



## HEAT IN THE CITY

---

Regina Vetter,  
C40 Cool Cities Network Manager



Photo: GettyImages-1178113265\_Pichaya Peanpattanangkul \_ EyeEm

# Table of Content

- 01.** C40 CONTEXT
- 02.** HEAT & VULNERABILITY MAPPING
- 03.**
- 04.** HEAT ACTIONS
- 05.** INTEGRATING CLIMATE MITIGATION & ADAPTATION



01.

## C40 CONTEXT

---



# C40 connects 96 cities worldwide to tackle the climate crisis together



**96**

**CITIES**

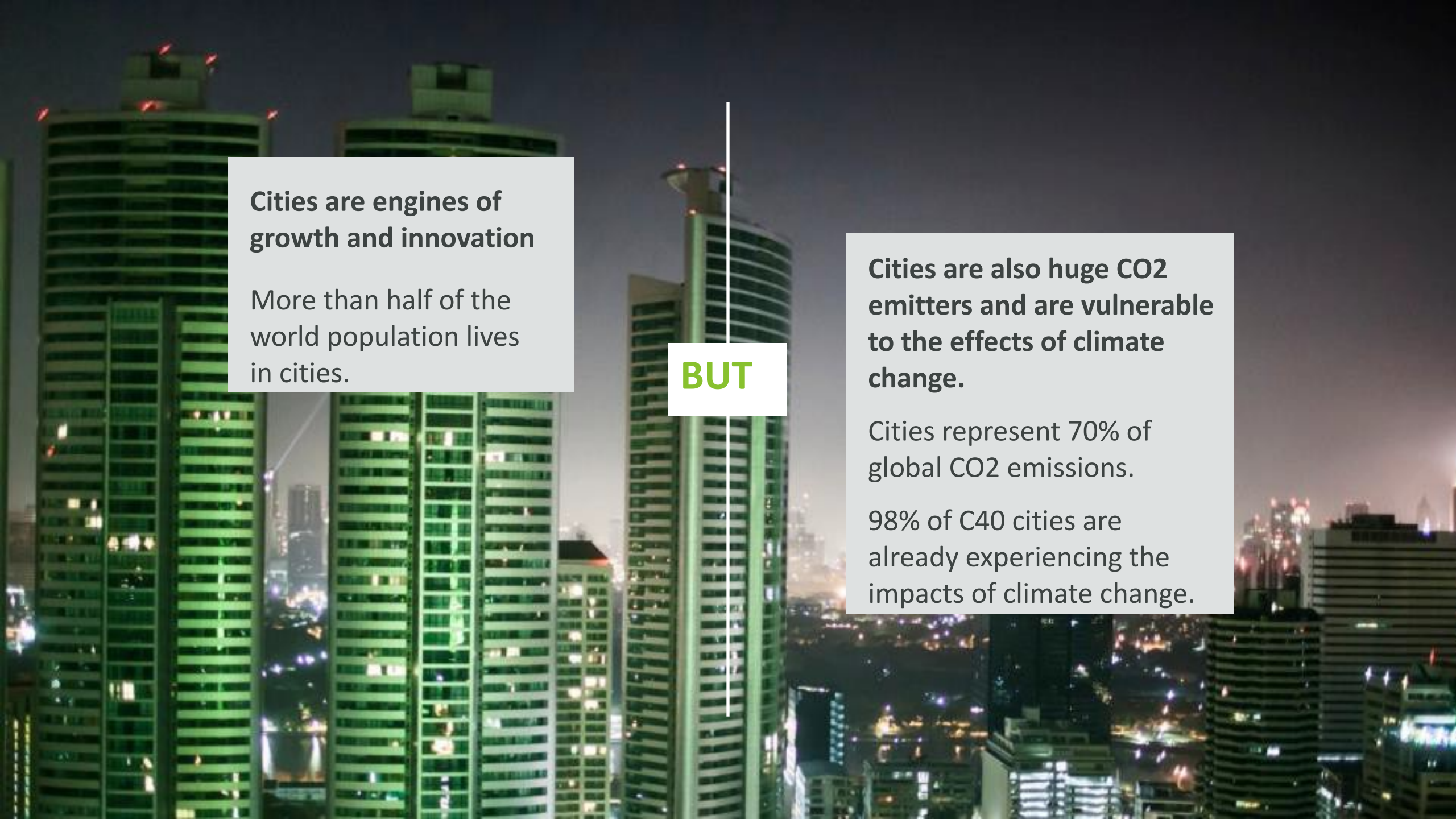
**650+**

**MILLION PEOPLE**

**25%**

**OF THE  
WORLD'S ECONOMY**



A nighttime photograph of a city skyline with several tall skyscrapers illuminated with lights. The sky is dark, and the city lights create a vibrant scene. A white vertical line runs down the center of the image, passing through a central text box.

**Cities are engines of growth and innovation**

More than half of the world population lives in cities.

**BUT**

**Cities are also huge CO2 emitters and are vulnerable to the effects of climate change.**

Cities represent 70% of global CO2 emissions.

98% of C40 cities are already experiencing the impacts of climate change.



## C40 is a city-led organization



17 members of the Steering Committee, representing the 7 regions, make strategic decisions and meet 3 times a year.

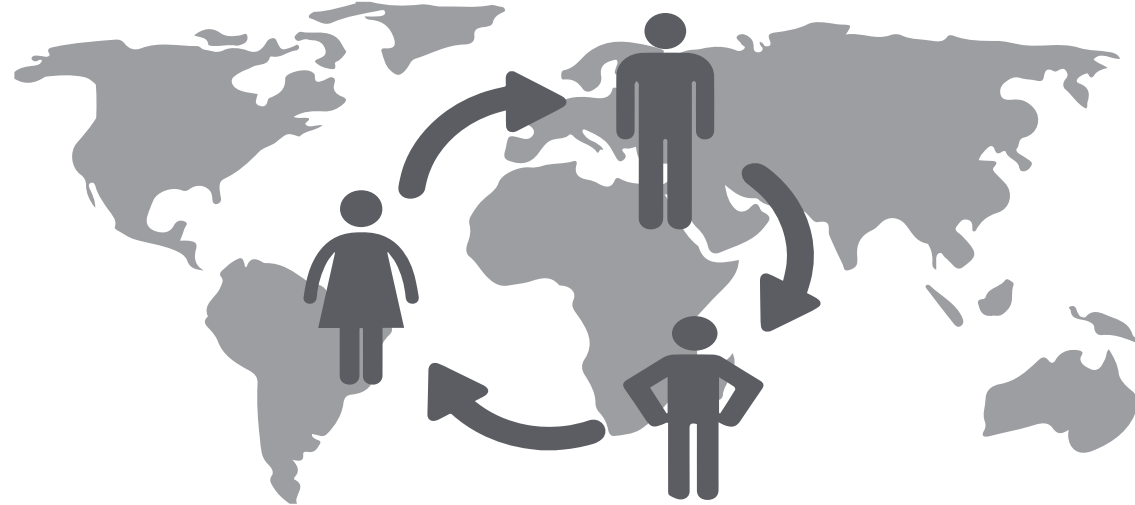
# 16 C40 Networks: Driving policy change in high impact sectors

