Urbanization, Vulnerability and Adaptation: the São Paulo Coastal Zone, Brazil

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PSTC – Brown University
Visiting scholar
Climate Change projects and actions at NEPO/UNICAMP

- Rede Clima: institutional network on climate change, “Rede Clima Cidades”

- National Institute on Climate Change: Megacities;

- Brazilian Panel on Climate Change: Chapter Human Security

- “Projeto Clima”:
-- Urban Growth, Vulnerability and Adaptation: social and ecological dimensions of climate change on the Coast of São Paulo;
Conclusions

- Climate change: understand the complexity of the context is fundamental
  -- Brazilian demographic and urban transitions:
    --- positive perspective for the future;
    --- still infrastructure problems;

- Vulnerability approach:
  -- sophisticated theoretical discussion, but poor data sources;
  -- must be connected to the adaptation perspective;
Conclusions

- Scales:

-- time: historical perspective; future long term and short term;
-- space: local, regional and global;

- “Icarus fly”:

how far can we go without falling in the “scientific common sense” of planning necessity?
Introduction

- Climate change is occurring; the human action is the most important cause of the climate change, according IPCC (2007);

- “new set” of hazards: extreme climate events (storms, droughts) and sea level rise;

- Differential vulnerability: social and environmental
  -- lower socio-economic status population;
  -- coastal zones;
Fundamental questions

- Urbanization process and vulnerability: what are the connections?

- What are the implications of these connections to adaptation, in the context of climate change?
Theoretical Remarks

* Vulnerability:

“vulnerability cannot be directly measured, but estimated through a group of socioeconomic and environmental variables. Vulnerability refers to a certain type of risk and region. It is the result of the relationship of a series of circumstantial factors of a quantitative and qualitative order” (Peduzzi et al., 2001).

* Population and environment relationships approach;
Methodology

* GIS system

- demographic information: Census Data

- Digital maps: IBGE (Brazilian Census Bureau)
Context: Brazilian coastal zone

* Heterogeneity;

* Land use and occupation:
  - economic activities;
  - residential;
  - leisure and tourism;
  - environmental preservation;

* Example of São Paulo State;
Ubatuba, SP
Juréia, SP
Santos, SP
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Making the vulnerability concept operational: the municipalities of São Paulo North Costal Zone

- Social vulnerability
  -- São Paulo Index of Social Vulnerability: social and demographic variables;
  -- census tract level;

- Environmental risk
  -- topography: $30^0$ parameter
Social Vulnerability, census tract, SEADE
Topography
Socioenvironmental Vulnerability
## Results

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<th>Socioenvironmental Index</th>
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<td>Medium</td>
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<td>17.95</td>
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<td>High</td>
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<tr>
<td>Very High</td>
<td>13.22</td>
<td>14.24</td>
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Final Remarks

Methodological issues

- environmental and geographic data: need more accurate elevation model;
- 2010 census at household level information: more recent and detailed information;
- local studies: need improve knowledge about specific areas;

São Paulo Coastal Zone

- acceleration of social and economic change;
- conflicts;
- possibility of real use of the information;
Role of Climate Change in Sustainability Of Detroit

Natalia Andronova
Jessica Parker
Larissa Larsen

ICARUS, May 2011
A steady decrease in Detroit’s winter temperatures during the 1940-1980 period may have a great impact on the poor population and may have contributed to a decrease in Detroit’s sustainability.
Sustainability ...

Over at least two to three decades...
City spending...
Usually, city’s expenditures are a function of population growth ...
...The recreation expenditure is expected to be related to the amount spent on education.

...The health expenditure is expected to be related to social security spending. As expenditures on social security increase, so too do the health expenditures.
• Indicators:

\[
p = \left\{ \frac{\Delta e}{\Delta pp}, \frac{\Delta s}{\Delta pp}, \frac{\Delta u}{\Delta pp}, \frac{\Delta g}{\Delta pp}, \frac{\Delta h}{\Delta ss}, \frac{\Delta r}{\Delta e} \right\}
\]
• Indicators:

\[ p = \left\{ \frac{\Delta e}{\Delta pp}, \frac{\Delta s}{\Delta pp}, \frac{\Delta u}{\Delta pp}, \frac{\Delta g}{\Delta pp}, \frac{\Delta h}{\Delta ss}, \frac{\Delta r}{\Delta e} \right\} \]

• Sustainability limits:

no gain vs. loss
Matrix of sustainable spending...

