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Platform for  
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Cities

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# Risk assessment & adaptation-mitigation interactions

Jana Davidova,  
Programme Manager, Climate Accelerated Delivery, C40



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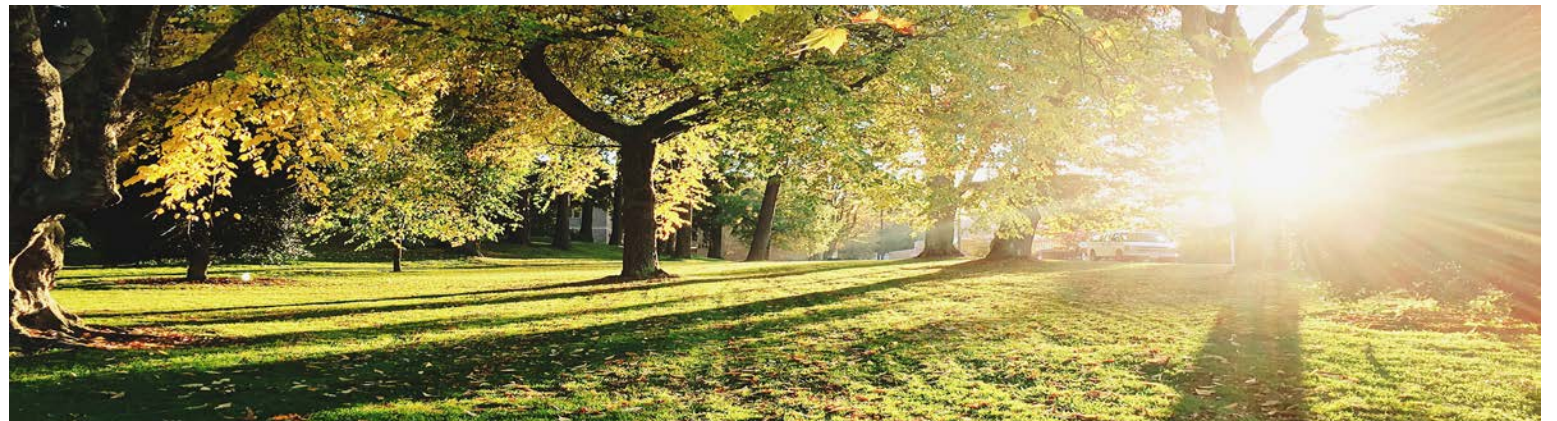


Why is it key to integrate mitigation & adaptation considerations throughout climate planning?



**MITIGATION:**

**ACTIONS TO MITIGATE CLIMATE CHANGE BY REDUCING GREENHOUSE GAS EMISSIONS**



**ADAPTATION:**

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

## 2019 Cities Impacts

Durban 22<sup>nd</sup> April:

**70 DEATHS**

**> 45 \$ MILLIONS DAMAGE**



Rio de Janeiro 06<sup>th</sup> February:

**06 DEATHS**

**> 50 \$ MILLIONS DAMAGE**



Washington DC 8<sup>th</sup> July:

**Highest hourly precipitation report  
in records dating back to 1936**



## Extreme weather impacts on C40 cities in 2018

### General statistics:

- Created and led by cities, C40 is a group of over 94 world leading cities, representing over 700 million people and 1/4 of global economy.
- Over 90% of C40 cities are already experiencing climate impacts
- 81 out of 94 C40 cities have experienced extreme weather events in 2018, including extreme temperatures, heavy storm and high precipitation, flooding, drought, landslides, forest fire /wildfire.

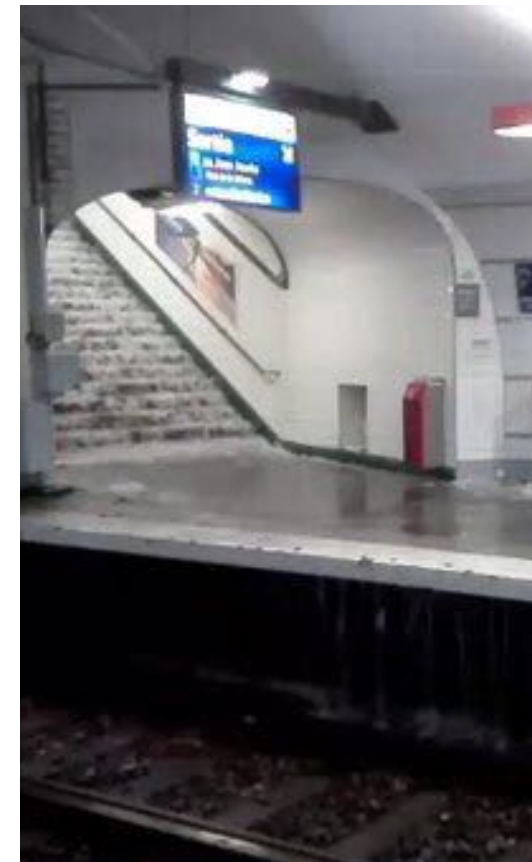
# Why to identify & address mitigation/adaptation interactions?