ENERGY & BUILDINGS	TRANSPORTATION & URBAN PLANNING	FOOD, WATER & WASTE
<ul style="list-style-type: none"><li>• Private Building Efficiency</li><li>• Municipal Building Efficiency</li><li>• New Building Efficiency</li><li>• Clean Energy</li></ul>	<ul style="list-style-type: none"><li>• Mobility Management</li><li>• Mass Transit</li><li>• Walking &amp; Cycling</li><li>• Zero Emission Vehicles</li><li>• Land Use Planning</li></ul>	<ul style="list-style-type: none"><li>• Sustainable Waste Systems</li><li>• Waste to Resources</li><li>• Food Systems</li></ul>
ADAPTATION IMPLEMENTATION	AIR QUALITY	
<ul style="list-style-type: none"><li>• Connecting Delta Cities</li><li>• Cool Cities</li><li>• Urban Flooding</li></ul>	<ul style="list-style-type: none"><li>• Air Quality</li></ul>	

## How Networks work

**C40 networks help replicate, improve and accelerate climate actions**

Support group of 25-40 city experts, sharing information, experiences, challenges and advising each other through all stages of policy development process



**SELECT  
ACTION**

**PLAN**

**APPROVE**

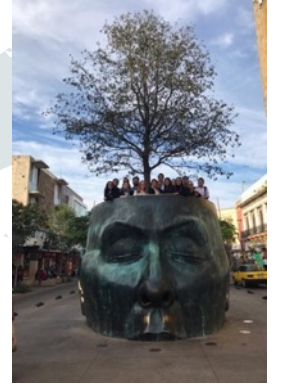
**IMPLEMENT**

**EVALUATE**

70% of C40 cities have implemented new climate actions, better or faster as a result of their participation in C40 networks.

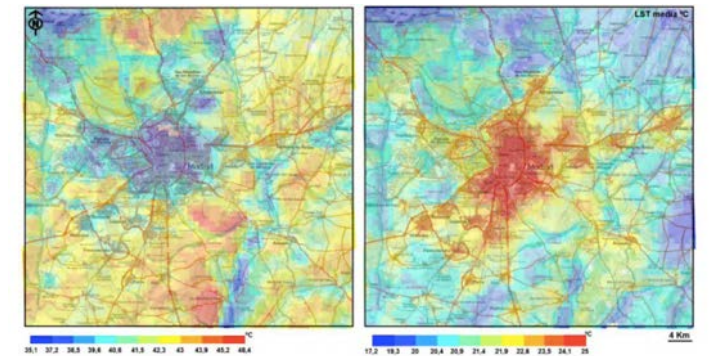
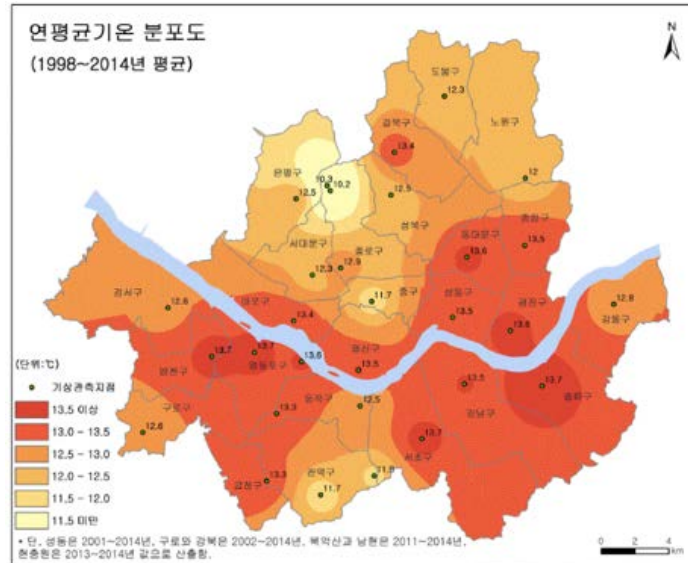
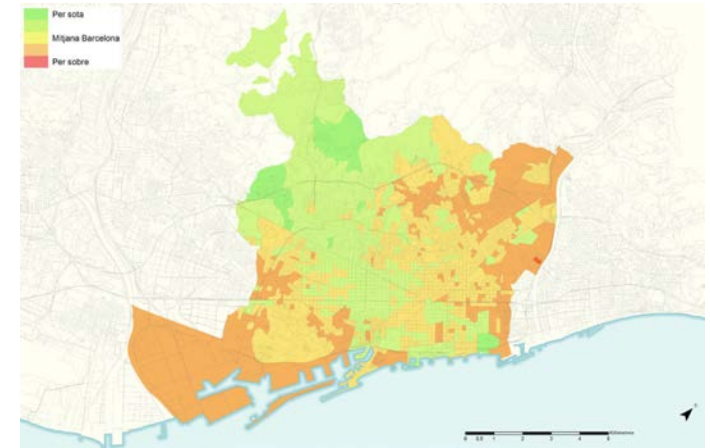
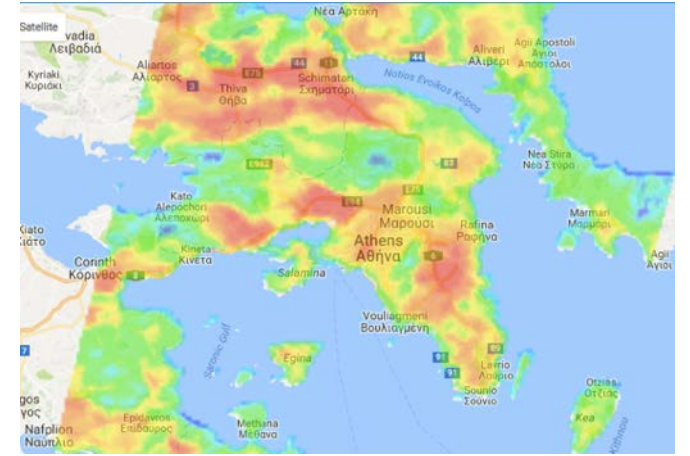
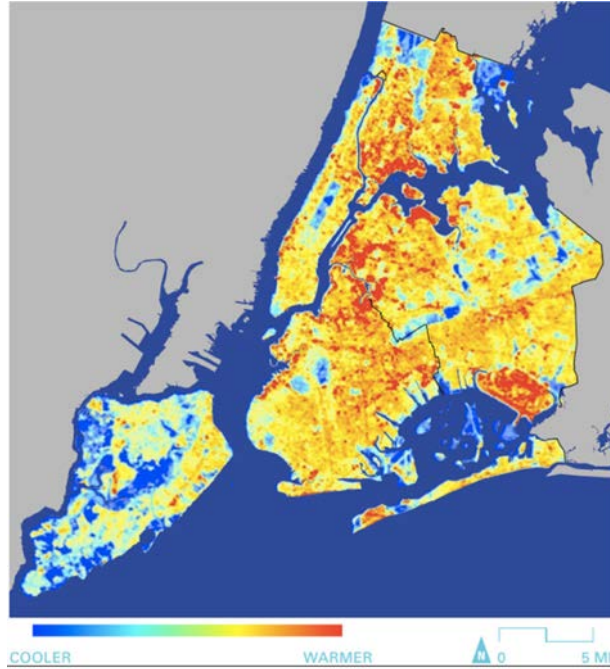


