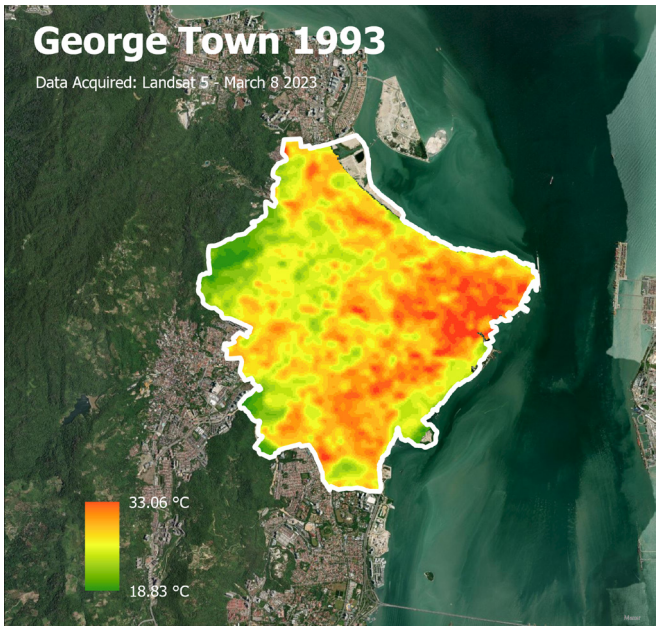


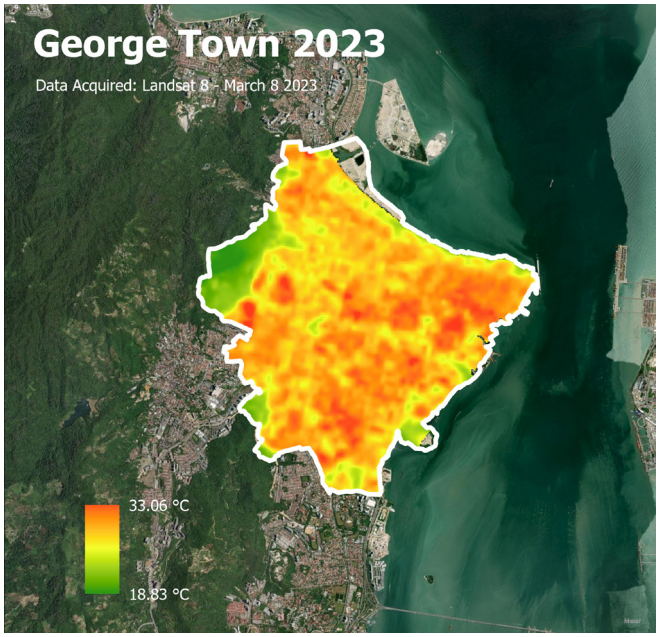


Source: Rani, Tanya. (2024).

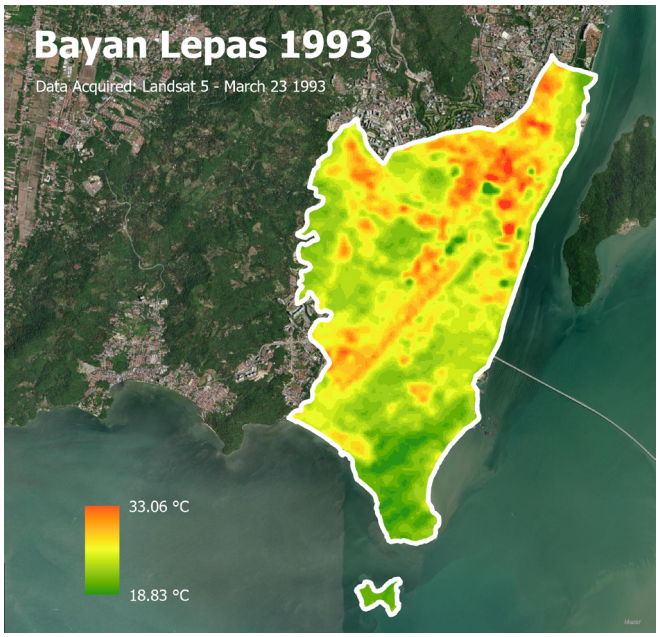
Increase in Hotspots Distributions Between 1993 and 2023

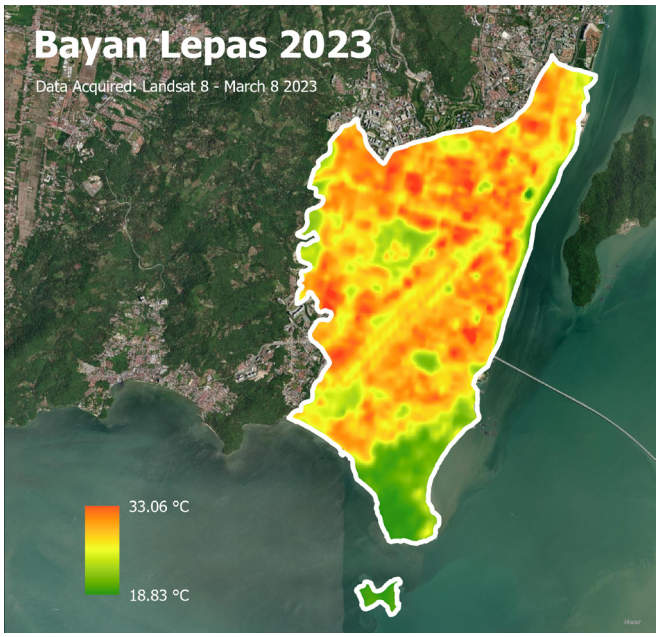
The comparison of temperatures in the two hottest areas of Penang for the years 1993 and 2023 shows a significant change in the distribution of hotspots.





