Urban Climate Policies and Practices in Latin America and Korea

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I. Integration of Mitigation and Adaptation in Urban Climate Action Plans in Latin America
(Kim, H. and Grafakos, S., 2019)

• Integration of Mitigation and Adaptation (M+A)
  - Level of integration M+A

• 44 Latin American Cities
  - Factors potentially influencing the level of the integration of M+A

II. Climate Adaptation Technologies in Korean Cities
(Kim, H., 2021)

• Korean Policies related to Climate Adaptation Technologies

• Adaptation Technologies Applied in the 3 Major Cities in Korea
Integration of Mitigation and Adaptation in Urban Climate Action Plans in Latin America

(Kim, H. and Grafakos, S., 2019)
Background

CO2
75 to 80% contribution
(Satterthwaite, 2008)

City

Urban population rate 81%
(UN DESA, 2018)

LAC region

By 2030, additional 5% extreme poverty rate in the LAC
(Hallegatte, et al., 2016)

City-level actions to mitigate and adapt to climate change

Climate change + Climate-related disasters
“A portfolio of adaptation and mitigation measures can diminish the risks associated with climate change ... Analysis of the interrelationships between adaptation and mitigation may reveal ways to promote the effective implementation of adaptation and mitigation actions.” (IPCC WGII, 2007. pp70-73)

“Integration of adaptation and mitigation into planning and decision-making can create synergies with sustainable development (high confidence)... Significant co-benefits, synergies, and trade-offs exist between mitigation and adaptation and among different adaptation responses; interactions occur both within and across regions” (IPCC WGII Part A, 2014. p184)

Synergies and trade-offs of adaptation and mitigation will be included in AR6 (IPCC, 2017)
Examples of interrelationships between M+A

<table>
<thead>
<tr>
<th>Type of interrelationship</th>
<th>Action/measure</th>
<th>Primary objective</th>
<th>Interrelationship explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-benefit</td>
<td>District heating and cooling system</td>
<td>Mitigation</td>
<td>District cooling can be used also in warm months to adapt to high temperatures</td>
</tr>
<tr>
<td>Synergy</td>
<td>Construction of green walls and rooftops</td>
<td>Adaptation and mitigation</td>
<td>Green walls and rooftops increase energy efficiency of buildings and decrease water run off</td>
</tr>
<tr>
<td>Conflict</td>
<td>Densification of urban structure</td>
<td>Mitigation</td>
<td>Dense urban structure reduces green areas suitable for natural flood protection measures</td>
</tr>
<tr>
<td>Trade-off</td>
<td>Urban zoning</td>
<td>Adaptation or mitigation</td>
<td>Challenges to set priorities in urban planning due to space limitations in cities</td>
</tr>
</tbody>
</table>

(Source: Grafakos et al. 2019)
# Level of Integration of M+A

## Analytical Framework (Grafakos et al. 2019)

Table A3. Evaluation framework for the level of integration of mitigation and adaptation in CCAPs (IMA Index). Reproduced from Grafakos et al CC BY 4.0 ©The Author(s) 2019.

<table>
<thead>
<tr>
<th>Stage of planning</th>
<th>Component</th>
<th>Indicators (23)</th>
<th>Scale</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying and understanding</td>
<td>Scientific knowledge and information</td>
<td>GHG emissions profile</td>
<td>0–1</td>
<td>Identified (1) or not identified (0) in the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHG emissions forecast</td>
<td>0–2</td>
<td>Forecast beyond 2020 (2), up to 2020 (1) or not included in the plan (0)</td>
</tr>
<tr>
<td>Envisioning and planning</td>
<td></td>
<td>Vulnerability profile</td>
<td>0–2</td>
<td>Supported by quantitative data (2), identified in the plan but w/o quantitative data (1) or not identified (0)</td>
</tr>
<tr>
<td></td>
<td>Target setting</td>
<td>Future climate projections</td>
<td>0–2</td>
<td>Projection beyond 2030 (2), up to 2030 (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uncertainty of climate impacts</td>
<td>0–1</td>
<td>Addressed (1) or not addressed (0) in the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost estimates of damages of climate impacts</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climate hazards (detailed)</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td>Implementation and monitoring</td>
<td>Communication</td>
<td>GHG emissions reduction targets (overall)</td>
<td>0–2</td>
<td>Target by 2050 (2), by 2020 (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHG emissions reduction targets (by sector)</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td></td>
<td>Financing</td>
<td>Adaptation objectives</td>
<td>0–2</td>
<td>Long term (2), short term (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost estimates of actions</td>
<td>0–2</td>
<td>Both M+A (2), either M or A (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benefit estimates of actions</td>
<td>0–2</td>
<td>Both M+A (2), either M or A (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consideration of M+A interrelationships</td>
<td>0–2</td>
<td>Both synergies and conflicts (2), either synergies or conflicts (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sustainability benefits</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Common public education and outreach</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Common public funding body or budget (national/city level)</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public or private financing commitment</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td></td>
<td>Implementation</td>
<td>Mainstreaming potential of both M+A</td>
<td>0–2</td>
<td>Both M+A (2), either M or A (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Common policy or regulatory framework</td>
<td>0–2</td>
<td>Both M+A (2), either M or A (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Common coordination/implementation body</td>
<td>0–1</td>
<td>Included (1) or not included (0) in the plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partnerships</td>
<td>0–2</td>
<td>Both M+A (2), either M or A (1) or not included in the plan (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Common monitoring procedure/framework</td>
<td>0–2</td>
<td>Both M+A (2), either M or A (1) or not included in the plan (0)</td>
</tr>
</tbody>
</table>

