Cities, Climate Change, and Sustainability

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Broad Motivation for Research

• Urbanization in an unprecedented scale,
• Evidence of Climate Change
• Increasingly interconnectedness of countries, nations and societies, recognized by countries’ collective interests and goals (e.g., SDGs, Paris, HRs),
• Abundance of data and knowledge available as never before,
• Management theories and practices constrained to research that are not connected to evidence or not concerned about what goes on beyond administrative boundaries,
• Scientists do not understand the problems of using science in practice
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Cities & Climate Change Science Conference

MARCH 5-7, 2018

EDMONTON, ALBERTA, CANADA
Links with 2030 Development Agenda
TRANSFORMING OUR WORLD:

THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

The 8 Millennium Development Goals

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Global partnership for development
The UN 2030 Development Agenda: achieving plain human development for all while keeping the life supporting systems for the next generations.

- The transformations will occur only if policymaking frameworks are able to recognize the ecological limits at the different scales, from local to planetary.
- Need radical innovations and the way they define and carry out development processes.
- Require better coordination among different stakeholders and levels of governance.
- But, we are far from having comprehensive governance and policy mechanisms to transform development processes,
TRANSFORMATIONS FOR SUSTAINABLE DEVELOPMENT

PROMOTING ENVIRONMENTAL SUSTAINABILITY in Asia and the Pacific

http://www.unescap.org/publications/transformations-for-sdg
Figure B11  Carbon intensity of the economy, Asia-Pacific region and the rest of the world, 1990-2011

Economic growth impact on poverty reduction

ESCAP Economic and Social Survey 2011
Top emitters: Fossil CO$_2$ emissions

The top four emitters in 2017 covered 58% of global emissions
China (27%), United States (15%), EU28 (10%), India (7%)

Annual Emissions: Top Four Emitters

- China 9.8 $\uparrow$ 1.7%
- USA 5.3 $\downarrow$ 0.5%
- EU28 3.5 $\uparrow$ 1.4%
- India 2.5 $\uparrow$ 4.0%

Bunker fuels, used for international transport, are 3.2% of global emissions.
Statistical differences between the global estimates and sum of national totals are 0.7% of global emissions.
Source: CDIAC; Le Quéré et al 2018; Global Carbon Budget 2018
Countries have a broad range of per capita emissions reflecting their national circumstances.
Box 1.1: Meeting the dual goals of sustainability – High human development and low ecological impact

Equity Issues
Why Cities?

- Cities just 3-4% of the area
- The economic activities located in cities account for 55% - 85% GNP. More than 70% of greenhouse gas emissions.
- The challenges and opportunities for creating a greener economy and the institutional framework for sustainable development pass necessarily, or mostly, to how cities are developed and managed.
- We still have tremendous urban challenges that need to be addressed in a more sustainable manner to avoid a steep increase in GHGs worldwide
Urbanization rates

Urbanisation
Population living in urban areas, % of total

Sources: CEIC; UN Population Division; The Economist
Urbanization rate more correlated to CO2 emissions than GDP/per capita

Source: Sethi and Puppim de Oliveira, Urban Climate, 2015

Fig. 1. The analytical framework – 3 x 3 spatial-development matrix.
Urbanization

• More than half of the population is now urban,
• Urbanization and associated lifestyle changes increase the demand for material consumption, drive land-use change and greenhouse gas emissions,
• 1 billion people moved to Asian cities between 1990 and 2014, and another billion in the next 20 years,
• India and Africa still lags behind in urbanization (~30%)
Impacts of cities (and vice-versa) (negative and positive)

- **Local** (within the city)
- **Regional** (in the immediate boundaries of the city)
- **Global** (in far away places).
Climate Change and Cities

• Mitigation and Adaptation
  • Sectoral issues (energy, transportation)
  • Physical issues (buildings)
  • Land use issues (urban form, heat islands)
  • Regional issues (effects on economy of the region)
  • Green Agenda issues (consumption)

Complexity increase
Urban Emissions

• Production-Based Approach (PBA),
• Consumption-based emissions inventories (CBA)
• Combination (PAS 2070)
• The results of CBA inventories can be much larger than those of PBA inventories (Millward-Hopkins, 2018)
Importance of Cities in Emerging Economies
CO₂ Emissions (Ref Scenario)

OECD cities contribute little over 50% in global cities’ emission now which is likely to fall to around 33% by 2030.

Out of 12.6 GtCO₂ global CO₂ addition in next 25 years, cities contribute 11 Gt or 87%

89% of cumulative increase in 2006-2030 in urban CO₂ comes from non-OECD countries.

WEO, 2008
Emerging Economies

- 40% of GDP in 2010, twice than in 1990
Economy and Research in LDCs

• 25% of the largest 500 firms in Forbes list 2011 on (4% in 1995)

• China and India will likely to become world powers in research being responsible for around 20% of the R&D in 2025 (European Commission, 2011)
Solution?