Over the past three decades, there has been a significant increase in the overall temperature in George Town, which can be attributed to rapid urbanisation, the reduction of green spaces, and the urban heat island effect. These changes reflect the impacts of development and climate change on the urban environment.





In the case of Bayan Lepas area, this change aligns with the transformation of Bayan Lepas from an agricultural area to a major industrial and commercial hub in Penang. Since the establishment of the Free Industrial Zone (FIZ) in 1972, the area has rapidly developed with the presence of multinational corporations, the growth of residential areas such as Bayan Baru, and the establishment of commercial centres.

3

Heatwaves Impact

Heatwaves have both Direct and Indirect Impacts on Society

Vulnerable Groups at Risk of Heatwaves

Effect of Heatwaves on Physical Health

Heat-Related Illnesses

Effect of Heatwaves on Mental Health

Heatwaves have both Direct and Indirect Impacts on Society

Direct Impacts

Exposure to extreme heat can cause **direct health effects** such as dehydration, heat exhaustion, heat stroke, loss of consciousness, and death. Several studies have also shown that there is an **increase in complications of chronic diseases** such as heart disease and respiratory diseases during heatwaves.

In addition, extreme heatwaves can **affect infrastructure** such as road surfaces melting, making them inaccessible or unsafe to use. In May 2015, a heatwave in India caused asphalt roads in New Delhi to melt when temperatures reached up to 50°C.

> In April 2024, the Ministry of Health Malaysia (MOH) recorded 45 cases of heat-related illnesses including **33 heat exhaustion**, **11 heat stroke**, and **1 heat seizure** due to extreme heat.

Source: News Straits Times, www.nst.com.my (2024).

Indirect Impacts

In addition to directly affecting human health, heatwaves negatively impact **urban economies and the provision of essential services**. For example, they can reduce the number of safe working hours for outdoor workers, lower productivity in offices without adequate cooling systems, and disrupt other sectors such as tourism.

Furthermore, extreme temperatures impact **physical infrastructure**, including energy systems, water storage and distribution, water treatment, and transportation. Heatwaves typically increase demand for water and electricity, straining existing systems and potentially causing supply shortages. **Water scarcity** due to extreme heat affects domestic use, agriculture, and industry. Hot weather increases the risk of haze-related illnesses due to the dispersion of fine dust particles, as shown by increased air pollution index.

Additionally, environmental phenomena such as **algal blooms** can occur during periods of elevated temperatures. In August 2023, the waters off Teluk Bahang in Penang experienced a '***red tide***' **phenomenon** caused by the algae species *Noctiluca scintillans*. While this bloom was found to be non-toxic to humans, it reduced oxygen levels in the water, resulting in fish die-offs and raising concerns about marine ecosystem health (CEMACS, 2023).

> The prolonged heatwaves in March 2024 caused water reserves at the **Air Itam Dam** and **Teluk Bahang Dam** to drop to critical levels.

Vulnerable Groups at Risk of Heatwaves

Infants and children

- Physiological and behavioural characteristics that increase heatwave-related health risks:
  1. Higher body heat production during physical activity.
  2. Absorb heat from the environment more quickly when air temperature exceeds body temperature due to a higher surface area-to-body weight ratio compared to adults.
  3. Reduced ability to increase cardiac output effectively.
  4. Reduced sweating capacity.
- Dependence on caregivers to recognise heat-related health effects and take appropriate action.

Pregnant and breastfeeding women

- Physiological changes during pregnancy and breastfeeding increase the risk of elevated body temperature and dehydration.

Elderly people

- Physiological changes in the elderly that may contribute to increased health risks from Heatwaves:
  1. Reduced sense of thirst
  2. Lower fitness levels
  3. Reduced sweating
  4. Higher likelihood of chronic dehydration
- Age-related degenerative issues such as vision, cognitive, hearing, agility, and mobility problems
- Chronic illnesses
- Medications taken for health conditions
- Perception of risk and vulnerability shaped by life experiences
- Living alone

Outdoor workers

- Construction workers, farmers, agricultural workers, and other outdoor workers exposed to extreme heat for extended periods.

Individuals with chronic health Conditions

- Abnormal physiological characteristics that increase health risks including:
  1. Cardiovascular diseases, hypertension, respiratory diseases or diabetes
  2. Obesity
  3. Kidney failure
  4. Psychiatric disorders
- Use of certain medications such as diuretics, antihypertensives, antidepressants, antipsychotics or antiparkinsonian agents which affect the body's ability to regulate heat by disrupting cooling or water and salt retention functions.
- Bedridden patients or those dependent on others for daily activities.

Individuals with mental health issues

- May have difficulty recognising heat-related illness symptoms, and pre-existing mental health conditions can worsen.
- Communication, sensory or cognitive impairments.

Physically active individuals

- Exposure to prolonged hot weather such as:
  1. Athletes like marathon runners, recreational athletes, hikers, or cyclists.
  2. School students engaging in outdoor sports.
- Increased heat production by the body during intense physical activity leads to significant water loss from the body.

Economically and socially disadvantaged groups*

* Low-income individuals, the homeless, or those living alone

- Living in poorly ventilated homes (zinc-roofed, no air conditioning, poor ventilation and overcrowded).
- High rates of alcohol consumption and drug abuse.
- Social isolation.

Foreign workers /Tourists

- Limited knowledge of local warning systems, health programmes and social services.

Source: Pelan Tindakan Pengurusan Kesihatan Gelombang Haba, MOH (2021).