Washington D.C. 2016



Madrid 2017



Paris 2017

# Climate Action Planning – Consider mitigation & adaptation



# Climate Risks



# CLIMATE HAZARDS

- DIRECT VS INDIRECT
- PHYSICAL, CHEMICAL OR BIOLOGICAL EVENTS

“A climate hazard is:

A short or long-term climate event that has the potential to cause damage or harm to human and natural systems.”

“Each hazard is characterized by its location, intensity, frequency and probability. Understanding the nature and likelihood of such hazards is critical to individual and community safety” (UNISDR, 2009).

**Table 1.** Please identify the most significant climate hazards faced by your jurisdiction (m) and complete the questions to the right for each one.†

HAZARDS <sup>16</sup> (grouped under headers, can report on multiple across the table)	CURRENT hazard RISK level (dropdown for each hazard selected)	
	Probability of Hazard <sup>17</sup> (m)	Consequence of hazard (m)
<b>Extreme Precipitation</b>		
Rain storm	<input type="radio"/> High <input type="radio"/> Moderate <input type="radio"/> Low <input type="radio"/> Do not know	<input type="radio"/> High <input type="radio"/> Moderate <input type="radio"/> Low <input type="radio"/> Do not know
Monsoon	[dropdown as above]	[dropdown as above]
Heavy snow	[dropdown as above]	[dropdown as above]
Fog	[dropdown as above]	[dropdown as above]
Hail	[dropdown as above]	[dropdown as above]
<b>Storm and wind √</b>		
Severe wind	[dropdown as above]	[dropdown as above]
Tornado	[dropdown as above]	[dropdown as above]
Cyclone (Hurricane / Typhoon)	[dropdown as above]	[dropdown as above]



