Managing Water at the Urban-Rural Interface for climate change resilient cities

Urban vulnerability and resilience to water mediated climate impacts

1. Definitions
2. Developing Vulnerability Assessment Framework
3. Accra Exposure Risk Mapping

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31 May 2011
Review and Definitions

• Body of literature on vulnerability:
  – Climate scientists focus on hazards
  – Planners and Policy makers focus on susceptibility of city
  – Economists focus on economic consequences of adaptation measures

• Lack of city focused quantitative assessments
Working Definition

• **Vulnerability**: degree of susceptibility, extent to which a system suffers harm.
  – It is the product of the **exposure** of people or systems to the impacts of climate change which is influenced by the **constraints** they face in being able to reduce or minimize this exposure, and their **sensitivity** and **resilience**

• **Sensitivity**: degree to which a system is affected

• **Resilience**: amount of change system can undergo without changing state

Vulnerability influenced by physical, social and environmental factors
Vulnerability Assessment Framework *(work in progress)*

**Objective**

- To identify and assess the vulnerability of systems and groups within cities in order to propose adaptation responses that need to be addressed through both policy and city-level interventions.

Vulnerability can be viewed from the broader perspective of systems as well as narrower perspective of individuals and groups.
Conceptual framework of categories for urban vulnerabilities to Climate Change

Pathways/media
- Water Supply (incl. quality)
- Sanitation
- Droughts
- Floods

Levels
- City

Groups
- Existing groups
  - Excluded in formal statistics
  - Included in formal statistics
  - New/potential set of at-risk groups

Sectors
- Agriculture
- Energy
- Domestic use
- Industry

Spaces
- Basin
- Urban
- Rural
- Urban-rural interface
Mapping Exposure Risk Accra

In order to deal with urban vulnerability to climate change
Vulnerability to climate change

- People’s vulnerability to climate change consists of a combination of the following factors:
  - The extent of exposure (rate): frequency/magnitude/duration
  - Their sensitivity: human/envt conditions
  - Their resilience: adjustment/coping strategies
Climate Change Exposure Rate

• The exposure rate is the most easily understood factor of vulnerability.
• The effects of climate change that Accra will (probably) be exposed to include:

**Scenario:**

**Magnitude:** More extreme weather events, thus more extreme droughts and more extreme rains.
**Duration:** longer
**Frequency:** more often
Mapping Accra’s Exposure Risk

• In order to work on Accra’s exposure Risk, the localities with the highest exposure risk should be known.
• CC effects are more extreme rainfall events, a direct consequence will be floods.
• Mapping flood prone areas is first step.
• Validated Assumptions
  – Risks that people experience during flood increases where the sanitation is poor (increased health risk).
  – During droughts, people with low quality of water supply services likely to face more risk than others.
Exposure Risk Mapping

• Thus, in order to map exposure risk, the following factors should be superimposed per locality:
  - Flood risk
  - Sanitation level (or service quality)
  - Water supply service quality
Frequently flooded areas
Frequently Flooded Areas Map

• There is no single map indicating frequently flooded areas in Accra

• As a first step, we **Combined** all named localities out of the following sources, without pre-selection:

  - Personal communication from Mr. W. Ametefe, Head of Drainage at the Hydrological Services Department of the Ministry of Water Resources, Works & Housing on flooded areas.
  - Personal contact with Mr C. Kagblor, Graduate Student Environmental Engineering University of Ghana,
Sanitation Burden (Songsore-2005)
Water Supply Burden (Songsore-2005)
Making of first exposure map

- Primary criterion: Flood Prone Area
- Secondary criterion: WATSAN burden
- Combining by simple averaging

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Alternative methodology qualitative combination

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High Exposure Risk Areas

GAMA Boundary

- No Value
- High Exposure Risk
- Extreme Exposure Risk

Date: 10-1-2011
High Exposure Risk Areas (before fieldwork, new methodology)
Next step..

- 12 high exposure areas identified
- 12 field visits conducted
- Interviews with the following types of community members
  - key persons (Assembly Men)
  - Interviews with non exposed ordinary inhabitants of the area
  - Interviews with victims (of flood, for example)
- Re-ranking as result
Ranking based on selected criteria:

**Flood**
- 0. No flood problem
- 1. Severe problem under extreme circumstances (water enters houses and stays at the street longer than a few hours, extreme circumstances: rain longer than 24 hours).
- 2. Severe problem under normal circumstances

**Sanitation : categorised into 3 distinct groups**
- No sanitation problem
- Only waste problem, not so much open defecation
- Severe problem with both waste and open defecation (and animals on the streets etc)

**Water supply : areas classified with an either/or rating**
- 1. Not considered as a problem
- 2. Considered as a problem
## New Rating of Localities, 3 classes

### outcome

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New Exposure Risk Map

- Not included in Research
- Extreme High Exposure Risk Under Normal Circumstances
- High Exposure Risk under Normal Circumstances
- High Exposure Risk under Extreme Circumstances

Date: 10-1-2011
Limitations of the study

• The visits were reconnaissance visits. Quality of results dependent on knowledge of people we met and therefore not really uniform across the sites (though we tried..)
• We did not interview enough people per locality to be completely sure of the value of our outcome. We cannot test our outcomes statistically.
• Different data sources described different administrative boundaries for the districts in Accra. Unable during this study to confirm which is official. This may have resulted in that we did not visit each locality completely or that we might have been in an area while we were thinking that we were still in the neighboring locality.
• The selection of the 12 field work areas is based on the first exposure risk map. This map is based on low quality data. Therefore, it could be that some areas have wrongly been excluded from the fieldwork.
Conclusion

• That said, the 7 localities are at a very high exposure risk for climate change effects and therefore very vulnerable.
• Projects to decrease Accra’s vulnerability to climate change should focus on these 7 most exposed areas.
NIMA 85% use public toilets

Gbgebeyise 70% - 100 % use public toilets
Mallam: solid waste and open defecation

Old Fadama: No legal status
ALAJO: improvements since drains were built BUT blue arrows show areas below the edge of drain indicating poor design and construction
Thank You