Effects of Heatwaves on Physical Health

Heat stroke, heat exhaustion and heat cramps are known to occur during heatwaves in any individual, especially those at risk.

However, there are scientific studies that have found that the incidence of other illnesses and deaths increases during this period among chronic respiratory and cardiovascular patients.

Cardiovascular diseases

A healthy cardiovascular system (including the heart, arteries and veins) is essential for regulating body temperature.

- Individuals with cardiovascular diseases, such as heart disease, may have difficulty regulating their body temperature.
- Certain medications that affect cardiovascular system function can also interfere with temperature regulation.

Respiratory diseases

Lung conditions such as asthma, COPD and respiratory infections (e.g. flu, bronchitis, pneumonia or tuberculosis) can worsen due to extreme heat.

- Heat and air pollution can cause inflammation of the airways.
- This inflammation can lead to serious breathing difficulties.

Medications

Certain medications can reduce a person's ability to regulate body temperature by:

- Inhibiting normal sweating, affecting cognitive alertness, or altering blood pressure and heart rate.
- Impacting kidney function.
- Patients should monitor how these medications affect them during heatwaves.

Heat-Related Illnesses

Heat-Related Illnesses refer to a range of health conditions that can occur due to exposure to excessive heat.

Heat Stroke

Heat Stroke is a serious and potentially life-threatening medical condition that occurs when the body is unable to cool itself due to prolonged exposure to high temperatures. This condition causes the body temperature to rise above 40°C, which can damage internal organs and the central nervous system.

- Body temperature exceeds 40°C
- Fainting/Coma
- Rapid and strong heart rate
- Impaired speech
- Seizures
- No sweating
- Brain function affected

Heat Exhaustion

Heat Exhaustion is a condition that occurs due to prolonged exposure to high temperatures, especially during physical activity in a hot environment. This condition can become serious if not addressed promptly.

- Body temperature between >37°C–40°C
- Headache, nausea, and vomiting
- Rapid and weak heart rate
- Fatigue and weakness
- Excessive sweating
- Can progress to heat stroke if not treated

Heat Cramps

Heat Cramps are painful muscle contractions, typically occurring in the legs, arms, or abdomen.

- They result from the loss of salt and minerals through sweating (dehydration).
- They usually occur after exercise and within a short period of time.

Effects of Heatwaves on Mental Health

Heatwaves not only affect physical health but also have a significant impact on an individual's mental well-being. Exposure to high temperatures has been linked to an increase in symptoms among individuals with **depression, generalised anxiety disorder, and bipolar disorder** (WHO, 2022).

Additionally, high temperatures and humidity have been linked to **worsening of symptoms in affected individuals**. Studies indicate that extreme heat can **impair cognitive function, increase aggressive behaviour, and contribute to higher rates of violent crime** (Anderson et al 2012).

Furthermore, heatwaves and extreme temperatures have been linked to various mental health effects, including **increased irritability, worsening depression symptoms, and higher risk of suicide** (WHO, 2022).

Therefore, it is crucial to take preventive measures such as staying adequately hydrated, resting in cool environments, and avoiding strenuous physical activity during hot weather to reduce the mental health impact of heatwaves.

> For immediate mental health assistance, contact the Ministry of Health Malaysia (MOH) at their facilities or through the Mental Health Crisis Helpline, **HEAL 15555**.

4

Preparation for Heatwaves

Identifying Hot Seasons and Exposed Areas in Your Neighbourhood

Identifying Vulnerable Groups During Heatwaves

Healthcare Guidelines for Infants and Children

Healthcare Guidelines for Children Aged 5 and Above

Healthcare Guidelines for the Elderly

Heatwave Safeguard: Staying Cool, Hydrated and Safe

Emergency First Aid for Heat-related Illnesses

Nature-based Solution (NbS) Adaptation

How Trees and Shaded Areas Help Reduce Temperature

Preparation for Heatwaves

Malaysia frequently experiences heatwaves that impact health and well-being, particularly among vulnerable groups such as children and the elderly. Identifying hot seasons and high-risk areas is a crucial step, supported by community efforts, health risk prevention, and government assistance.

Measures such as cooling homes and utilising natural solutions, like green spaces, can help reduce heat effects and enhance sustainability. These initiatives not only protect vulnerable populations but also contribute to long-term resilience against the challenges posed by extreme temperatures.

Identifying Hot Seasons and Exposed Areas in Your Neighbourhood

During the hot season, schedule outdoor activities before peak sunlight hours.

- **Avoid outdoor activities during peak heat hours**. If possible, go out before 10 a.m. or after 5 p.m. to minimise heat exposure.
- **Check the weather forecast**, and heat index, before planning outdoor activities.
- **Identify exposed areas** and choose shaded routes whenever possible.

For the latest information on weather and heatwaves, you can refer to the official MetMalaysia website or download the myCuaca application.

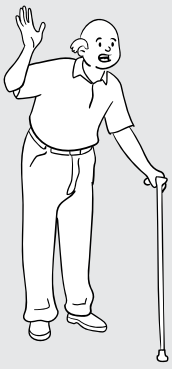
Refer to **Module 2** of the Toolkit to create a heat map of your neighbourhood area.

Identifying Vulnerable Groups During Heatwaves

The population most affected by heatwaves includes the elderly, children, individuals with chronic illnesses, outdoor or field workers, and those living in houses with zinc roofs or limited access to air conditioning. However, it is important to remember that heat stroke can affect anyone, especially during extreme weather conditions.