## CLIMATE RISK = PROBABILITY \* IMPACT

### **Probability is identified per event, e.g.**

- 50mm rainfall in 2 hrs
- Day above 40 degrees

E.g. a 1:100 year rain event

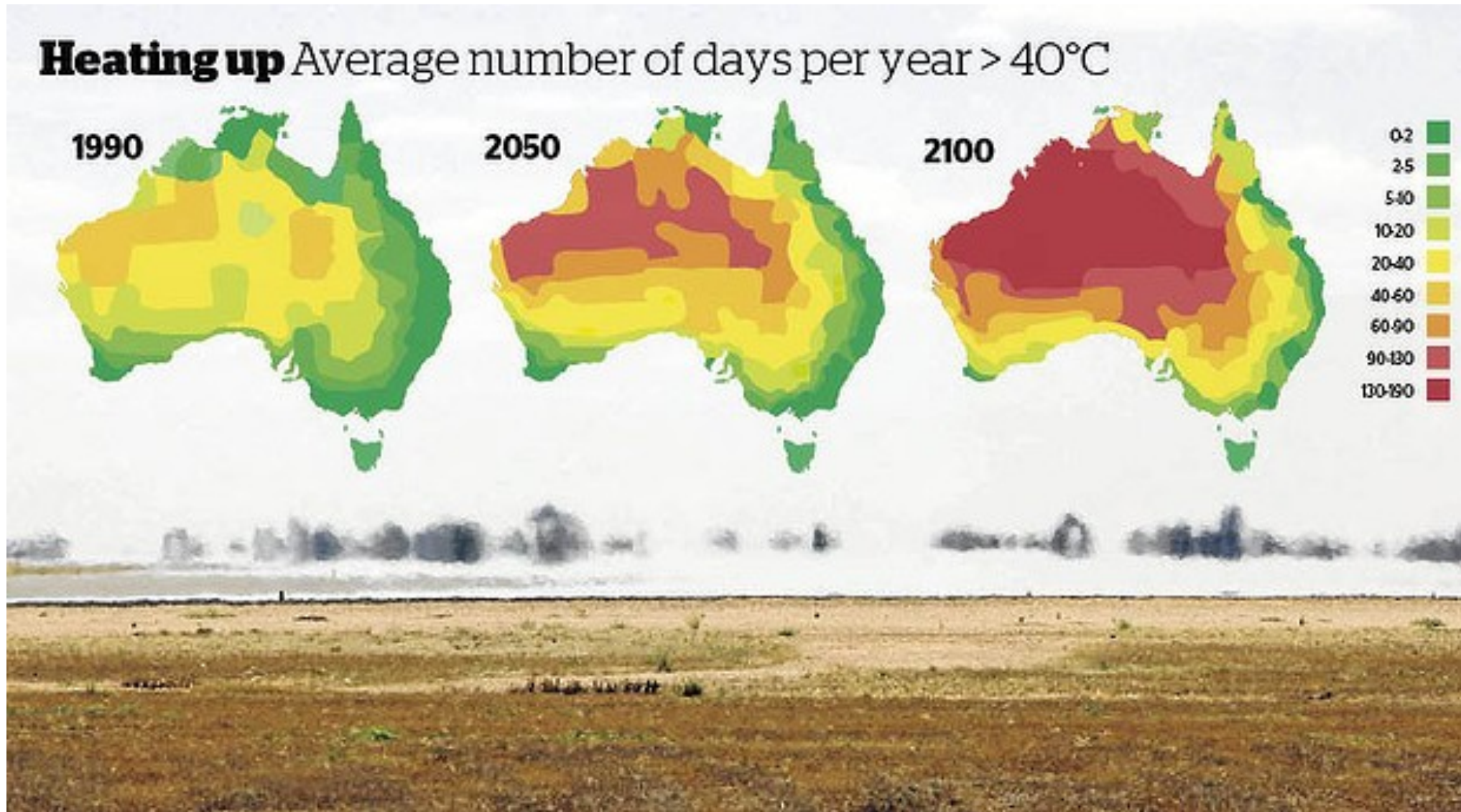