# C40 Cool Cities Network



# 03.

## HEAT RISK MAPPING



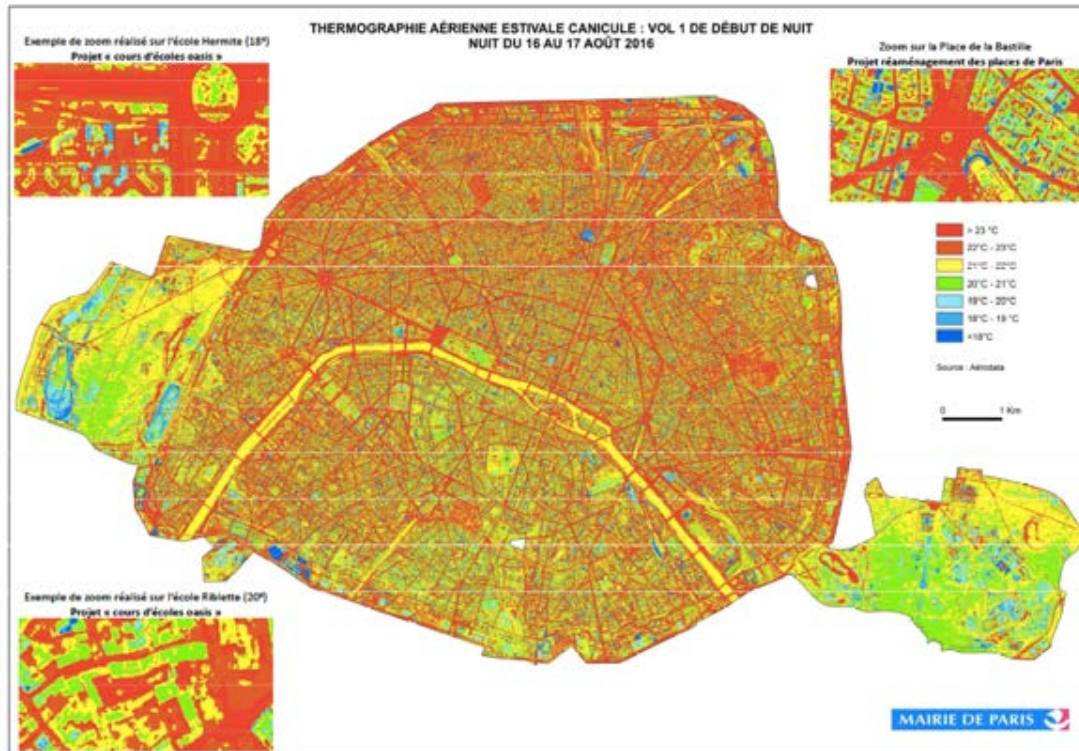


## 2. HEAT RISK MAPPING

# CITY CASE STUDY

## Surface temperature maps

# PARIS - HEAT MAP



## 2. HEAT RISK MAPPING

# CITY CASE STUDY

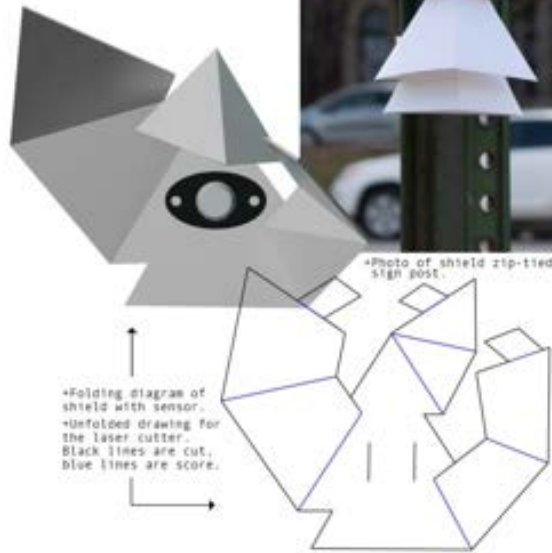
## Air temperature sensors

Maryland Institute College of Art  
John Hopkins University  
Faculty: Katie O'Keefe, Nick  
Ben Zaitchik, Jim  
Students: Sophie Stroerckel  
Clara Witsman

+Made from a thin light reflective film, this shield can be zip-tied to street signs, light posts, or drain spouts.



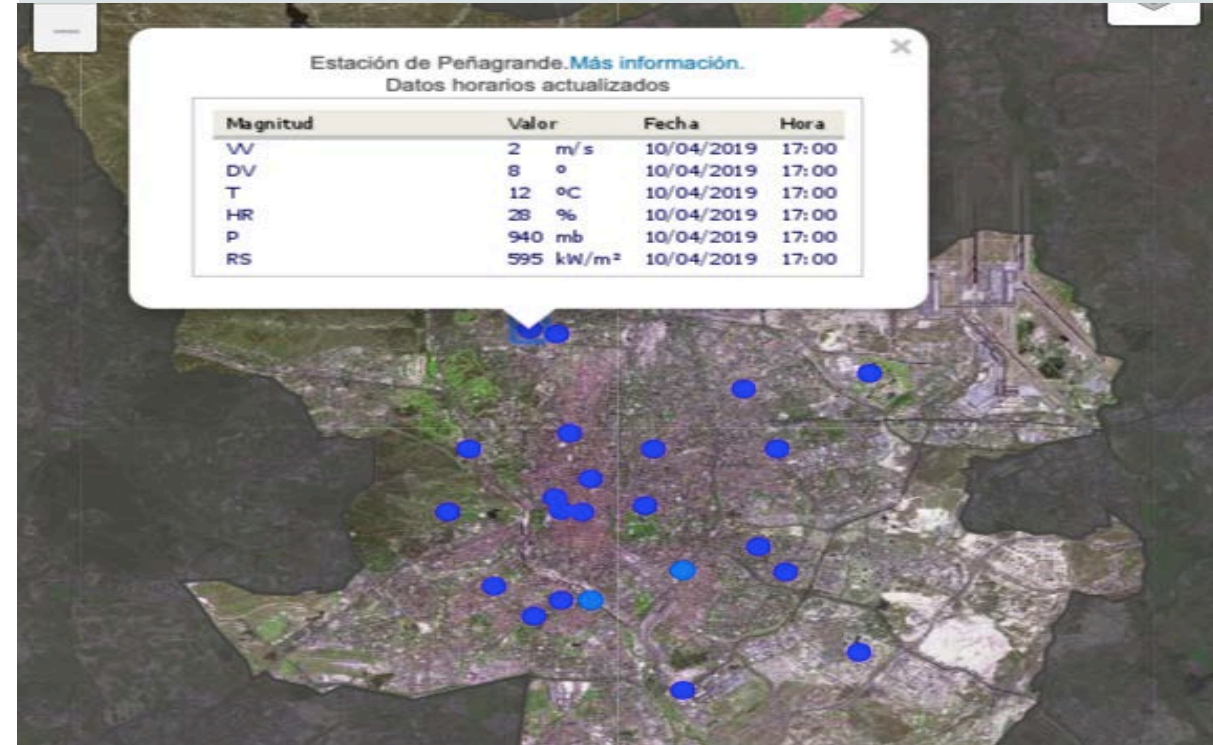
+Photo of shield zip-tied to sign post.



+Folding diagram of shield with sensor.  
+Unfolded drawing for the laser cutter.  
Black lines are cut, blue lines are score.