Total score (IMA index)  

Target Cities: 44 cities in LAC

Selection Criteria
• More than one million inhabitants.
• Have already developed policies that include separated mitigation or adaptation, or integrated (combined) action plans, as of July 2018.

44 cities in the LAC region which populations account for around 28 percent of the total population of the entire area.

<table>
<thead>
<tr>
<th>REGION</th>
<th>COUNTRY (16)</th>
<th>CITY (44)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARIBBEAN</td>
<td>Cuba</td>
<td>Havana</td>
</tr>
<tr>
<td></td>
<td>Dominican Republic</td>
<td>Santo Domingo</td>
</tr>
<tr>
<td>CENTRAL AMERICA</td>
<td>Costa Rica</td>
<td>San Jose</td>
</tr>
<tr>
<td></td>
<td>Honduras</td>
<td>Tegucigalpa</td>
</tr>
<tr>
<td></td>
<td>Mexico</td>
<td>Aguascalientes, Mexico City, Cuernavaca, Guadalajara, Leon de los Aldamas, Merida, Puebla, Queretaro, Tijuana, Toluca de Lerdo, Torreon</td>
</tr>
<tr>
<td></td>
<td>Panama</td>
<td>Panama City</td>
</tr>
<tr>
<td>SOUTH AMERICA</td>
<td>Argentina</td>
<td>Buenos Aires, Mendoza, Rosario</td>
</tr>
<tr>
<td></td>
<td>Bolivia</td>
<td>Cochabamba, La Paz, Santa Cruz de la Sierra</td>
</tr>
<tr>
<td></td>
<td>Brazil</td>
<td>Belo Horizonte, Brasilia, Curitiba, Florianopolis, Fortaleza, Goiania, Vitoria, Joao Pessoa, Rio de Janeiro, Salvador, Sao Paulo</td>
</tr>
<tr>
<td></td>
<td>Chile</td>
<td>Santiago</td>
</tr>
<tr>
<td></td>
<td>Colombia</td>
<td>Bogota, Bucaramanga, Cali, Cartagena, Medellin</td>
</tr>
<tr>
<td></td>
<td>Ecuador</td>
<td>Quito</td>
</tr>
<tr>
<td></td>
<td>Paraguay</td>
<td>Asuncion</td>
</tr>
<tr>
<td></td>
<td>Peru</td>
<td>Lima</td>
</tr>
<tr>
<td></td>
<td>Uruguay</td>
<td>Montevideo</td>
</tr>
<tr>
<td></td>
<td>Venezuela</td>
<td>Caracas</td>
</tr>
</tbody>
</table>
Integration of M+A

- Adaptation plan: 3 (7%)
- Mitigation plan: 9 (20%)
- Integrated plan: 32 (73%)

- Climate change plan: 18 (41%)
- Sustainable development plan: 11 (25%)
- Development plan: 9 (21%)
- Strategic plan: 3 (7%)
- Territorial development plan: 1 (2%)
- Climate change strategy: 1 (2%)
- Environment plan: 1 (2%)
### Top 10 cities