Can be multiplied (storm \* high tide)

### **Impact depending on**

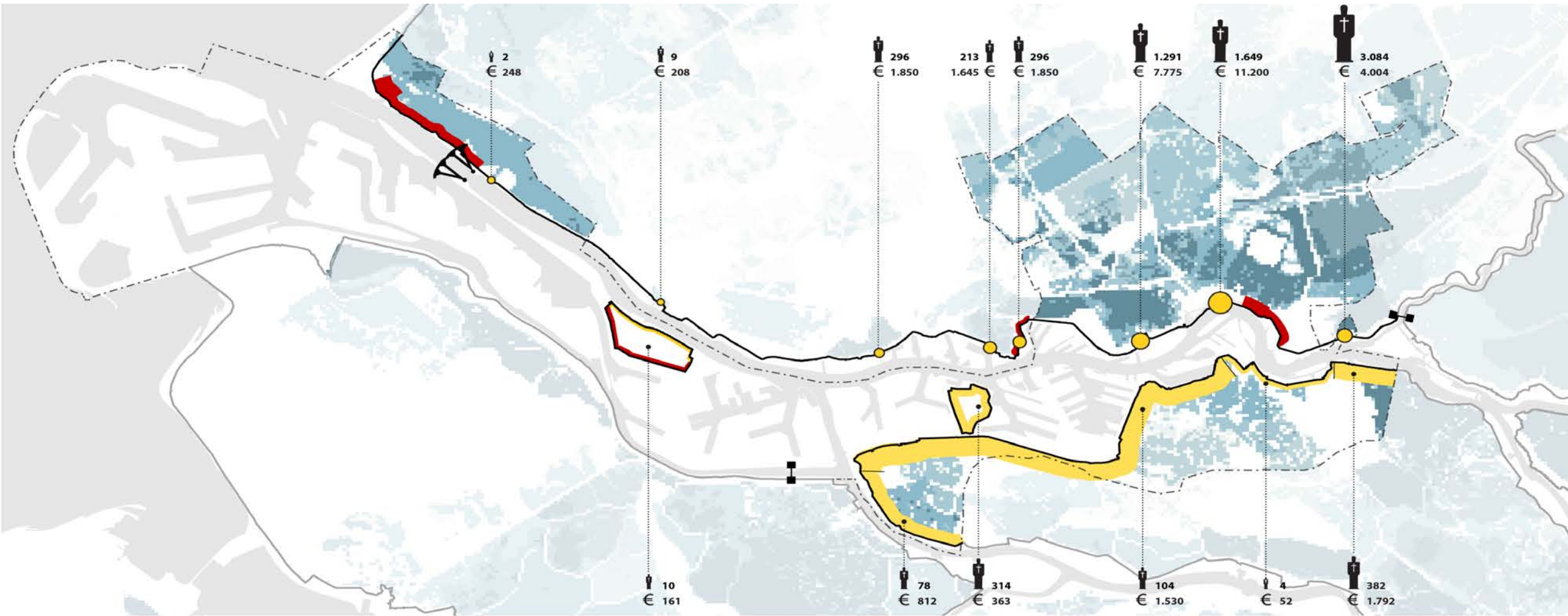
- Economic value (assets)
- Population
- Systems (hard and soft)
- Institutions (robustness)