# MADRID





## 2. HEAT RISK MAPPING

# TORONTO

# CITY CASE STUDY

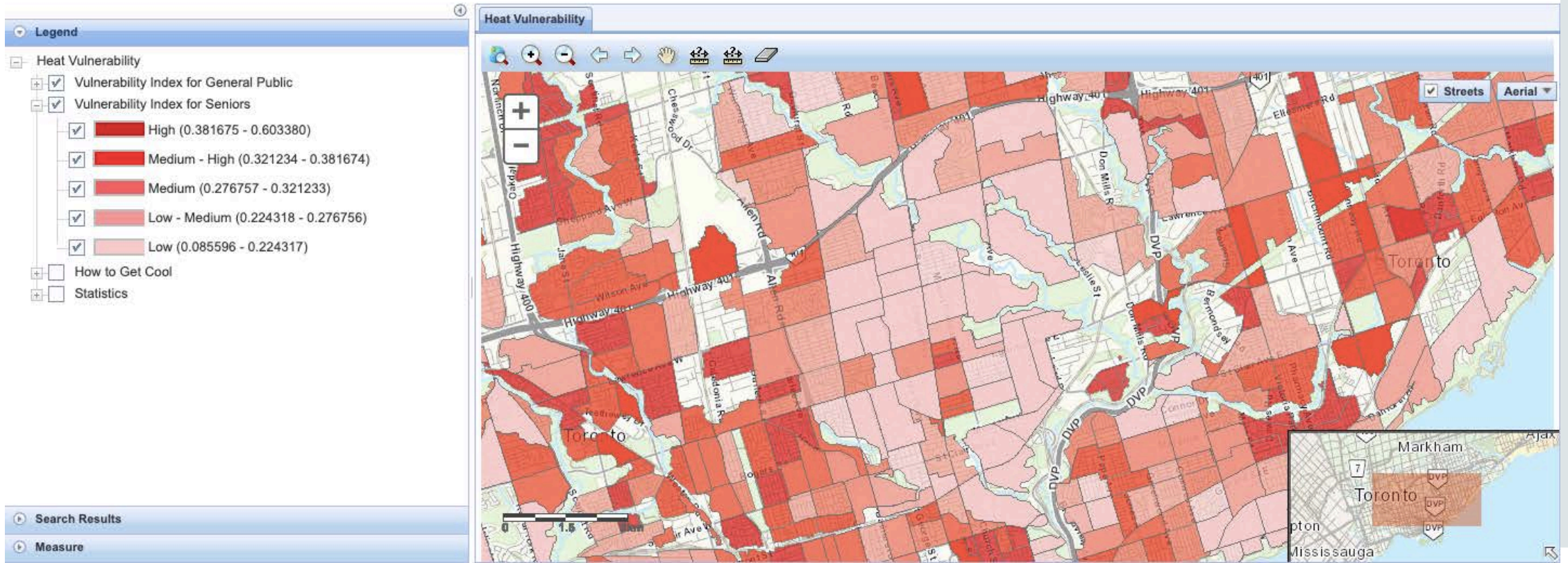
## Heat vulnerability Index - visualisation



Toronto Public Health - Heat Vulnerability

About Map

Search by Name, Address, or Intersection





03.

## HEAT ADAPTATION ACTIONS

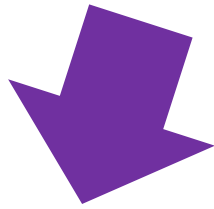
---

1. Heat emergency management
2. Long-term cooling actions





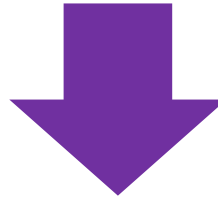
# Heatwave emergency management



## HEATWAVE PROTOCOL

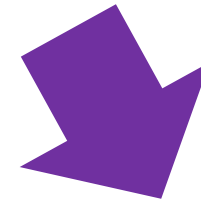
Outlining the arrangements for the management of heatwaves across preparedness, response and recovery.

HIGH	Red
MEDIUM	Yellow
LOW	Light Yellow
VERY LOW	Green



## COMMUNICATION CAMPAIGN

Strategies and for communication of heat risk to vulnerable populations



## COOLING CENTRES

= public or private spaces within a city, which are set up by local authorities to temporarily protect citizens from the health effects of a heat wave.



### 3. HEAT ACTIONS

## Communications campaign

- Identification of vulnerable groups
- Targeted outreach campaigns, examples:
  - *Social media*
  - *Flyers in strategic locations (doctors, pharmacies,..)*
  - *Posters (buses, stations, schools, ..)*
  - *Neighbourhood check-ins for elderly (collaborating with community groups)*



## BUENOS AIRES

### Cambio climático y olas de calor: InFormate sobre qué hacer

#### Calentamiento global y cambio climático

La temperatura del planeta está aumentando debido a la gran concentración en la atmósfera de gases de efecto invernadero, generados en mayor medida por actividades humanas (consumo de energía y recursos, actividades industriales, deforestación). El aumento de la temperatura trajo aparejado el calentamiento global y con él, eventos climáticos extremos, cuyos impactos son: lluvias torrenciales, granizo, vientos fuertes (sudestadas) inundaciones, varios días sin lluvia, olas de frío y olas de calor.

#### ¿Qué son las olas de calor?



Una ola de calor es un fenómeno climático que se caracteriza por presentar temperaturas extremadamente cálidas. Cuando la temperatura mínima supera los 22°C y la máxima los 32°C, durante al menos 3 días consecutivos, estamos frente a una ola de calor.

#### ¿Qué producen las olas de calor en nuestro cuerpo?

- Dolores de cabeza
- Deshidratación
- Cansancio / Agotamiento
- Elevada temperatura corporal (40° o más)
- Mareos / Nauseas
- Respiración y pulso débiles
- Presión baja / Desmayos



#### ¿Qué hacer si tiene algunos de estos síntomas?

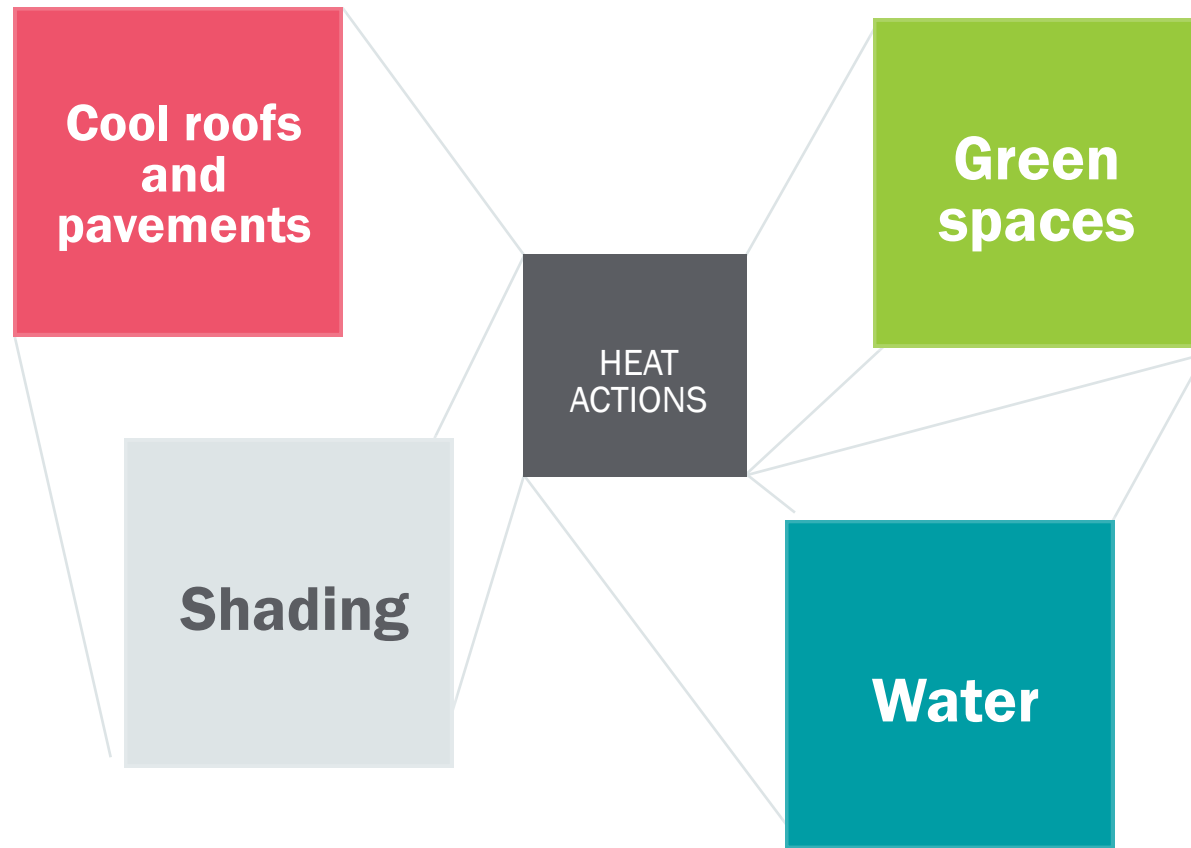
- Pida ayuda
- Llame al SAME al 107
- Tome agua fresca
- Si está en la calle, siéntese en un lugar con sombra, asegúrese estar acompañado, tome agua y espere la atención médica.