**Table 3.** Ten highest ranking cities based on IMA index.

<table>
<thead>
<tr>
<th>Rank</th>
<th>City</th>
<th>Country</th>
<th>IMA index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bogota</td>
<td>Colombia</td>
<td>28</td>
</tr>
<tr>
<td>2–4</td>
<td>Asuncion</td>
<td>Paraguay</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Mendoza</td>
<td>Argentina</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mexico City</td>
<td>Mexico</td>
<td></td>
</tr>
<tr>
<td>5–8</td>
<td>Cali</td>
<td>Colombia</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Florianopolis</td>
<td>Brazil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Montevideo</td>
<td>Uruguay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Panama City</td>
<td>Panama</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Buenos Aires</td>
<td>Argentina</td>
<td>23</td>
</tr>
<tr>
<td>10</td>
<td>Cartagena</td>
<td>Colombia</td>
<td>22</td>
</tr>
</tbody>
</table>

**Source:** Kim & Grafakos 2019
Question.
To what extent do institutional, socioeconomic, and environmental factors potentially influence the level of the integration of mitigation and adaptation in urban action plans of Latin American and Caribbean cities?
The level of the integration of mitigation and adaptation action plan (Integration Index) of 44 LAC cities:

- **Identification and understanding of current and future GHG emissions and climate change impacts**
  - Scientific knowledge and information

- **Envisioning and planning**
  - Target setting
  - Prioritization of actions
  - Communication strategy

- **Implementation and monitoring**
  - Financing
  - Implementation strategy
  - Monitoring

Potential drivers and barriers of the planning of climate action plan:

**Factors in the context of LAC region**

- **Institutional Factors**
  - Existence of climate policy
  - Institutional capacity
  - Networks
  - Donor agency contribution to the development of action plan

- **Socioeconomic Factors**
  - Population
  - City-level GDP per capita
  - Unemployment
  - Civil society

- **Environmental Factors**
  - City-level CO2 emissions per capita
  - Geographical conditions
  - Meteorological conditions

42 institutional, socioeconomic, and environmental factors
Result: Factors Potentially Influencing the Level of Integration of M+A

Multiple regression analysis

Results

Table 5. Factors with a significant level of correlation with IMA index.

<table>
<thead>
<tr>
<th>Factors with significant level of correlation ($p &lt; 0.05$, $r &gt; +0.30$ or $&lt; -0.30$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive correlation (Driving factors)</td>
</tr>
<tr>
<td>• Institutional factors (3)</td>
</tr>
<tr>
<td>• Regional network ‘FLACMA’</td>
</tr>
<tr>
<td>• Regional network ‘UCCI’</td>
</tr>
<tr>
<td>• Donor agencies’ contribution to the development of CCAPs</td>
</tr>
<tr>
<td>Negative correlation (Constraining factors)</td>
</tr>
<tr>
<td>• Institutional factors (2)</td>
</tr>
<tr>
<td>• National common climate fund**</td>
</tr>
<tr>
<td>• Global network ‘Urban LEDS’</td>
</tr>
</tbody>
</table>

* $p < 0.01$.

• Potential drivers
  - Participation in regional networks
  - Donor agencies’ intervention in developing urban climate policies: IDB, UNDP, etc.

• Potential barriers
  - National Climate Fund
  - Global network Urban LEDS Phase I

Source: Kim & Grafakos 2019
• Still unbalanced focus between mitigation and adaptation
  ⇒ Need to put more efforts to adapt to climate change
  ⇒ One way is to promote RD&D of adaptation technologies in order to attract both public and private sectors.
II.

Adaptation Technologies in Korean Cities

(Kim, H., 2021)
Technology Mechanism

UNFCCC

- Conference of the Parties (COP)
- Technology Mechanism
  - Policy
    - TEC (20 representatives from developing and developed countries)
  - Implementation
    - CTCN
      - Hosted by UNEP in collaboration with UNIDO
      - Supported by 11 institutions
    - GCF
    - GEF
    - NDA and focal points

Korea

- Technology Mechanism
  - CTCN
  - Korea CTCN Committee led by GTC
  - Other Funding Channels
    - Special Fund
      - Special Climate Change Fund (SCCF), Least Developed Countries Fund (LDCF), and Adaptation Fund (AF)
    - Other Funding Channels
      - Bilateral, regional and multilateral channels.

- Financial Mechanism
  - Ministry of Finance & GCF NDA
  - Ministry of Technology and ICT
  - Other ministries

(Source: Kim and Grafakos, Under Review)

(Source: Kim, 2021)
Korean National and Local Policies Related to Adaptation Technologies

Support from KACCC
Korea Adaptation Center for Climate Change

(Source: Kim, 2021. p 28)
Challenges in Major Korean Cities

- **Seoul** – inland megacity (10 million inhab.):
  - PM concentration (positive correlation with temperature (Yang, 2019))
  - Extreme Hot and Cold Weather (incl. Heatwave)

- **Daegu** – intermontane city (2.4 million inhab.):
  - Extreme Hot Weather and Heatwave

- **Busan** – coastal city (3.4 million inhab.):
  - Heavy Rainfall and Flood
Adaptation Technologies in Korean Cities: Seoul

**PM 2.5 concentrations**

Temperature rise -> higher PM concentrations in the air

Negative impacts on public health: respiratory diseases, etc.