<table>
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<th>rates vs. time</th>
<th>e/p</th>
<th>s/p</th>
<th>u/p</th>
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<th>h/ss</th>
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<td>1970</td>
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= sustainable development
Sustainable Index...
The best climate data are at airports...
Winter temperatures are relatively consistent between the sites.
July temperature

January temperature
• The least sustainable decade in Detroit was during the 1930s, and the most sustainable decade was during the 1940s.

• In the 1950s and 1960s, the city’s population and its expenditures on education were in decline, while spending on security and crime control was exponentially increasing.

• The number of colder winters increased after 1930, which could be attributed to the ‘urban’ effect of winter smog from industrial pollution.

A steady decrease in Detroit’s winter temperatures may have a great impact on the poor and may contribute to a decrease in the city’s sustainability.
Gender, Assets, and Urban Water Insecurity: A Qualitative Study from Baguio City, the Philippines

Lisa Reyes Mason
Washington University in St. Louis

May 6, 2011
ICARUS II
Ann Arbor, Michigan
Water Insecurity

Scope

• Affects over 1 billion people worldwide
• At least 32 million water-related deaths from 2000 to 2020
• Lost income opportunities, risk of local conflict

The Concept

• No standard definition, measurement
• Water for different uses (basic and non-basic needs)
• Multiple dimensions should be considered: quantity, quality, affordability, physical accessibility, temporal accessibility
Urban Water Insecurity

- Like rural areas, can be subject to seasonal rainfall variation and drought

- Aggravated by urban migration, environmental pollution, inadequate infrastructure for treatment and delivery

- Often focuses on megacities of 10 million or more, while smaller and mid-sized cities are growing rapidly

- Seasonal aspects of urban water insecurity little examined to date

- Research from areas familiar with seasonal change and insecurity (such as Baguio) may inform other cities, expected to deal with water insecurity for the 1st time or to greater extent
Why Gender and Assets?

• Women are more vulnerable to climate change than men. Gender roles and relations matter. (Demetriades & Esplen 2010, Denton 2002, MacGregor 2009)

• Water access, needs, and uses are shaped by gender relations in every society, as often (though not exclusively) informed by rural research. (Ray 2007, Wallace & Coles 2005)

• Assets—stocks of resources used to buffer crisis and advance well-being—protect people from vulnerabilities of various kinds. (e.g., Dreze & Sen 1989, Moser 1998, Prowse & Scott 2008)

• Better understanding of which assets matter for which climate change outcomes is needed, and would be more useful for policymakers. (Moser & Satterthwaite 2010, Ribot 2010)
Study Objectives

Explore experiences and perceptions of the multiple dimensions of water insecurity in an urban context.

Explore how gender and assets relate to vulnerability and adaptation to water insecurity in an urban context.
The Philippines

- Population 88 million
- Medium level of human development
- Gender status and relations
- High vulnerability to climate change impacts (typhoons, flooding, landslides, drought)
Baguio City

- Population 300,000
- Elev. 5,100 feet
- Distinct rainy and dry seasons
- Estimate 50% household access to Baguio Water District (BWD), rationed year round
- Threats to water insecurity
  - Overpopulation
  - Poor infrastructure
  - Mining pollution
  - Climate trends and change
Methods

- Conducted informal interviews
- Reviewed neighborhood profiles
- Selected three neighborhoods
- Used purposive sampling to obtain variation in sample
- Conducted 15 in-depth interviews
- Reviewed data, produced memos, and performed qualitative text analysis (NVIVO 8)
## Participant Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Dominican Hill (N=5)</th>
<th>Irisan (N=3)</th>
<th>Hillside (N=7)</th>
<th>All (N=15)</th>
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<td>Male</td>
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<td>2</td>
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<td>Age</td>
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<td>Mean</td>
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<td>Mean</td>
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<td>Monthly HH Income, PhP (USD)</td>
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<tr>
<td>Minimum</td>
<td>3,936 (90)</td>
<td>9,132 (210)</td>
<td>800 (18)</td>
<td>800 (18)</td>
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<tr>
<td>Maximum</td>
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<td>13,000 (299)</td>
<td>80,000 (1,839)</td>
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<tr>
<td>Mean</td>
<td>19,594 (450)</td>
<td>10,422 (240)</td>
<td>19,050 (438)</td>
<td>17,506 (402)</td>
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</table>