#### ¿Qué hacer Frente a las olas de calor o temperaturas muy elevadas?

- Beber abundante agua durante todo el día, aunque no sienta sed
- Evitar exponerse al sol de 11 a 17hs y protegerse usando gorros y sombrillas
- Usar ropa holgada y de colores claros
- Reducir la actividad física
- Permanecer en ambientes frescos, ventilados o acondicionados
- Evitar ingerir comidas abundantes y calóricas; elegir frutas y verduras
- Evitar consumir bebidas calientes, muy azucaradas o con alcohol
- Cuidar especialmente a niños y adultos mayores
- A los lactantes darles el pecho con mayor frecuencia



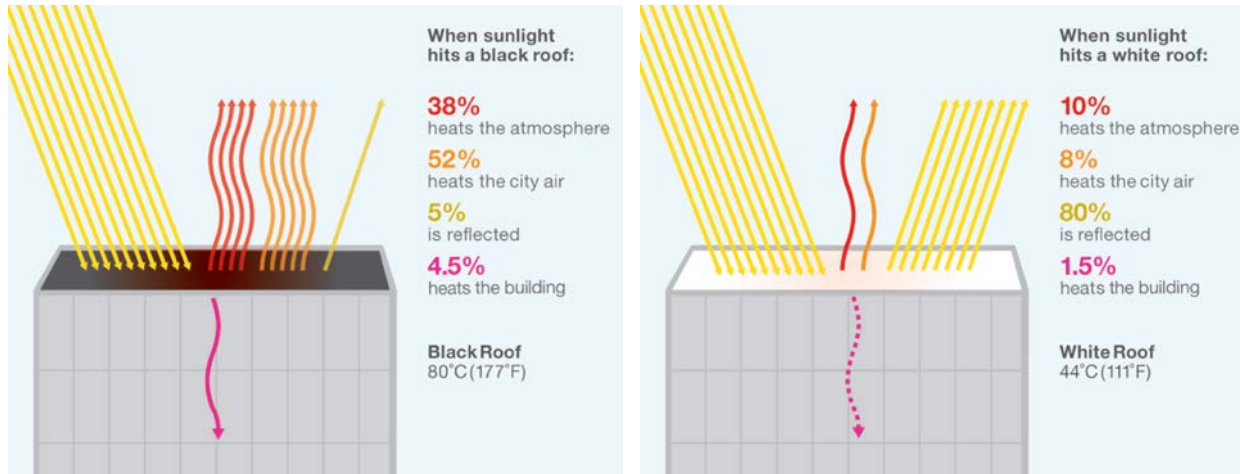
# Long-term cooling actions



### 3. HEAT ACTIONS

Cool roofs  
&  
pavements

## Reducing surface temperatures



Comparison of a black and a white flat roof on a summer afternoon with an air temperature of 37 degrees Celsius.

Source: Adapted from data from LBNL Heat Island Group.

TOKYO

heat-shielding pavement

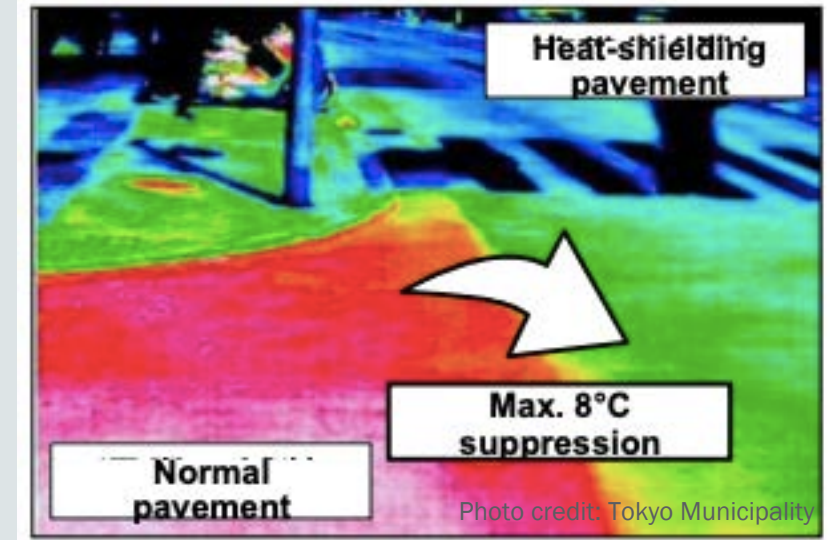
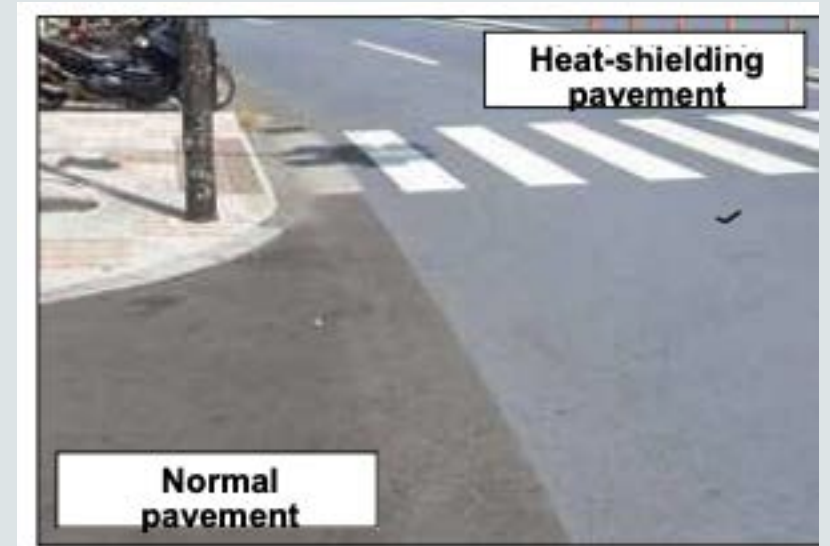