## Risk: Example climate map (PROBABILITY)



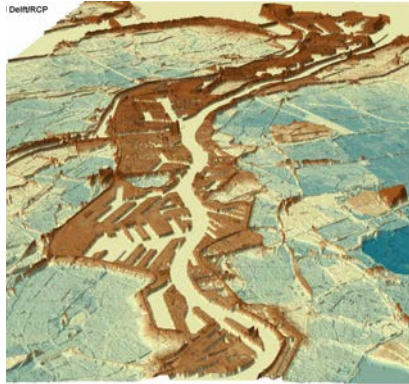
## Risk: Example flooding map (IMPACT)



# RISK: WHAT'S ACCEPTABLE?



**VARIES PER CITY**



**VARIES WITHIN A CITY**



**VARIES WITHIN POPULATION GROUPS**



**DEPENDS ON COSTS**

Hence there's no adaptation equivalent for "carbon neutral".  
What's considered "climate resilient" is a political choice.

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## **RISK: Changing impacts**

- ~ **RAPID URBANISATION**
- ~ **DEMOGRAPHIC TRENDS**
- ~ **SOCIO-ECONOMIC TRENDS**
- ~ **POLITICAL TRENDS**



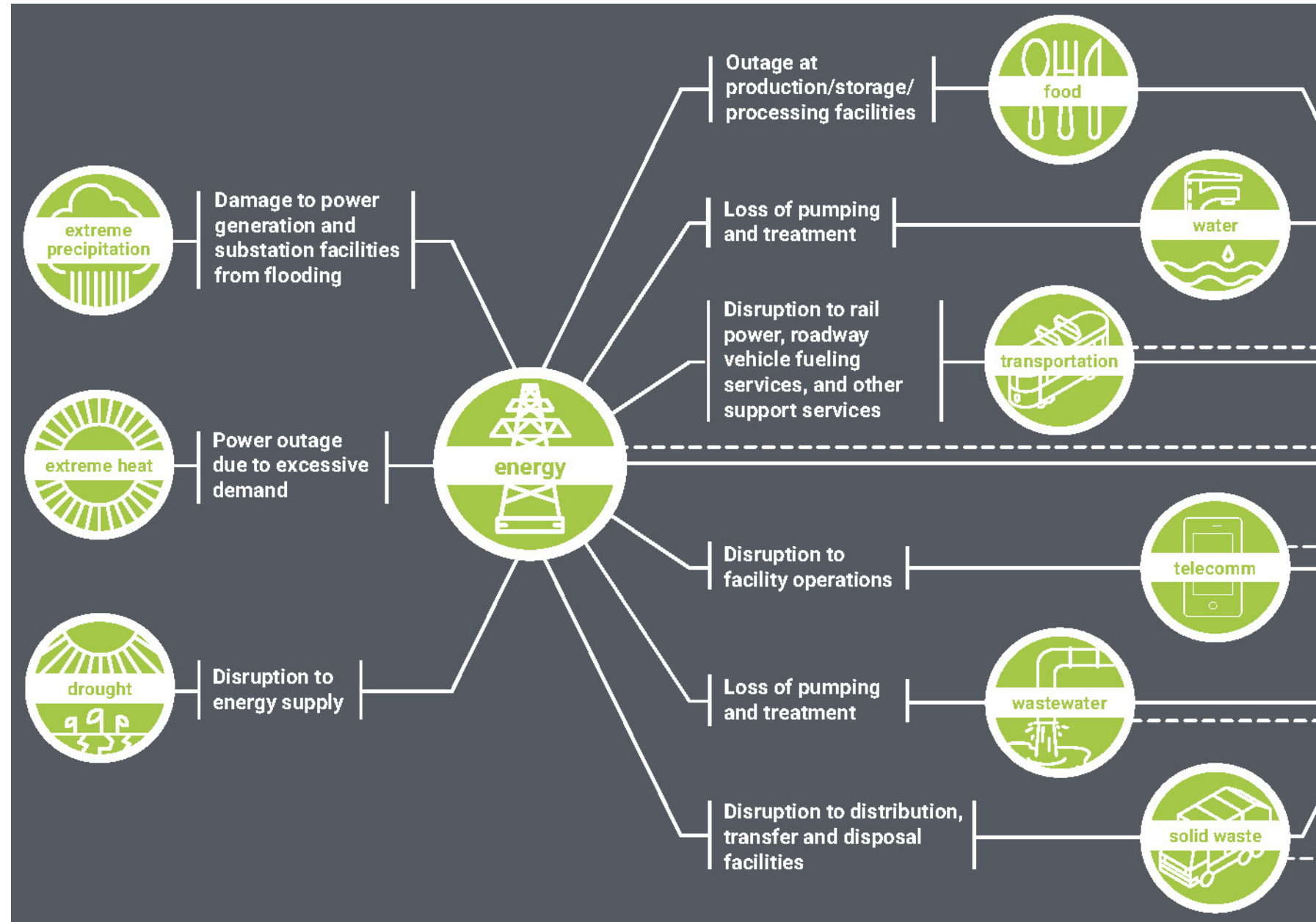
## RISK: Cities and high-risk sites

### WHY CITIES DEVELOP ON HIGH RISK SITES?

- HISTORIC REASONS (FOUNDATION OF CITY)
- ORIGINAL CITY SITE HAS OUTGROWN
- DEVELOPMENTS CAN CREATE NEW RISKS
- LOW-INCOME POPULATION NEED HOUSING NEAR LIVELIHOODS OPPORTUNITIES,
- BUILT AREAS RARELY RELOCATE.
- WEALTHIER GROUPS/COMPANIES LOW RISK