In Penang, areas such as George Town and Bayan Lepas, with high population density and rapid development, may have a population more exposed to the effects of heatwaves. Mapping urban heat zones and conducting demographic analyses can help identify communities most in need of intervention.

Are any at-risk groups below members of your family or neighbourhood?



Elderly
(60 and above)

Pregnant
women

Outdoor
workers

Infants and toddlers
(Age 0–4)

Individuals with chronic illnesses/
Persons with disabilities (PWD)

If yes, please give extra attention to these groups as they are more vulnerable to the effects of heatwaves.

Refer to **Module 1** of the toolkit to identify vulnerable groups within your community.

Healthcare Guidelines for Infants and Children

Infants and children under five are highly sensitive to heat and at greater risk of heat-related illnesses. This group may not show specific symptoms. Common signs include appearing unwell, feeling uncomfortable, and increased irritability.

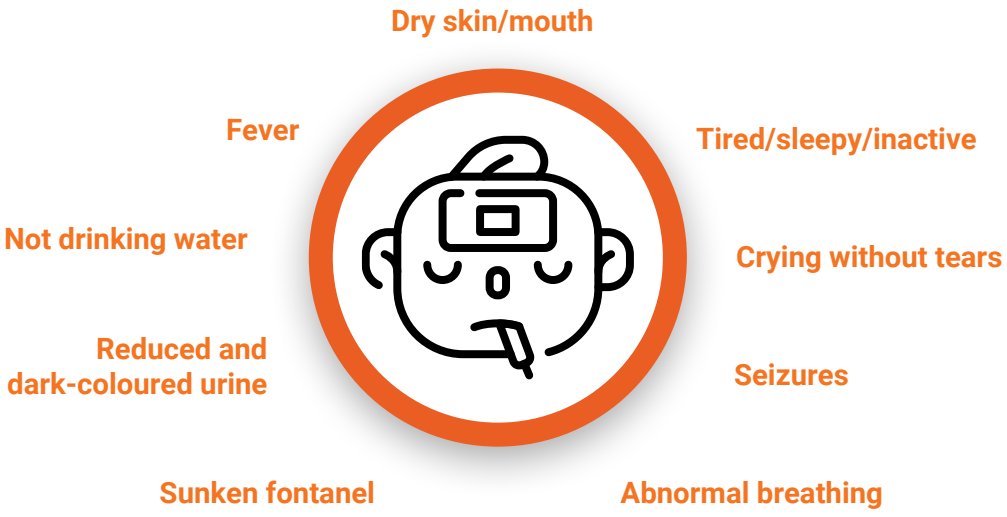
Parents or caregivers should always monitor any changes in behaviour and hydration levels to prevent the risk of heat-related illnesses. Signs of dehydration include dry skin, refusal to drink, or reduced water intake. In infants, the fontanel (soft spot on the head) may also appear sunken.

Ensuring adequate intake of water/milk	a. Infants are unable to express their thirst. Therefore, it is important to offer them milk more frequently to maintain hydration levels. b. For children, ensure they drink plenty of plain water and avoid sugary, caffeinated, and carbonated drinks. c. Including fruits such as oranges, watermelon, and guava in their diet can also help with hydration (avoid flavoured drinks). **Note**: A good sign of proper hydration is changing wet diapers six to eight times within a 24-hour period.
Cooling the body	a. Dress the baby in loose and lightweight clothing. b. Frequently dampen the baby's body with water or a wet towel. Avoid using cold water or ice. c. Use air conditioning or fans to cool the environment. • Fans should be used to help circulate air better in the room. Avoid pointing the dry air from the fan directly at the baby. • Ensure the air conditioning is not set too cold; the recommended temperature is between 24°C and 26°C. • Choose a well-ventilated room with a comfortable temperature for the baby to sleep in.
Outdoor Activities	a. Avoid taking babies/children outside or for walks during hot weather, especially from 11 a.m to 5 p.m. b. If going outdoors is necessary, use an umbrella to provide shade and limit time outside.

Travelling by Vehicle

a. Avoid taking babies/children along when riding a motorcycle.
b. Never leave babies/children unattended in a vehicle, even with the air conditioning on.
c. Prevent direct sunlight from shining on the baby/child's body.
d. Make it a habit to check the vehicle before leaving to ensure that no baby or child is left inside the vehicle.
e. Keep the vehicle locked when not in use to prevent children from playing inside and accidentally locking themselves in.

Parents/guardians are advised to seek immediate healthcare services at the nearest clinic or hospital if the baby/child is unwell and exhibits the following symptoms:



Healthcare Guidelines for Children Aged 5 and Above

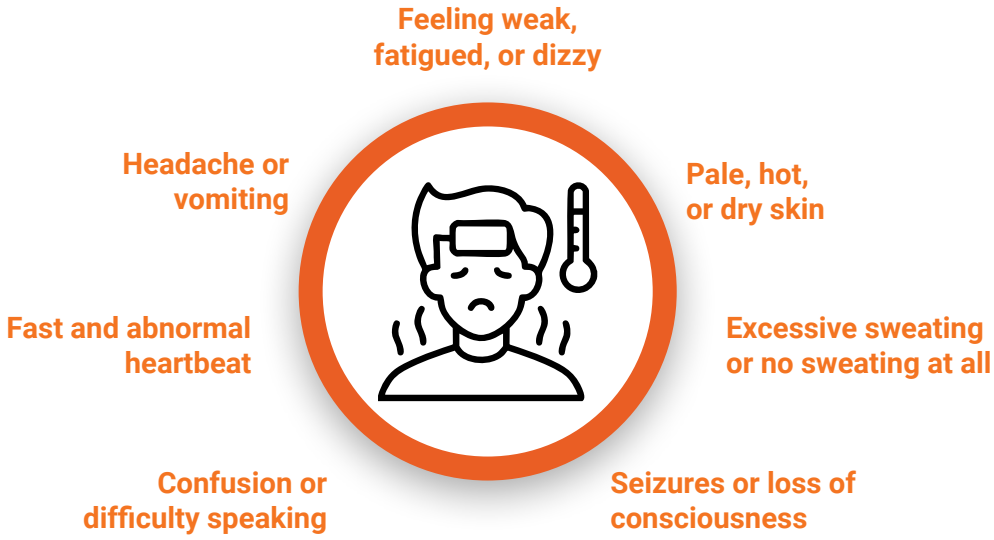
Children aged 5 and above require special attention to their healthcare as they undergo rapid growth and development. Proper healthcare guidelines help ensure they grow up healthy, strong, and resilient to diseases. These include balanced nutrition, sufficient physical activity, personal hygiene, and regular health check-ups.