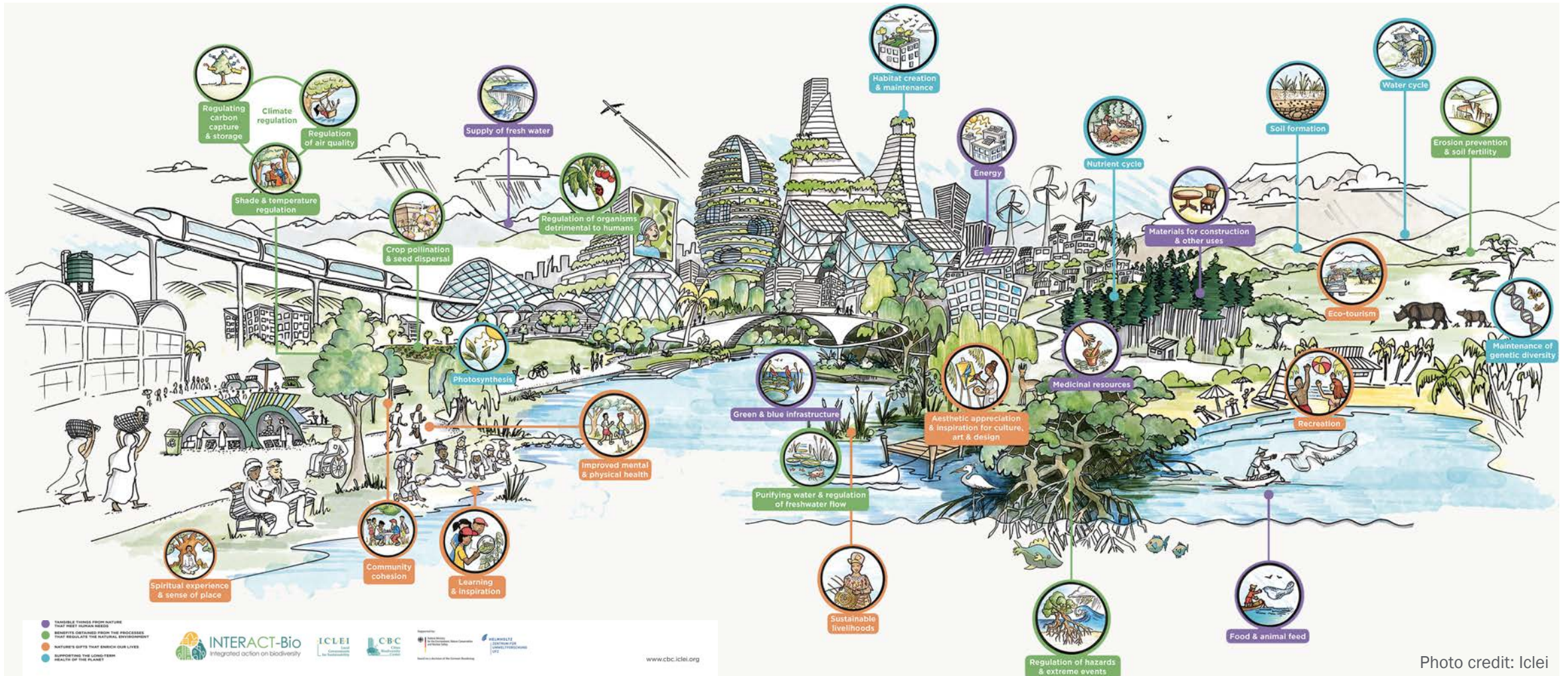
Photo credit: Tokyo Municipality



### 3. HEAT ACTIONS

## Green spaces

# THE VALUE OF NATURE IN URBAN LIFE

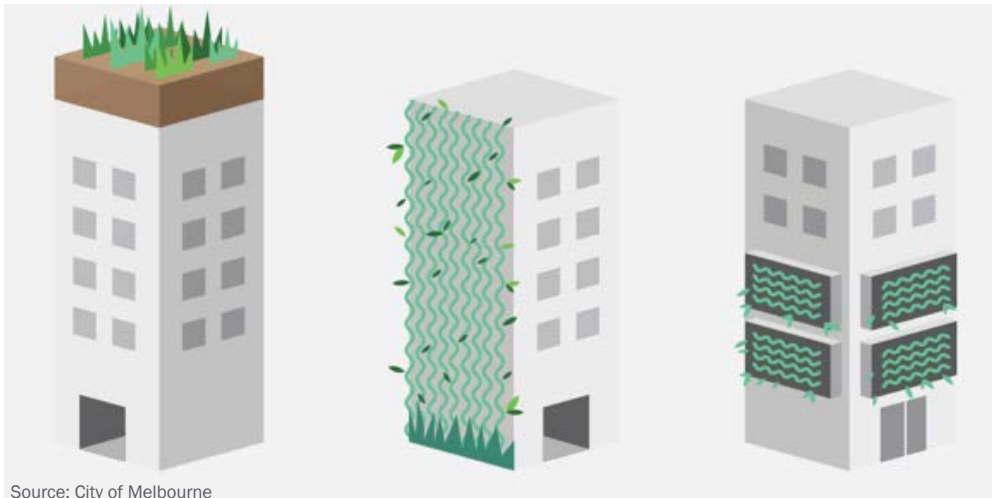




### 3. HEAT ACTIONS

Green spaces

## Green roofs and walls



Source: City of Melbourne

EXTENSIVE  
green roofs

INTENSIVE  
green roofs



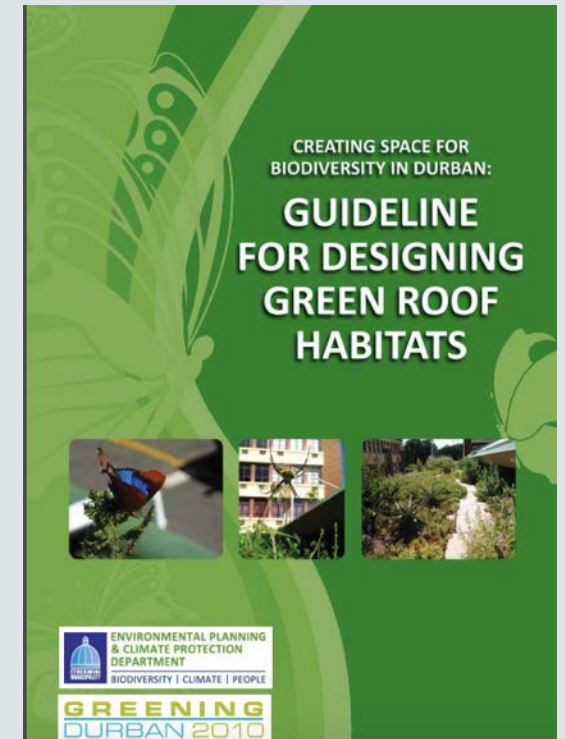
Photo credit: Ecobusiness

## SINGAPORE

“LUSH policy” that regulates and incentivises private building greenery

## DURBAN

“Green Roof Guidance” that provides support for green roofs on residential buildings





### 3. HEAT ACTIONS

## Green spaces

# Urban forests - parks and tree canopy



## SEOUL

The City of Seoul has the goal of creating 1000 forests and 1000 gardens. For example, the City turned a former overpass into a lush public park with over 24,000 plants.



Photo credit: City of Seoul

## ATHENS

Athens has developed a web-based tree inventory, that helps to know the exact costs of maintenance and help to allocate resources appropriately.