- Ban on old vehicles (diesel before 2009, gasoline before 2000)
- EWS: send notification to citizens via mobile services
- Operation of PM signal lights in public parks

**Heatwaves and PMs**

: Cooling fog and green energy vehicle

**Climate resilient and low carbon urban agriculture**

: Urban plant factory (Smart Metro Farm)

Adaptation Technologies in Korean Cities: Daegu (experiments of technologies against heatwave)

- Cool roof
- Cool pavement
- Cool and clean road
- Cooling fog
- Smart shade-open
- Smart shade-closed
- Smart bus shelter

Source: (a) http://www.newsmin.co.kr/news/22905/; (b, e, f, g) Photographed by author; and (c, d) adapted from Daegu Environment Story Blog (http://blog.naver.com/PostView.nhn?blogId=ecocitydaegu&logNo=221564859820&parentCategoryNo=&categoryNo=&isShowPopularPosts=false&from=postList)
Adaptation Technologies in Korean Cities: Busan

Coastal disaster prevention forest in Dadaepo, Busan

2006

2020
Adaptation in hillside villages

• Several villages were informally built during the Korean War in 1950s.
• The proportion of older dwellers is still high, accounting for over 20%. They are vulnerable to heatwaves.
• Hocheon village, selected as the 1st cool roof village
• Prone to flooding due to the inadequate drainage system
• Urban regeneration projects are in process.
Maps of LAC region and Korea

- Diversity of geographic conditions: coasts, mountains and islands
- Population concentrated in coastal cities


(Source: Kim, 2021, p 31)
Potential Areas for Cooperation between Cities in Latin America and Korea

TA requests from LAC to CTCN for adaptation technologies by sector (from 2014 to September 15, 2020)

Possible cooperation areas between cities in Latin America and Korea

<table>
<thead>
<tr>
<th>Sector</th>
<th>Adaptation challenges</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Extreme/unpredictable weather</td>
<td>Agro-weather information system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smart farm (e.g., metro farm)</td>
</tr>
<tr>
<td>Disaster</td>
<td>Flooding</td>
<td>EWS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retention facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban greening</td>
</tr>
<tr>
<td>Water</td>
<td>Freshwater shortage</td>
<td>Desalination (coastal area)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rainwater collecting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Underground dam (coastal area)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water reuse</td>
</tr>
<tr>
<td>Health</td>
<td>Heatwave</td>
<td>Cool roof</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cool and clean road system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EWS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban greening</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water sprays in recreational area</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Heatwave</td>
<td>Cool and clean road system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EWS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban greening</td>
</tr>
<tr>
<td>Fishery</td>
<td>Water temperature rise</td>
<td>Green buildings (e.g., green wall, green roof)</td>
</tr>
<tr>
<td>Coastal zone</td>
<td>Beach erosion</td>
<td>Diversifying aquaculture</td>
</tr>
<tr>
<td></td>
<td>Coastal flooding</td>
<td>Coastal forest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EWS</td>
</tr>
</tbody>
</table>

(Source: Kim, 2021. p 66)
Start-up for Sustainable Cities and Communities

• Since 2021
• Headquarters in Seoul, South Korea
• Regional focal points
  - Manila, the Philippines
  - Quito, Ecuador
  - Eindhoven, the Netherlands

https://sustainableif.com
contact@sustainableif.com

• Areas
  - Urban climate policy, governance, and technology analysis
  - Strategy development for sustainable cities projects
  - Development projects for the ESG-related activities of private sector
  - Project review and Monitoring & Evaluation (M&E)

• Topics for further research
  - Drivers of deforestation and reforestation / Ecosystem services in Amazon (South America)
  - Comparative analysis of urban climate policies and technologies
  - Climate change and gender
  - Contribution of ESG-related activities to achieving the SDGs
Seeking Opportunities for Projects Collaborating with other Start-up Partners

SusIF

Research and policy analysis, feasibility study, strategy development, implementation planning, project coordination, and project review

 Collaboration

Huasipichanga Urban Consulting

Headquarters in the Netherlands
A brother company in Ecuador

Child-friendly urban planning

ESG
• Main literature


Thank you.

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