Adequate milk/water intake	a. Ensure that children drink plain water regularly, as well as fruit juices or low-sugar sports drinks. b. Avoid caffeinated, carbonated, and energy drinks, as they can increase the risk of dehydration. c. Encourage children to always carry a water bottle with them.
Clothing and Protective Gear	Always remind them to: a. Wear loose and light-coloured clothing. Avoid dark/black clothing, thick, or tight garments as they can increase heat absorption and slow down the cooling process of the body. b. Wear a hat or use an umbrella when exposed to direct sunlight. c. Frequently dampen their body with water to stay cool. d. Encourage the use of sunscreen (SPF ≥ 30) to help reduce the effects of direct sunlight exposure. However, excessive use is not recommended, as it may interfere with sweating.
Outdoor Activities	Outdoor play is common for children and teenagers. For those who are always active, the following guidelines should be observed: a. Limit outdoor activities to early mornings and limit time spent outside. b. Avoid physical activities or sports when the temperature exceeds 35°C. c. If engaging in physical activities, follow the health guidelines for physical activity during hot weather provided by the Ministry of Health Malaysia (MOH). d. If feeling uncomfortable or faint, move immediately to a cooler or shaded area to rest and stay hydrated. e. Wear loose, light-coloured clothing. Avoid dark or black clothing and avoid wearing thick or tight garments.

Indoor Activities

a. Open windows at night to release trapped heat from the building.
b. Use curtains or blinds to reduce heat but ensure they do not block ventilation.
c. Turn off all electrical appliances, including computers and monitors, when not in use (appliances generate heat even in standby mode).

Parents/guardians/teachers should seek immediate medical attention if a child/student appears unwell or exhibits any of the following warning signs:



Healthcare Guidelines for the Elderly

Elderly individuals, aged 60 and above are at high risk of experiencing health complications from extreme weather changes. This makes them particularly vulnerable to the effects of heatwaves.

As they age, their body systems become less efficient at regulating body temperature, making them more susceptible to health problems such as dehydration, heat exhaustion, and heat stroke.

Why The Elderly are More Vulnerable

Physiological aging changes

- Reduced sweating
- Reduced thirst sensation
- Decrease water intake leading to mild dehydration

Chronic health problems

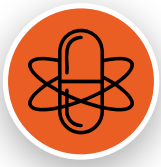
- Dementia
- Depression
- Diabetes
- Cardiovascular diseases

Physical disabilities

- Individual with stroke
- Osteoarthritis
- Require monitoring and caregiver assistance

Social and environmental factors

- Elderly individuals who live alone face a higher risk of heatwave complications due to limited assistance or family support



Use of various medications

- Certain medications can disrupt fluid balance and cause unwanted side effects (e.g., sedation).
- Some medications may lead to dehydration

Cooling the body

a. Increase plain water intake (patients with conditions like dialysis or heart failure should consult a doctor first).
b. Avoid caffeinated and hot drinks.
c. Avoid alcoholic beverages.
d. Bathe frequently or dampen the body/clothing with water.
e. Stay in a cool environment, such as air-conditioned buildings or areas with water mist fans.

Note: The use of fans should be monitored if they only circulate hot air, as this may lead to increased body temperature rather than providing cooling.

Physical activities

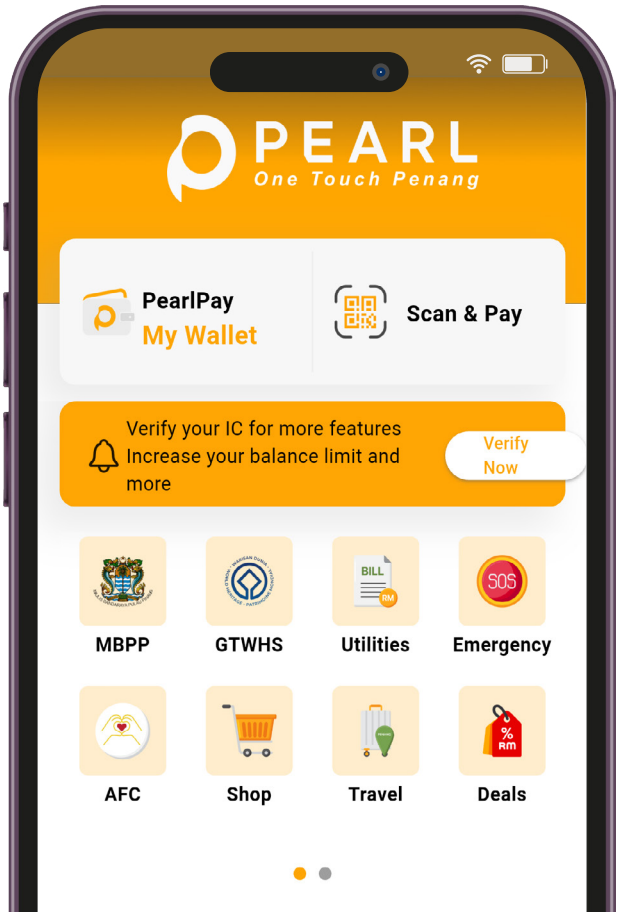
a. Wear loose, sweat-absorbing, and light-coloured clothing.
b. Reschedule outdoor physical activities during heatwave. Perform activities indoors in air-conditioned spaces with good ventilation.
c. Delay organising outdoor events such as celebrations or gatherings.
d. If it is necessary to be outdoors:
    - Avoid direct exposure to sunlight.
    - Use an umbrella or a wide-brimmed hat.
    - Wear UV-protective sunglasses.
    - Apply sunscreen with an SPF of 30 or higher.