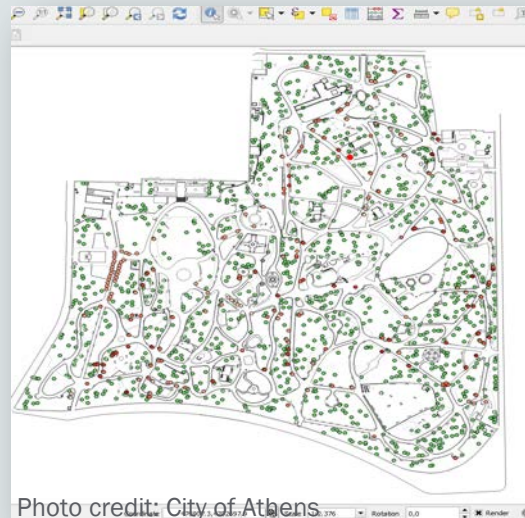


Photo credit: City of Athens

## MEDELLIN

'Green Corridors' - a network of greenery across the city with the aim of reducing UHI effect, and also improving biodiversity and air quality. Trees, shrubs and ground cover have been planted along the main transport axes, riverside as well as marginalised neighbourhoods of Medellín.



Photo credit: City of Medellín

### 3. HEAT ACTIONS

## Shading

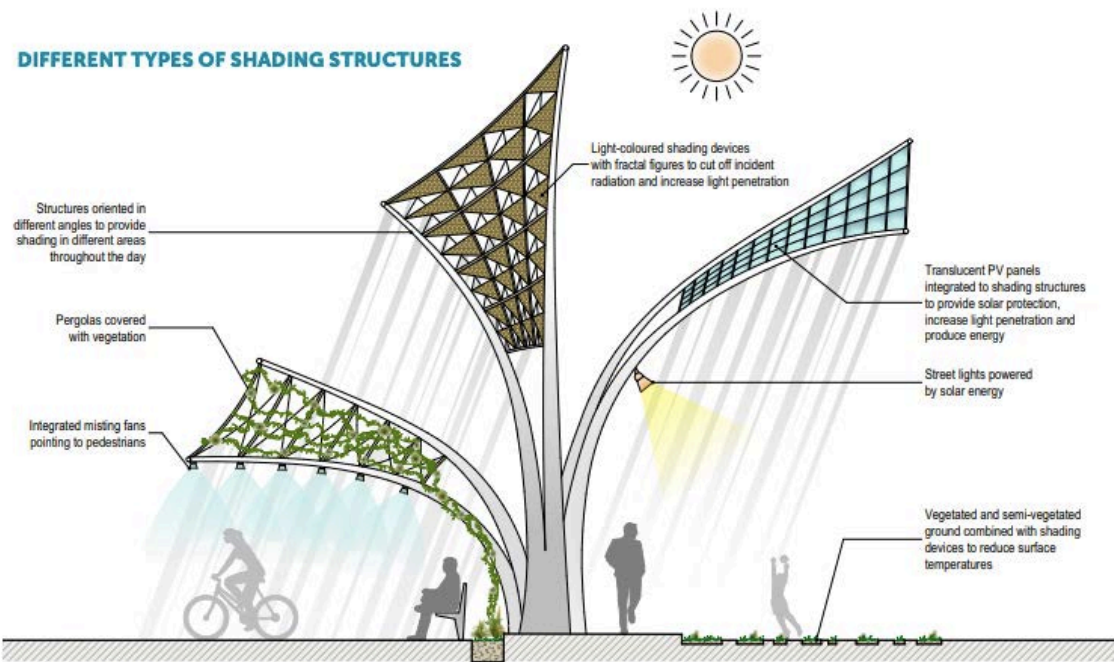


Photo credit: City of Tel Aviv

**TEL AVIV**

Shading Planning  
Guidelines  
& innovation  
competition

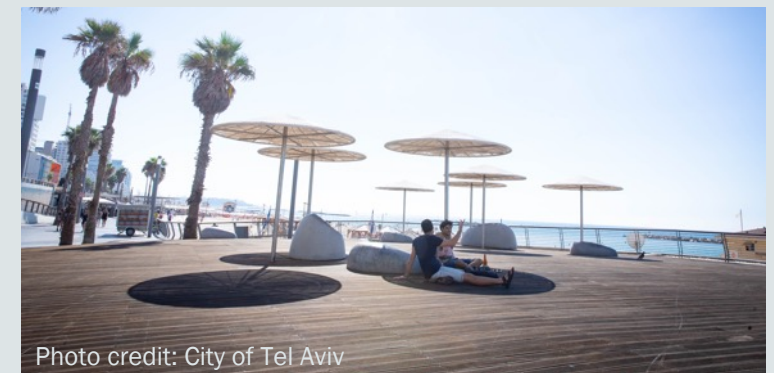


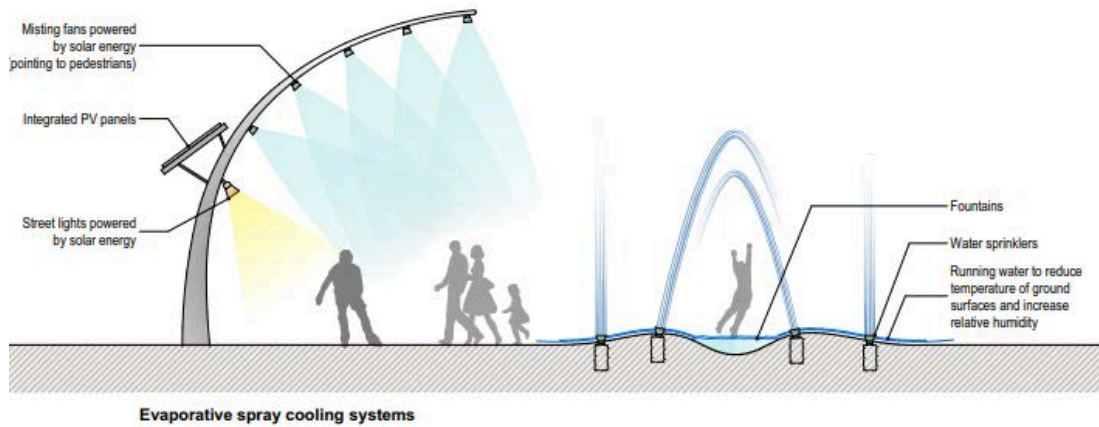
Photo credit: City of Tel Aviv

Source: Guide to Urban Cooling Strategies, CRC Low Carbon Living (2017)



### 3. HEAT ACTIONS

Water



Source: Guide to Urban Cooling Strategies, CRC Low Carbon Living (2017)

## CAPE TOWN

Water spray parks



Photo credit: City of Cape Town



Photo credit: City of Cape Town



04.