• The solution passes through the cities of emerging economies
• Others have to join as well
• How to solve the puzzle?
Linking Global and Local

**PROBLEMS (Global):**
- Climate change
- Health
- Security and human rights

**SOLUTIONS (Local):**
- Local governance: local governance structures emerge and change,
- Old problems, new agendas for implementation: global policy implementation more effective at the local level by integrating with other policies
Conceptual discussion

Multi-actor Governance

Multilevel Governance

Global
Regional
National
State
Local

How are the institutions built and policies implemented to have an impact?
Emissions x GDP per capita

World Bank, 2012
Greening the sectors  
Transforming space and movement

- Compact urban development increases density, which promotes all kinds of efficiencies in terms of energy use and reduced travel  
  - 20-40% reduction in private vehicle kilometres driven
- Combined with mixed land-use and increased public transport  
  - Green buildings  
  - Enhanced urbanism

Source: LSE Cities 2014  
More compact development can reduce transport emissions by an order of magnitude.
Private transport and density

- Compact urban development increases density, which promotes all kinds of efficiencies in terms of energy use and reduced travel
  - 20-40% reduction in private vehicle kilometres driven
- Combined with mixed land-use, increased public transport, energy efficiency, waste management, reduction in consumption
  - Green buildings
  - Enhanced urbanism
Case: Dealing with various development objectives
Economic Development and Environmental Issues

Poor Settlements

Wealthy Settlements

Shifting Environmental Burdens

Local → Global
Immediate → Delayed
Threaten Health Directly → Threaten Life Support Systems

(McGranahan et al. 2001)
Fig. 1. a – Graphic representation of a typical wealth versus environmental burdens (no scale, based on McGranahan et al. (2001)). b – Needed changes in the curves.
Co-benefits and Development

AGGREGATED CO-BENEFITS

GHG reduction benefits
LEP reduction benefits
Economic benefits
Energy security benefits
Health and Safety

Co-benefits (climate policy+env policy)
Development (short term +long term)
Innovate for Co-benefits

• Innovate to create opportunities for Co-benefits
• Win-win situations exist in large scale
• No need for “rocket science”
Fig. 1. Framework of co-benefits approach for cities utilized in the cases in this special volume.
Innovation

• All the projects had a certain kind of technology or practice new to the locals.

• Appropriate technology.
Community-Based Waste Management Actions – Indonesia, Co-Management
Case Study Analysis: Solid Waste Management, Yogyakarta, Indonesia

Correlation between Amount of CBSWM Group and Volume of Disposal Solid Waste into the Landfill in Yogyakarta City, 2008 – 2010

The growth of CBSWM in last 7 years shows correlation to waste generation and disposal into landfill. Figure 4 shows there is a decreasing of solid waste about 28% from 2008 until 2010.


Figure 10 - Correlation between among of CBSWM group and volume of disposal solid waste into the landfill in Yogyakarta city
City-to-city level cooperation for generating urban co-benefits: the case of technological cooperation in the waste sector between Surabaya (Indonesia) and Kitakyushu (Japan)

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ABSTRACT

In recent years, Surabaya has confronted municipal solid waste (MSW) with a partnership with Kitakyushu city for the use of the Takakura Home Composting (THC) method. A large number of Takakura bins have been distributed to households and cadres have been involved in educating local households about organic waste reduction through the method. In the past decade (2005–2013), the city has reduced organic waste through many diverse composting methods such as THC and about 3421 Mt of CO2 equivalent emissions could be reduced annually. By adapting the THC method, Surabaya has made strides in improving the MSW management situation. This kind of cooperation can be a model for other cities to improve their waste management.
Curitiba (Brazil)

- Parks in low land areas reducing the risks of flooding, and health related problem

- Since 1980s, the city gives tax breaks of up to 100% for landlords that keep more than 70% of native or old growth forests.

- Owners who preserve 100% can use their development rights in other areas of the city.

- Parana State also established the Ecological Value-Added Tax (ICMS-E), which includes incentives for protection of water reservoirs.
The Case of Rio de Janeiro

• Bus Rapid System (BRS) in the City of Rio de Janeiro
• Rio de Janeiro has made some efforts to improve the urban transportation system recently due to the World Cup in 2014 and the Olympic Games in 2016.
• The BRS made gradual adjustments to improve the existing bus system.
• These changes were able to reduce the travel time in up to 50% in certain routes, improving mobility and reducing fuel consumption
• The city is also building new initiatives in the bus system such as a Bus Rapid Transit (BRT).
# Learning mechanisms