Note: Caregivers should be attentive to subtle changes in the health of elderly individuals (especially those with dementia or mental health conditions).

Symptoms to watch for include drowsiness, fatigue, restlessness, reluctance to drink or eat properly, and other unusual behaviour.

Seek medical attention at a nearby clinic or hospital if you or the senior citizen in your care experiences any health issues related to hot weather.

The **Penang Pearl** app offers emergency functions such as locating nearby hospitals and clinics, nearby AEDs, and a list of ambulance services.



Source: Pelan Tindakan Pengurusan Kesihatan Gelombang Haba, MOH (2021)

Heatwave Safeguard: Staying Cool, Hydrated and Safe

Heatwaves can be dangerous, leading to heat exhaustion, dehydration, and even heat stroke if proper precautions are not taken. To protect yourself and those around you, it is essential to take preventive measures to stay cool, hydrated, and informed. Below are key steps to safeguard your well-being during extreme heat.

Ensure Your Body Stays Cool and Hydrated at All Times

To protect yourself and those around you from heat-related illnesses, follow these steps:

Take a cool shower or use cooling alternatives such as cold packs, wet towels, and foot soaking.

Wear light and loose clothing made of breathable fabrics. If going outdoors, wear a hat and dark sunglasses.

Drink plenty of water during hot weather to prevent dehydration. Avoid caffeine, alcohol, and sugary drinks.

Use sunscreen to protect yourself from UV radiation (SPF >30)

Avoid strenuous outdoor activities during hot weather.

Eat lighter meals and avoid foods high in protein.

Emergency First Aid for Heat-Related Illnesses

Recognising Heat Exhaustion vs. Heat Stroke

Heat exhaustion and heat stroke are serious conditions caused by prolonged exposure to extreme heat. Recognising the difference is crucial for effective treatment:

Heat Exhaustion	Heat Stroke
• Body temperature >37°C–40°C • Rapid and weak heartbeat • Dizziness or headache • Nausea or vomiting • Feeling tired and weak • Excessive sweating • Brain function is not affected	• Body temperature higher than 40°C • Rapid and strong heartbeat • Impaired speech • Seizures • Coma/fainting • No sweating • Affects brain function

If you start to experience heat-related illness symptoms

1. **Seek help** if you feel dizzy, weak, anxious, experience excessive thirst, or have an unusual headache.
2. **Move to a cooler** place immediately and check your body temperature.
3. **Drink water or fruit juice** in small amounts to rehydrate.
4. **Rest in a cool place** if you experience muscle cramps (especially in the legs, arms, or abdomen).
5. **Drink an electrolyte solution** (e.g., isotonic drinks).
6. Go to the nearest clinic if you are experiencing **abnormal symptoms** or **unresolved symptoms** and muscle cramps for more than an hour.

If symptoms progress or do not improve within 1 hour, seek medical attention.

Responding to Heat Emergencies

If a family member or someone you are assisting is showing **heat stroke** symptoms, follow these steps:

1. Immediately call a **doctor or ambulance**
2. While waiting for help, **move the individual to a cool place**
3. Lay the individual flat with their **legs and hips elevated**
4. **Unbutton clothing and begin external cooling**, such as placing cold packs on the neck, armpits, and groin
5. **Continuously fan the body** and spray the skin with water at a temperature of 25°C–30°C
6. Measure the individual's **body temperature**
7. **Do not administer aspirin** (acetylsalicylic acid) or paracetamol
8. If the individual is **unconscious, lay them on their side**

Call for immediate medical assistance if:

- The person has a body temperature above 40°C.
- They become confused, drowsy, or unconscious.
- They experience seizures.
- Symptoms do not improve with cooling measures.

Home Cooling Strategies

Here are some tips to minimise the effects of heatwave and keep your home comfortable:

Ensure that your living space is cool. Ideally, the room temperature should be below 32°C during the day and 24°C at night.

(Use a mosquito netting if the window is open).

Use the night air to cool your home. Open all windows and blinds at night and early morning when the outside temperature is lower (if it is safe to do so).

Reduce heat buildup inside your apartment or house.

Close windows and blinds (if available), especially those facing the sun during the day.

Use LED lights and turn off lights when not in use.

Clean dust from fans and air conditioner filters to improve efficiency.

Spray water on outdoor surfaces in the late afternoon to help cool the area.

Set the air conditioner to a temperature of 22°C–25°C only.

Set the ceiling fans to rotate counterclockwise to improve airflow and enhance cooling.

Declutter furniture and organise your home to improve airflow and comfort.