## INTEGRATING HEAT IN OTHER SECTORS

---



Photo credit: SCPR

# Mitigation & Adaptation



## MITIGATION:

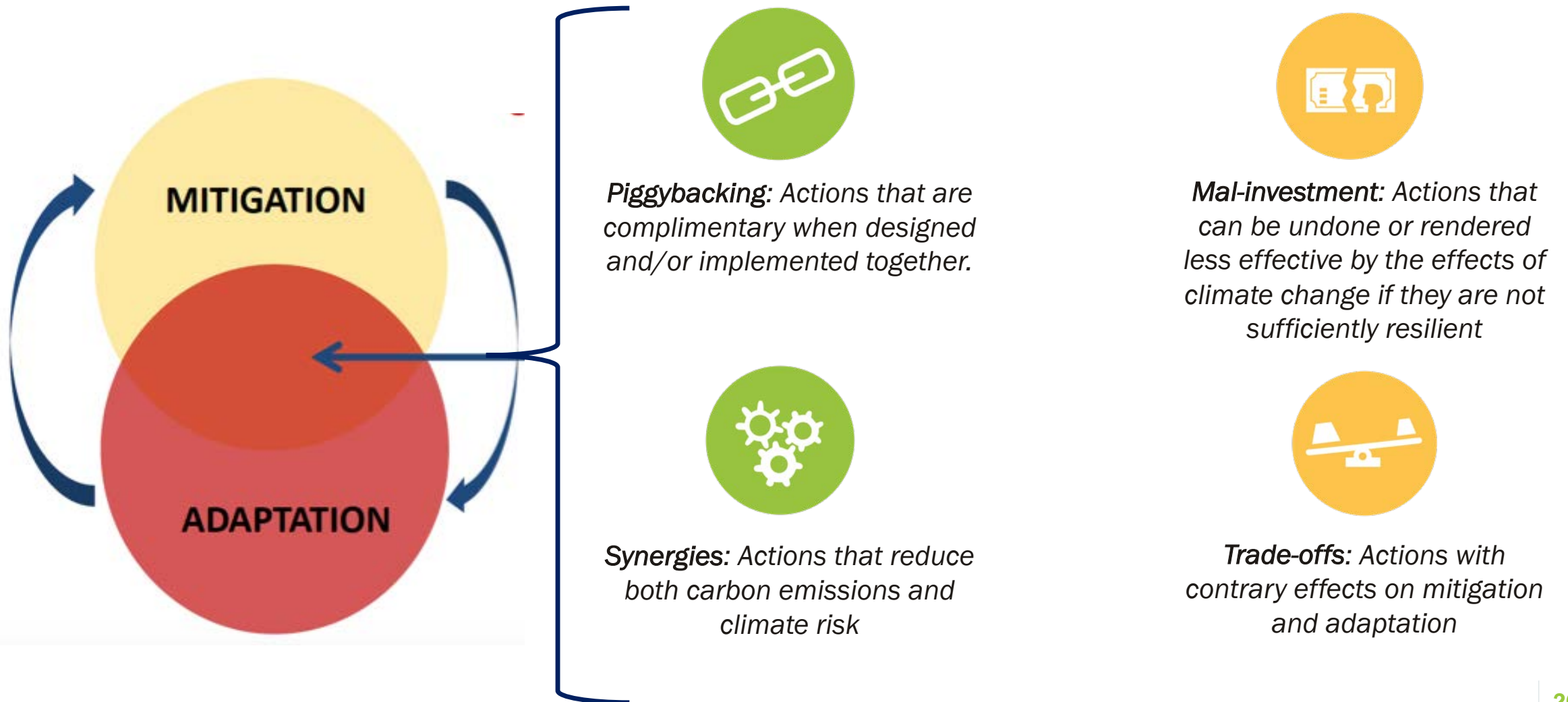
**ACTIONS TO REDUCE GREENHOUSE GAS EMISSIONS (GHG)**



## ADAPTATION:

**ACTIONS TO REDUCE THE IMPACTS OF EXTREME WEATHER EVENTS**

# Types of interactions





# C40 Resources:

...available on C40 Knowledge Hub  
[www.c40knowledgehub.org](http://www.c40knowledgehub.org)

For example:

- “Understanding Infrastructure Interdependencies in Cities” (2019)
- “The Future We Don’t Want” Report (2018)
- Adaptation Integration Guides (*Clean Energy Systems, Municipal Buildings Efficiency, Private Buildings Efficiency, New Buildings, Mass Transit, Walking & Cycling, Food Systems, Waste Systems*)
- Heat Communications Toolkit (2020)



## Climate change mitigation & adaptation

In response to climate change, cities around the world are already implementing ambitious actions to reduce emissions (mitigation) alongside efforts to increase their climate resiliency (adaptation), to protect citizens and infrastructure against current and future extreme weather events. 70% of C40 cities already experience the effects of climate change, and the main climate hazards cities are reporting are:



It is crucial that the investments cities make in the transition towards zero carbon are resilient to the current and future climate and extreme weather events. While good functioning transport plays a crucial role in cities for accessing education, employment and essential services, at the same time, transportation systems are highly vulnerable to extreme weather events, which are predicted to increase in intensity and frequency with global climate change.

## What does climate change mean for Mass Transit Systems?

Transport planners have the responsibility to plan, develop and run a public transport system in their cities that aims for zero carbon emission AND that are resilient to those changing climate impacts. The collaboration between transport planners with the Climate Adaptation or Resilience teams in each city is crucial to ensure that mass transit projects are adapted to climate change and working correctly during critical events.

Integrating climate adaptation consideration in public transit systems ideally starts at the planning stage of transportation projects. As shown in the figures below, after the climate risks are identified, suitable adaptation actions are

implemented and monitored hand-in-hand with the mass transit project. However, adaptation should not only be considered at the beginning stages of a project, but can also be 'added on' to already existing Mass Transit infrastructure. Effectively adapted and resilient transit systems infrastructure can also play the role of climate shelters, that is, of safe and comfortable places which the population can rely upon during an extreme weather event.



## Climate change mitigation & adaptation

In response to climate change, cities around the world are already implementing ambitious actions to reduce emissions (mitigation) alongside efforts to increase their climate resiliency (adaptation), to protect citizens and infrastructure against current and future extreme weather events. 70% of C40 cities already experience the effects of climate change, and the main climate hazards cities are reporting are:



It is crucial that the investments cities make in the transition towards zero carbon are resilient to the current and future climate and extreme weather events. Cities failing to integrate climate change adaptation into investments in clean energy, buildings, transport, waste and other key sectors risk mal-investment and missed opportunities. Early consideration of climate hazards and potential responses can therefore reduce risk for building owners and does not necessarily need to add cost to projects.

## What does climate change mean for Municipal Buildings Efficiency?

Buildings face major risks of damage from the projected impacts of climate change. The location of a building is key to its vulnerability as increasingly severe flooding events can cause damage to buildings materials and structures. With rising temperatures and more frequent heat waves, the energy demand for the cooling of buildings is expected to rise, and also has implications in buildings design (using more passive cooling). And expected sea level rise and storms puts buildings by the seashore at risk of damage.

At the same time, energy consumed in buildings accounts for around 50% of C40 city emissions, on average, and as much as 75% for many cities. Cities have a high degree of control over their municipal buildings, meaning they can directly introduce energy efficiency improvements, reduce energy consumption, cut their emissions, save public money and adapt with these actions to climate change. Action is needed to retrofit and upgrade municipal buildings, which can in turn act as flagships to pilot new ideas, demonstrate leadership, and inspire other building owners and users.

As cities begin to lay out pathways to Paris Climate Agreement compliant Climate Action Plans through Zoning 2022 and declarations such as the Zero Carbon Buildings Declaration there is the increasingly recognition that the deep retrofits of municipal buildings provides the ideal opportunity for

systematically integrating adaptation measures within these valuable public assets, not only securing the future viability of these buildings, but also strengthening the security and resilience of the communities they host and neighbour.



## UNDERSTANDING INFRASTRUCTURE INTERDEPENDENCIES IN CITIES







---

# Thank you!

## **Contact**

Regina Vetter

Cool Cities Network Manager, C40

[rvetter@c40.org](mailto:rvetter@c40.org)

**C40**  
CITIES