Note: HH is household. Income conversion is $1 (USD or U.S. dollars) to ₱43.5 (PhP or Philippine pesos).
Dominican Hill

- Pop. 4,182
- Rocky terrain
- "Millionaires" & squatters
- Limited BWD, no springs
- Water delivery
- "Sharing groups" for ordering water
- Bottled drinking water, or rainwater if boiled
- Water expense: 2.2 to 25.6% of monthly income
Irisan

- Pop. 18,827
- Next to city dumpsite
- Mostly lower and middle income
- Variety of sources: BWD, protected (but unsafe) spring, private delivery, bottled water, rainwater
- Water expense: 0.6 to 10.5% of monthly income
Hillside

- Pop. 1,735
- 20% forested
- All income levels
- Variety of sources, including protected spring ("savior")
- Some BWD, private delivery
- Bottled water or spring for drinking
- Water expense: 0 to 21.3% of monthly income
Seasonal Changes to Portfolios and Insecurity

“In the rainy season, we have a good life. We can do anything we want. We can even clean our cement floors, our chairs. We wash everything.” – Married, lower income, female

“For summer, it would be a good week if we got even water [from BWD] once a week...If I get to fill [my tank] up full, even one day, then...we’re able to manage. But that means not flushing the toilet every time you go...and bathing with maybe one pail of water, and not every day.” – Married, wealthy, female

• Households substitute rain for other sources, mostly BWD and private
• Less insecurity of quantity, affordability, and temporal access
• For some, water expenses decrease by half to 2/3
• Rainwater officially an “improved source” but for participants, quality dimension not necessarily improved; most still purchase bottled water
• Physical access generally unchanged, though some frequent spring less
Gender Roles and Relations

- Gender and portfolio management
- Married women as managers, consistent with gender norms
  - Check supply
  - Remind husbands to order private delivery
  - Perform certain tasks themselves (e.g., laundry)
  - Stay home to wait for water
  - Budget family/men’s income for water, other needs

“In our family, it’s always me…I’m always the one who sees to it that we have enough. We have many kids, so water is very important to us…I always make sure there’s enough in reserve.” – Married, wealthy, female

- Carrying water (5-gallon bottled/mineral jugs, and buckets from spring) seems to be seen as men’s work
Physical Assets

- Help households get, store, and more easily use water

  - Cell phone
  - Modern stove
  - Small container
  - Bucket
  - Hose
  - Drum
  - Water tank
  - Pipe connection
  - Wall
  - Home

- Can be privately, jointly, or communally owned
Financial Assets

- Savings often needed to purchase physical assets

- Sample costs ($USD):
  - 10m hose ($6)
  - 1 water tank ($276)
  - 1 drum ($14)
  - 1 BWD pipe connection ($345)

- Households ranged from paying outright to saving for two years to purchase a hose, drum, tank, or BWD connection
Social Assets

• Relationships with neighbors

Provide connection to BWD via hose
Provide critical mass ("sharing group") to order private water
Lend money for buying private water
Lend or give drums or tanks
Lend or give water

“If one suffers, everyone suffers.” - Married, lower income, female

• Relationships with employers

Lend or give drums or tanks
Implications

• **If gender matters**, incorporate gendered perspectives into program and policy planning. Develop, implement, and test gender-sensitive, water security policies. Continue to collect gender-disaggregated data, and conduct gender analyses to better understand how and why gender matters.

  **Note:** Gender means gender. Seek input from women and men, from different household structures and types, in water program and policy development.

• **If assets matter**, develop, implement, and test asset accumulation strategies for the specific assets that seem to matter most, considering a range of climate scenarios (e.g., assets for typhoon-related versus drought-related water insecurity in urban areas)
Future Research

• How do gender, assets, and their intersection (gendered assets) relate to urban water insecurity both among and within households?

• How can public policies support asset accumulation of the specific assets used by households to lower their vulnerability and increase their capacity to adapt to water insecurity?

• Given population, climate, and public infrastructure trends for urban areas like Baguio, what is the appropriate role for private water vendors, and what policies and regulations are needed to improve affordability, safety, and access of the water they provide?

• When water expenses decrease seasonally, can and will families capture these savings for other productive assets, further strengthening their capacity to adapt?
Research Support and Contacts

Research Support
Center for Social Development
Brown School International Dissertation Award

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