# RISK: interdependencies of systems and cascading failures



# Climate Risk Assessment – How? How often?

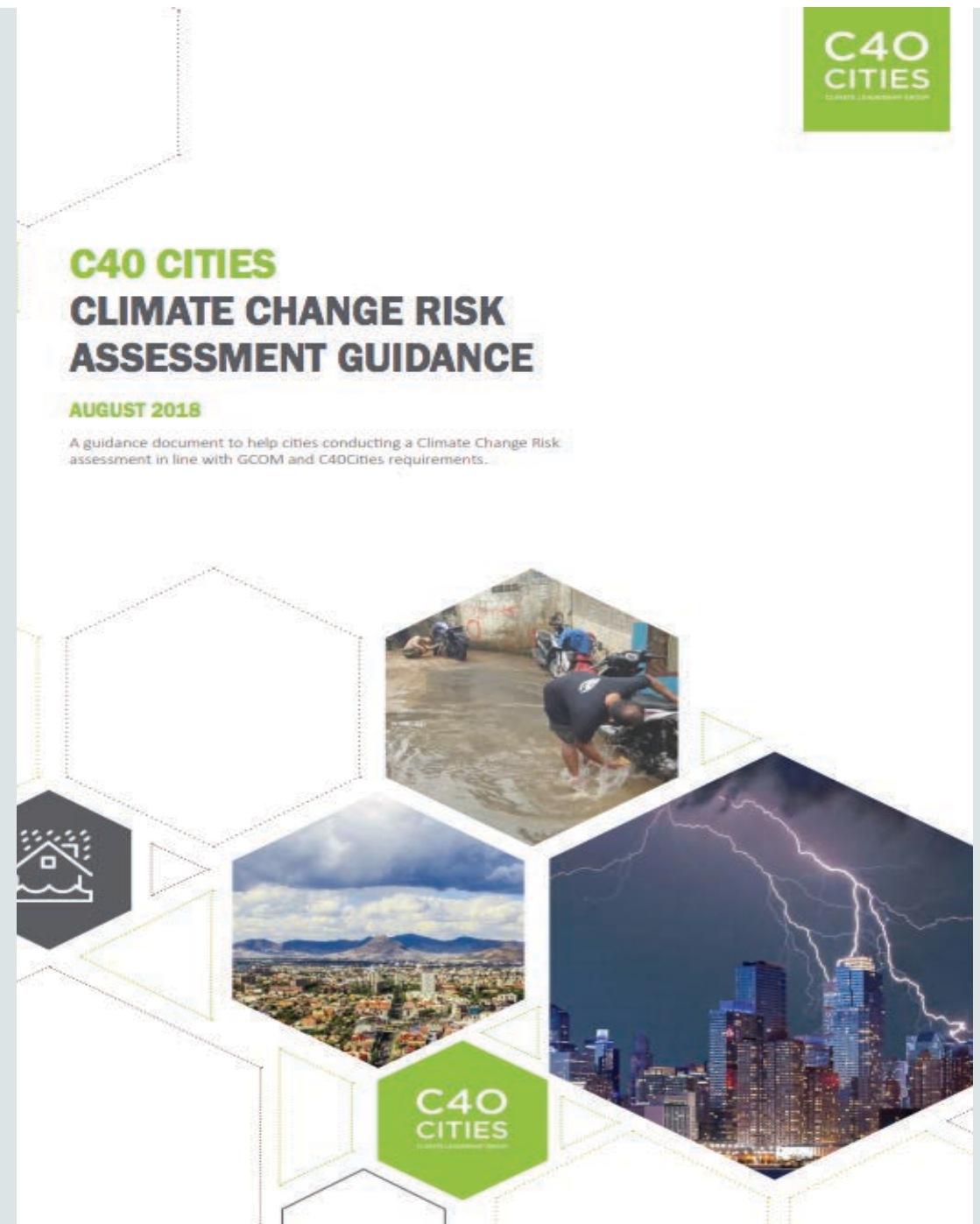


[Report available here](#)



# Risk assessment guidance

- **COMPATIBLE WITH THE GLOBAL COVENANT OF MAYORS (GCOM) AND C40 CLIMATE ACTION PLANNING FRAMEWORK:**
- **# Essential components, which GCOM and C40 Climate Action Planning Framework define as crucial for the assessment.**
- **# Best practices, for highly recommended items.**
  
- **CAN SERVE AS RFP**
- **FIND GUIDANCE [HERE](#)**



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# How to conduct a Risk Assessment?

## 1. DEFINE THE CONTEXT:

- Goals & objectives: what would be considered success
- Identify existing and potential resources
- Identify relevant stakeholders

## 2. ENGAGE STAKEHOLDERS AND FORM AN INTERDISCIPLINARY TEAM

## 3. IDENTIFY, ANALYZE AND EVALUATE RISKS:

- Examine existing methods for assessing and managing risks
- Research each of the risks: likelihood, consequence, frequency
- Prioritize climate risks

## 4. CREATE RISKS AND VULNERABILITIES MAP



## 5. ASSESS AND DEVELOP OPTIONS:

- How different climate hazards will impact the city
- Which assets will be affected, where?
- How impacts in specific assets will affect others (Interdependencies Assessment)

### NOTE

- **REITERATIVE ASSESSMENT OF RISKS AND ADAPTATION STRATEGIES IS STRONGLY SUGGESTED TO ASSURE NO UNDERESTIMATION OF RISKS, OR OVERLOOKING AN INCREASINGLY PRESENT CLIMATE HAZARD.**

## In Summary

- **Probability x Impact = Risk**  

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- **Probability x Impact = Risk**  

- **Probability x Impact – Adaptive Capacity = Risk**

### Risk definition

**The probability of climate hazard increases with climate change**

**But the impact also increases with the development of cities**

**And impacts are interdependent**

**Adaptive Capacity reduces the risks**

# Integrating Mitigation & Adaptation – Benefits and Climate Proofing





**TYPES OF  
INTERACTIONS**

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**Piggybacking  
opportunities**