<table>
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<tr>
<th>Level of cognitive efforts</th>
<th>(A) Rank ILM</th>
<th>(B) External learning mechanisms</th>
<th>(C) Internal learning mechanisms</th>
<th>(D) Rank ILM</th>
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<td>High</td>
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<td>Two-way knowledge flows</td>
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<td>R&amp;D-based interactions with foreign organizations</td>
<td>Knowledge codification</td>
<td>High complexity</td>
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<td>R&amp;D-based interactions with local universities and research institutes</td>
<td>Knowledge sharing/socialization</td>
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<td>R&amp;D-based interaction with suppliers</td>
<td>Learning from formal R&amp;D experimentation</td>
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<td>R&amp;D-based interaction with users</td>
<td>Learning from engineering and design experimentation</td>
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<td>Exchanges of knowledge with foreign organizations or other cities</td>
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<tr>
<td>Low</td>
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<td>One-way knowledge flows</td>
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<td>Hiring of expertise</td>
<td>Internal training</td>
<td>Low complexity</td>
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<td>Education and training programmes</td>
<td>Learning from operational experimentation</td>
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<td>Learning from technical assistance and consulting services</td>
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<td>Learning from supply assistance</td>
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<td>Learning through feedback from lead users</td>
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<td>Searching into specialized knowledge sources</td>
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Main points on Climate Co-Benefits Innovation in Cities

• Understanding innovation goes beyond firms (e.g., city management) or organizations (urban governance, communities)
• Innovation is place based, and I would say mostly city based
• Other factors beyond economics (e.g., culture) explain the appearance of innovative places/innovation systems
• Individuals and organizations are important, but their interactions are key to understand innovative places, and those interactions go beyond economic transactions
• Innovation goes beyond technological innovations (e.g., social innovation)
• Spatial dimension of processes (e.g., shaping urban spaces and communities),
• Public policies can nurture the development of place based innovations, but can also hurt
Case – Bottom-up without top-down
Malaysia

• Sustainable Living in Malaysia (SLiM) is a concept developed by the Environmental Protection Society Malaysia (EPSM), one of the oldest NGOs in the country with support from some of the leading scientists.

• SLiM is based on ecological footprint analysis. EPSM has led national efforts to quantify carbon, food and water footprints in households through surveys,

• SLiM and the Rio+20 discussions in Malaysia

• The long-term success of this initiative partly depended on sustained government support, which after Rio+20 faded away.
Lessons:

• Bottom-up alone cannot sustain the changes in the long term with broader “top” support.

• The forces for transformation and solutions for collective-action problems will be both “top-down” and “bottom-up”, bringing about a combination of efforts in different scales.
Case. Health as driver of change: Networks of implementation in Delhi and Surat, India
Drivers of Change: Health and well-being (e.g., Water)

• Large part of the diseases in developing countries are related to the environment (~65% of hospital entries in some cities)
• Cases of large disruption in cities because of health (from floods, drought etc.)
• Large investment in the heath sector (in most countries is the largest budget)
• Relate to people (rich and poor) directly
• Large urban transformations were caused by health drivers (e.g., London, Surat)
Delhi Clean-up
Mode shift to the Metro

Delhi Metro Corporation: Partnerships among governments

- Bus: 44%
- Car: 22%
- Taxi: 4.5%
- Motorcycle: 25%
- 3-wheelers: 4.5%
However...
Surat, India.
Health Drivers
In 1994 poor sanitation in vulnerable communities is reasoned to have caused an outbreak of pneumonic plague. A chain reaction following a flood permanently changed Surat’s approach to waste and flood management, becoming one of the India’s cleanest cities. Health got control of environmental management.
## Networks in Public Policy