Nature-based Solution for Heat

In Malaysia, Nature-based Solutions (NbS) play a crucial role in addressing the increasingly severe impacts of heatwaves caused by climate change. NbS refers to the use of natural ecosystems, such as tree planting, urban park development, and mangrove conservation, to mitigate the effects of extreme heat.

By harnessing natural ecosystems, NbS provides innovative ways to enhance resilience to climate change and reduce the impact of rising temperatures. This approach not only benefits the environment but also helps communities cope with the health and well-being challenges arising from extreme weather events.

***Green Roof at Hin Bus Depot, Penang**: Enhancing urban cooling and promoting environmental sustainability.*

Source: Belalang Inovasi

***Kebun Kita(r), Penang Digital Library**: A community urban garden that helps cool the city through greenery and evapotranspiration while supporting food security.*

Source: Buletin Mutiara

How Trees and Shaded Areas Help Reduce Temperature

Trees and shaded areas play a crucial role in lowering temperatures, especially in urban environments where concrete and asphalt tend to absorb and retain heat. This natural cooling effect is vital for improving comfort, reducing energy consumption, and mitigating the urban heat island (UHI) effect.

1. **Cooling Through Shade**
Trees provide shade that blocks direct sunlight from heating surfaces such as roads, pavements, and buildings. By reducing the amount of solar radiation that reaches these surfaces, shaded areas remain significantly cooler compared to exposed spaces. This can lower ground temperatures by several degrees, creating a more comfortable outdoor environment.

2. **Evapotranspiration and Air Cooling**
Trees also cool the air through a process called evapotranspiration. As trees absorb water from the soil, they release moisture into the atmosphere through their leaves. This process helps to cool the surrounding air, similar to how sweat cools the human body. In humid climates like Malaysia, this effect can significantly reduce the perceived temperature.

3. **Impact on Urban Heat Island Effect**
Cities experience higher temperatures than surrounding rural areas due to the urban heat island effect. This occurs because buildings, roads, and other structures absorb and retain heat. Increasing tree cover and shaded areas in urban settings can help counteract this effect, reducing overall temperatures and improving air quality.

4. **Energy Savings and Climate Benefits**
By planting trees around homes and buildings, air conditioning needs can be reduced, leading to lower energy consumption and electricity bills. In addition, trees absorb carbon dioxide, contributing to climate change mitigation and promoting environmental sustainability.

Armenian Park, George Town

5

Trainer Guide

Module 1: Identifying Individuals at Risk

Module 2: Mapping Community Heat Risk

Module 3: Preventing and Reducing Health Impacts During Heatwaves

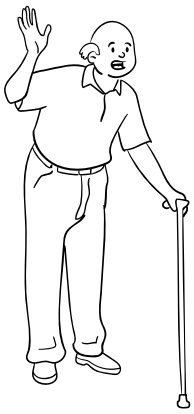
Heatwaves Trainer Guide

Module 1

Identifying Individuals at Risk

- Explain the effects of heatwaves on human health.
- Identify the importance of protecting vulnerable groups in the community.

Vulnerable groups



Elderly
(60 and above)

Pregnant
women

Outdoor
workers

Infants and toddlers
(Age 0–4)

Individuals with chronic illnesses/
Persons with disabilities

Activity	• Identify High-Risk Groups around the neighbourhood for each participant. The groups to be identified include the Elderly, Children, Women, Persons with disabilities (PWD), and Foreign workers.
Practical	• Ask participants to use the checklist to assess who in their family or neighbourhood may need extra attention during a heatwave. • Encourage participants to discuss supportive steps they can take, such as reaching out to neighbours or family members to help these vulnerable groups.

Module 1

Identifying Individuals at Risk

Checklist for At-Risk Individuals

Use this list to identify individuals in your family or neighbourhood who may need assistance during heatwaves.

1. Age

- ☐ Is the individual 65 years or older?
- ☐ Is the individual under 5 years old?

2. Health

- ☐ Does the individual have chronic conditions such as:
  - ☐ Heart disease
  - ☐ Diabetes
  - ☐ High blood pressure
  - ☐ Respiratory illnesses (e.g., asthma, COPD)
- ☐ Does the individual have mobility issues (difficulty moving)?
- ☐ Is the individual taking medications that may cause dehydration (e.g., diuretics, antihistamines)?

3. Living Conditions

- ☐ Does the individual live alone without support from family or neighbours?
- ☐ Is the individual's home poorly ventilated or lacking cooling devices such as fans or air conditioning?

4. Work

- ☐ Does the individual work outside for extended periods (e.g., construction labour, farming, street vendors)?

5. Additional Factors

- ☐ Is the individual pregnant or breastfeeding?
- ☐ Does the individual have a history of heat-related health issues (e.g., heat stroke, heat exhaustion)?

Follow-up Actions

- If any boxes are checked, ensure that the individual receives attention and assistance during the heatwaves.
- Contact them regularly to monitor their condition.
- Provide guidance on staying cool, such as drinking enough water, avoiding strenuous activities, and seeking cooler places.

Module 2

Mapping Community Heat Risk

The purpose of this module is to teach the community how to create a neighbourhood heat map, identify community cooling centers, and encourage collective action to mitigate and adapt to heat impacts.