**Potential  
mal-investment**



**Synergies**



**Trade-offs**

# WHAT ARE THE ADAPTATION-MITIGATION INTERACTIONS?



*EV charging point  
Mal-investment*



*Air Conditioning  
Trade Off*

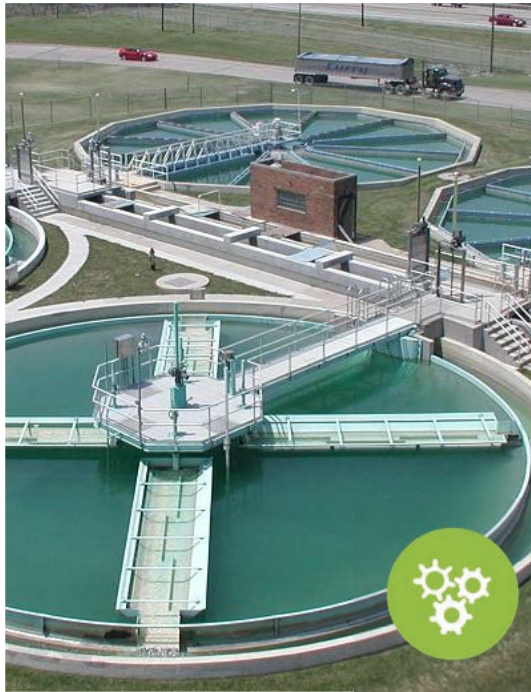


*Flood-sensitive cycling  
lanes  
Piggybacking*



*Green infrastructure  
Synergies*

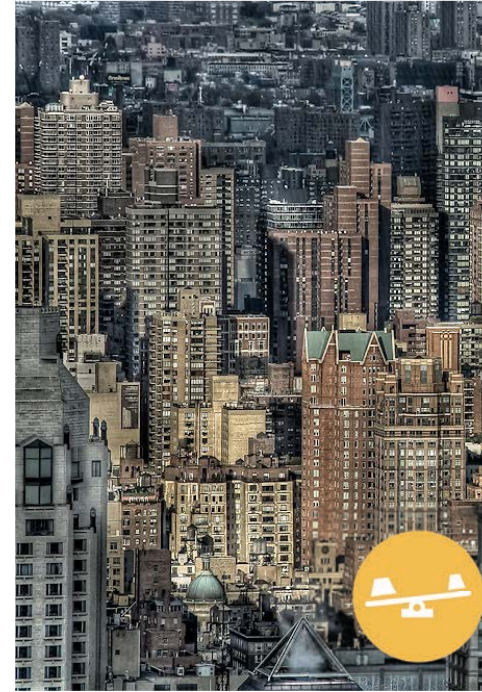
# Examples : Transport, Waste, Heat and Flooding



*Durban  
Wastewater reuse  
for industries*



*Melbourne  
Cycling water  
sensitive Lanes*



*Compact or wide  
cities?*



*Rotterdam EV-  
charging point*

# The Adaptation Mitigation Interaction Assessment Tool

C4O  
CITIES

Welcome!

## Adaptation and Mitigation Interaction Assessment Tool

This tool is designed to assist cities in maximizing synergies and minimizing counter-productive interactions between their climate change mitigation and adaptation plans and actions.

You will provide a list of mitigation and adaptation actions (measures, projects, programs, or strategies), and the tool will assess interactions



**Synergies:** Actions that reduce both carbon emissions and climate risk.



**Trade-offs:** Actions with contrary effects on mitigation and adaptation, i.e., mitigation actions that increase risk or adaptation actions that increase emissions.



**Mal-investment:** Actions that can be undone or rendered less effective by the effects of climate change if they are not sufficiently resilient.



**Piggybacking:** Actions that are complementary when designed and/or implemented together, e.g., projects with opportunities to add additional mitigation or adaptation actions at a small marginal cost.

Start



# The Adaptation Mitigation Interaction Assessment Tool

C4O  
CITIES

AMIA

Introduction

Set-up

Results

Case Studies &  
Examples

Directions

In this sheet, you select adaptation and mitigation actions for the tool to analyze. Move actions you wish to analyze from the Selection List on the left to the Analysis List on the right, and then click "Analyze Actions."