<table>
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<th>Key features</th>
<th>Surat</th>
<th>Delhi</th>
<th>Analysis of the difference</th>
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</table>
| Involvement of multiple levels | - Plague led to decentralizing its decisions and operations to zonal chiefs  
|                         | - Decentralization led to the creation of a multiplicity of relations with various nodes | - The courts became the focus of the network for pushing for the clean-up of the air in Delhi  
|                         |                                                                       | - Network function essentially depended on the court                  | - A more centralized network led by court through the rulings pushed by the PIL led to difficulties to deal with the multiplicity of regulated actors. |
| Network design          | - The new design of the SMC dispersed the burden of coordinating the relations among the zonal chiefs  
|                         | - Chiefs could balance the intensity of the relations with the local actors, creating more intense relationships when needed | - The courts occupy a privileged position in the network hierarchy  
|                         | - This led to a more participative governance and helped in the management of the relations with local actors according to the needs of the zone | - Ability to force cities to enforce laws on private and public actors  
|                         |                                                                       | - No balance in the relationships (see Appropriate governance)        | - The capacity to manage the design of the core of the network in the case of Surat contrasts with the rigid design in Delhi. |
| Appropriate governance  | - The decentralization allowed a reduction in the number of organizations in each network  
|                         | - This helped to build legitimacy to SMC and bring support to the health initiatives of the city | - A series of rulings created incremental changes in ad-hoc areas of the transport system  
|                         |                                                                       | - Other actors lacked the capacity to reinforce these gains with complementary policies to balance what was coming from the court.  
|                         |                                                                       | - Courts did not play the role of managers (nor should they); thus, the network was not participative or had a proper manager.  |
| Building and maintaining legitimacy | - Zonal chiefs brought the municipal government closer to the local actors and increased the responsiveness of the SMC to local needs  
|                         | - Trust was improved between SMC and local actors  
|                         | - This helped to build legitimacy to SMC and bring support to the health initiatives of the city | - High degree of mistrust among the different actors in the network  
|                         |                                                                       | - Although the court and city used their legitimate ‘police’ power of state actors to enforce the environmental legislation  
|                         |                                                                       | - Lack of legitimacy for the network to perform other tasks that needed a more voluntary approach | - The city had to enforce the rulings, and the own court decision undermined the legitimacy of the city. There was also a lack of trust between the actors behind the PIL and court on the one side, and the city and regulated actors in the other side. |
| Stability               | The decentralization helped SMC to be flexible in its relations at the local level  
|                         | - Each zonal chief could manage the local waste supporting network according to its capacity and local needs  
|                         | - SMC kept the core of the city-wide network formed by the chiefs stable to perform the core activities, including network management | - Court decisions did not lead to the formation of a stable network.  
|                         |                                                                       | - Enforcement network was formed by the courts with pressure from civil society actors in order to have the city enforce legislation over regulated actors. | - The network formed in Delhi had a weak core, formed basically by the court. As soon as the effects of the ruling ceased, network was weakened. |
Lessons

• The advice of specialists in health led the changes in the two cities,
• However, resilience in the network in Delhi made the improvements to be reversed,
• Network: Delhi’s had a more centralized network and lack of changes in urban management design,
• Legitimacy: Court led the changes in Delhi, undermining legitimacy of the city government,
Case – Setting efficiency/carbon intensity boundaries (decoupling)
Figure B11  Carbon intensity of the economy, Asia-Pacific region and the rest of the world, 1990-2011

Case: Recognizing ecological limits at the local level

• Is it possible? How? Why? Is it irrational?

• E.g., Tokyo
In 2010, the Tokyo Metropolitan Government (TMG) introduced a mandatory CO₂ emission reduction. It is the world’s first such scheme that sets binding targets for buildings.

GHG reduced by 23 per cent on average from the base years and 10 per cent below the average of other parts of the country before the end of the first compliance period of five years (2010–2014). 90% of ~1,350 regulated facilities achieved the first reduction target, and 69% of them even met the 2019 targets.
Factors for Success (Tokyo)

FACTORS FOR SUCCESS IN POLICYMAKING

• Administrative leadership and capacity of public administration.
• Energy security
• Fair involvement and facilitation of stakeholders in policy design.
• Availability of historical data to support the discussions.

FACTORS FOR SUCCESS IN IMPLEMENTATION

• Transparency in monitoring and enforcement.
• Gradual implementation.
• Flexibility.
Lessons: Recognizing ecological limits

- Context: Need to shift the discussions from what policies are needed to the political and institutional conditions that make the adoption of certain policies more likely,
- Capabilities need to be build overtime.
Case - Changing Environment-Economy-Society Relations through values
Bhutan

• Bhutan is well known for initiating the Gross National Happiness (GNH)
• The country’s Constitution mandates that forests should cover 60 per cent of Bhutan’s territory through a network of protected areas covering more than 40 per cent of the country’s territory.
• Certain political and institutional conditions have facilitated these innovative initiatives.
  • The political transition process from an absolute to a constitutional monarchy,
  • Bhutan’s unique political and administrative systems, in which religious affairs are interwoven with administrative affairs in the bureaucracies at the national and local levels,
Lessons: Changing Environment-Economy-Society Relations through values

• Different ways to think about development having a window of opportunity
• Looking beyond Western models of the State and economic system (e.g.: accountability mechanisms beyond rational choice)
Key Messages

• The core of the *modernization* discourses, are a necessary but insufficient condition for a broader transformation towards sustainability;

• **Western models of development x Other models** (e.g., culture of sufficiency)

• Transformations towards more sustainable development will occur only if **policymaking frameworks recognize the socio-ecological limits at the different scales**, from local to planetary,

• The forces for transformation and solutions for collective-action problems will be both “top-down” and “bottom-up”, bringing about a combination of efforts in different scales (e.g. Malaysia).

• Need to **shift the discussions from what science and policies are needed to the political and institutional conditions** that make the adoption of certain policies more likely (e.g., Tokyo),
Understanding Innovative Initiatives for Governing Food, Water and Energy Nexus in Cities Using Green and Blue Infrastructure
Thanks!
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