Risk assessment & adaptation-mitigation interactions

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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 22nd April:
70 DEATHS
> 45 $ MILLIONS DAMAGE

Rio de Janeiro 06th February:
06 DEATHS
> 50 $ MILLIONS DAMAGE

Washington DC 8th 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 ¼ 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?

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).
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)

Heating up Average number of days per year > 40°C

1990  2050  2100
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.
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
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 $\times$ Impact = 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

- Probability $\times$ Impact – Adaptive Capacity = Risk
Integrating Mitigation & Adaptation – Benefits and Climate Proofing
TYPES OF INTERACTIONS

- Piggybacking opportunities
- Synergies
- Potential mal-investment
- 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

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.

[https://resourcecentre.c40.org/resources/interaction-between-adaptation-and-mitigation-actions](https://resourcecentre.c40.org/resources/interaction-between-adaptation-and-mitigation-actions)
The Adaptation Mitigation Interaction Assessment Tool (AMIA) is a tool designed to help select adaptation and mitigation actions for analysis. Users can move actions they wish to analyze from the Selection List on the left to the Analysis List on the right, and then click “Analyze Actions.” The tool allows users to filter actions by climate hazard, sector, and category. Examples of climate hazards include flooding and storm surge barriers, while sectors could be energy storage and multifunctional flood defenses.
The Adaptation Mitigation Interaction Assessment Tool

<table>
<thead>
<tr>
<th>Adaptation Action Selection</th>
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</thead>
<tbody>
<tr>
<td>Climate Hazard Filter: Flooding</td>
</tr>
<tr>
<td>Search</td>
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<tr>
<td>Levee/dike construction and heightening</td>
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<tr>
<td>Multifunctional flood defenses</td>
</tr>
<tr>
<td>Stilted/floating buildings</td>
</tr>
<tr>
<td>Storm surge barriers</td>
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<tr>
<td>Pumping stations</td>
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</tbody>
</table>
The Adaptation Mitigation Interaction Assessment Tool

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

Analysis List: Adaptation and Mitigation Actions

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

Buttons:
- Clear Filters
- Clear Search
- Select All
- Unselect All
- Add to Analysis

Buttons:
- Analyze Actions
- Clear Selected
- Clear All
EXERCISE
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?
<table>
<thead>
<tr>
<th>Climate Action</th>
<th>Piggybacking opportunities</th>
<th>Synergies</th>
<th>Risk of malinvestment</th>
<th>Trade-off</th>
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### WHO AND HOW WILL THE PEOPLE BE IMPACTED?

<table>
<thead>
<tr>
<th>STAKEHOLDER TYPE</th>
<th>GENDER AND SEXUALITY</th>
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<tbody>
<tr>
<td>INCOME LEVEL</td>
<td>DISABILITY</td>
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<tr>
<td>RACE AND ETHNICITY</td>
<td>ECONOMIC ACTIVITY</td>
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<tr>
<td>AGE CATEGORY</td>
<td>AREAS OF THE CITY</td>
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<tr>
<td>SEX</td>
<td>MIGRATION STATUS</td>
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(C40 CITIES)