## Adaptation Action Selection

Climate Hazard Filter

Flooding

Category Filter

Hard engineering

Clear Filters

Search

Clear Search

Levee/dike construction and heightening  
Multifunctional flood defenses  
Stilted/floating buildings  
Storm surge barriers  
Pumping stations

Select All

Unselect All

Add to Analysis

## Analysis List: Adaptation and Mitigation Actions

Storm surge barriers  
Multifunctional flood defenses  
Levee/dike construction and heightening

Analyze Actions

Clear Selected

Clear All

## Mitigation Action Selection

Sector Filter

All

Category Filter

All

Clear Filters

Search

Energy Storage

Clear Search

Energy storage (grid scale)  
Energy storage (district scale)  
Energy storage (building scale)

Select All

Unselect All

Add to Analysis

# The Adaptation Mitigation Interaction Assessment Tool

1

## Adaptation Action Selection

Climate Hazard Filter **Flooding**

Category Filter **Hard engineering**

Search

Levee/dike construction and heightening  
Multifunctional flood defenses  
Stilted/floating buildings  
Storm surge barriers  
Pumping stations



# The Adaptation Mitigation Interaction Assessment Tool

2

## Mitigation Action Selection

**Sector Filter**

All

**Category Filter**

All

**Search**

Energy Storage

Energy storage (grid scale)  
Energy storage (district scale)  
Energy storage (building scale)



# The Adaptation Mitigation Interaction Assessment Tool

3

The screenshot displays the 'Analysis List: Adaptation and Mitigation Actions' interface. On the left, there are two identical sets of control buttons. The top set includes 'Clear Filters', 'Clear Search', 'Select All', 'Unselect All', and a large grey arrow labeled 'Add to Analysis'. The bottom set includes 'Clear Filters', 'Clear Search', 'Select All', 'Unselect All', and another large grey arrow labeled 'Add to Analysis'. The central panel, titled 'Analysis List: Adaptation and Mitigation Actions', contains a scrollable list of three items: 'Storm surge barriers', 'Multifunctional flood defenses', and 'Levee/dike construction and heightening'. On the right side of the interface, there are three buttons: 'Analyze Actions' (a grey button), 'Clear Selected', and 'Clear All'.

# Q&A





# EXERCISE

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## EXERCISE : MITIGATION/ADAPTATION INTERACTIONS

1. What mitigation plans and policies are developed and implemented in your city **that could be mal-investments** if not climate resilient?
2. Which mitigation plans and projects in your city do you think adaptation could **piggyback** on?

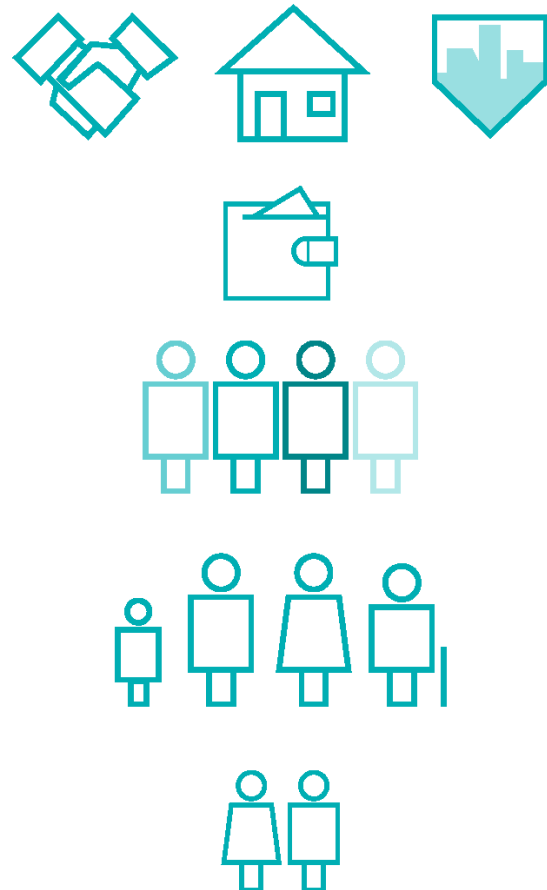


Climate Action	Piggybacking opportunities	Synergies	Risk of malinvestment	Trade-off



# WHO AND HOW WILL THE PEOPLE BE IMPACTED?

STAKEHOLDER TYPE
INCOME LEVEL
RACE AND ETHNICITY
AGE CATEGORY
SEX



GENDER AND SEXUALITY
DISABILITY
ECONOMIC ACTIVITY
AREAS OF THE CITY
MIGRATION STATUS