Introduction	**What is a Heat Map?** ☐ A heat map is a visual representation of areas that experience high temperatures compared to others. It is commonly used to identify "hot spots" due to urbanisation, lack of green spaces, and building density. **Importance of Heat Maps** ☐ Helps identify areas that require heat mitigation actions. ☐ Increases community awareness of heat risks. ☐ Supports local authorities in urban planning decisions.
Items Needed	• Mobile devices or infrared thermometers to measure temperatures. • Base maps of the neighbourhood (can be obtained from Google Maps or local authorities). • Software or mobile apps for creating heat maps (e.g., Google Earth, QGIS, or mobile mapping apps). • Temperature data recording forms.
Practical	**Steps for Creating a Heat Map** **Step 1: Determine Neighbourhood Locations** • Define the boundaries of the area to be mapped. • Divide the area into smaller zones (e.g., housing blocks, parks, commercial areas). **Step 2: Collect Temperature Data** • Measure temperatures during the day (e.g., between 12 p.m and 3 p.m). • Use an infrared thermometer to record temperatures in: ✓ Road surfaces ✓ Green spaces ✓ Shaded areas ✓ Covered areas like parking lots • Ensure measurements are taken at the same points each time.

Practical

Step 3: Mapping the Data

- Input the temperature data into the neighbourhood base map.
- Use heat map applications to generate visualisations of hot areas.
- Different colors can be used to indicate temperature intensity (e.g., blue for cooler areas, red for hot areas).
- Also mark cooler areas that can be utilised by the community (e.g., shaded bus stops, covered walkways).

Step 4: Data Analysis

- Identify "hot spots," which are areas with higher temperatures than the average.
- Compare these with green areas or shaded places to understand the causes of high temperatures.

Step 5: Report Preparation

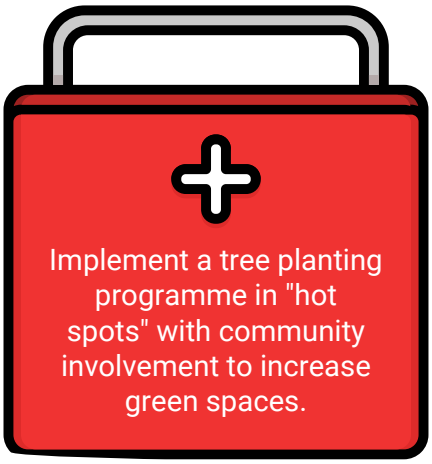
- Document the generated heat map.
- Describe critical areas and the sources of high temperatures.

Action Recommendations Based on the Heat Map

- Plant trees and create green parks in hot areas.
- Install shade structures or green roofs.
- Encourage the use of cooler building materials (e.g., reflective materials for roads or roofs).
- Add public water stations in hot locations.

Example:

No.	Location	Date	Time	Temp (°C)	Surface Type	Additional Notes
1	Playground Block A	13 Jan 2025	12:00 PM	35°C	Grass	Shaded by trees
2	Main Road Block B	13 Jan 2025	12:30 PM	40°C	Tar	No shade, busy area
3	Car Park	13 Jan 2025	12:45 PM	38°C	Cement	Partially

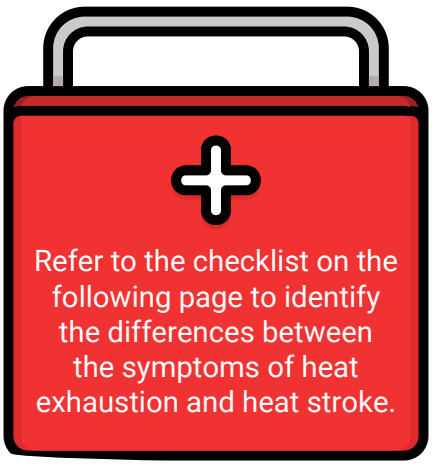


Module 3

Preventing and Reducing Health Impacts During Heatwaves

This module aims to provide participants with basic knowledge and skills in administering first aid to individuals experiencing heat exhaustion and heat stroke. Heat exhaustion and heat stroke are health issues that can occur due to prolonged exposure to high temperatures, and both can be life-threatening if not treated promptly.

Introduction	Heat exhaustion and heat stroke are health issues that occur due to prolonged exposure to high temperatures, and both can be life-threatening if not treated promptly. In this module, participants will learn essential steps in managing both conditions, including how to cool the affected body, provide fluids properly, and recognise when to seek emergency medical assistance.
First Aid Steps	**Heat Exhaustion**: ☐ **Move the individual to a cooler place**: Relocate them from the hot environment to a shaded area or air-conditioned space. ☐ **Give cool water**: Help the individual sip water every few minutes. Avoid caffeinated or alcoholic beverages. ☐ **Fan them**: Use a fan or breeze to rapidly lower their body temperature. ☐ **Loosen clothing**: Ensure their clothing is loose and comfortable to allow for better airflow. **Heat Stroke**: ☐ **Pour cool water on their skin**: Use cool water (not ice) to reduce body temperature, or place a damp, cool cloth on their body. ☐ **Use a fan**: Fan them vigorously to speed up the cooling process. ☐ **Call emergency services**: If the individual is unresponsive or the condition worsens, immediately call emergency services or an ambulance. **Monitoring and Ongoing Care**: ☐ Ensure the affected individual is not left alone and continue monitoring their condition until help arrives. ☐ Do not give food or drink if the individual is unconscious.



Module 3

Preventing and Reducing Health Impacts During Heatwaves

When exposed to extreme heat, you may experience heat exhaustion or, in more severe cases, heat stroke.

Tick ✓ if you experience any of these symptoms.

Heat Exhaustion		Heat Stroke	
	Body temperature >37°C–40°C		Body temperature higher than 40°C
	Rapid and weak heartbeat		Rapid and strong heartbeat
	Dizziness or headache		Speech Impaired
	Nausea or vomiting		Seizures
	Feeling tired and weak		Coma/fainting
	Excessive sweating		No sweating
	Does not affect brain function		Affect brain function

Please seek immediate medical treatment if you experience these symptoms.

6

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