

Climate change, salinity intrusion and water insecurity in peri-urban Khulna, Bangladesh



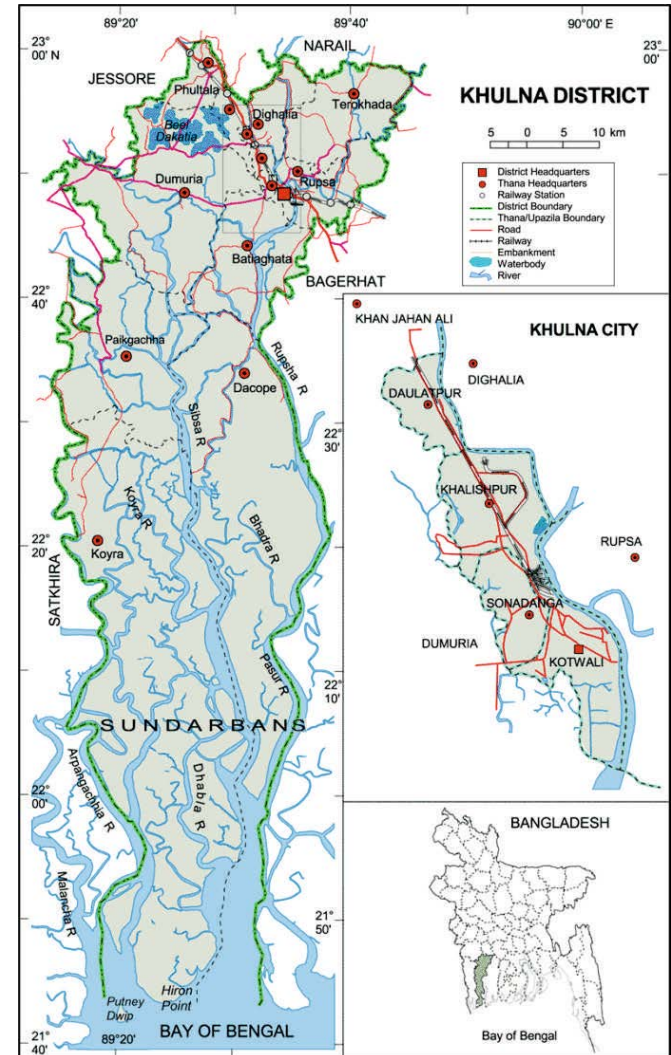
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Water Security in Peri-urban South Asia: Adapting to Climate Change & Urbanisation
Final Dissemination Meeting: June 18, 2013; Kathmandu, Nepal

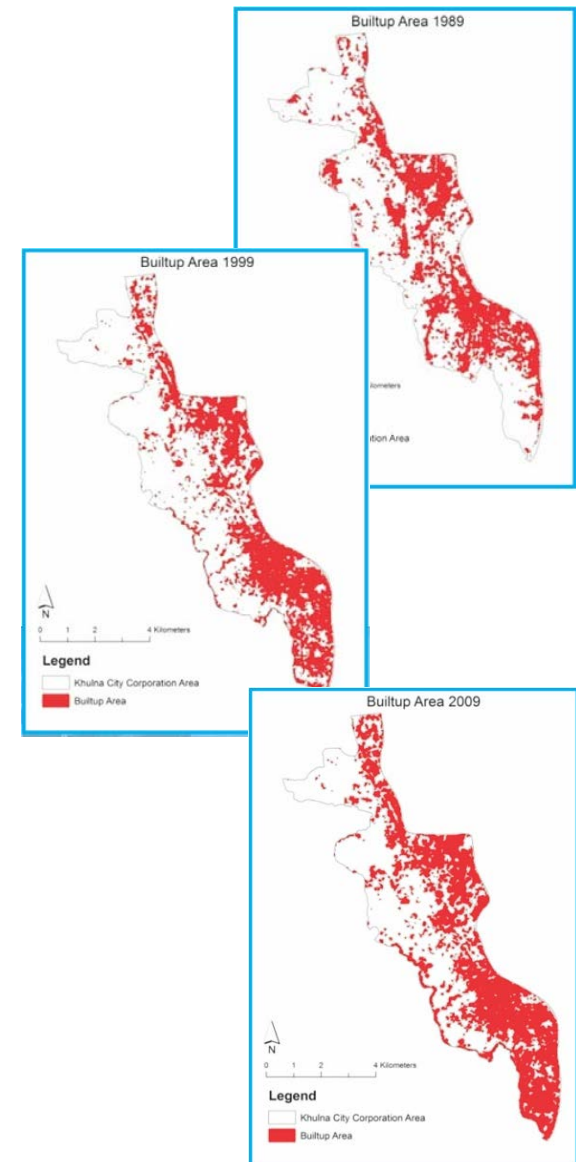
Khulna: Overview

- Khulna is the **third largest** metropolitan city in Bangladesh
- One of the five biggest **river ports** in Bangladesh
- Important for its proximity to the second seaport of the country at **Mongla**
- Central **urban corridor** of the **southwest** coastal region
- Once known as an **industrial city**
- Gained importance for **shrimp farming and processing**



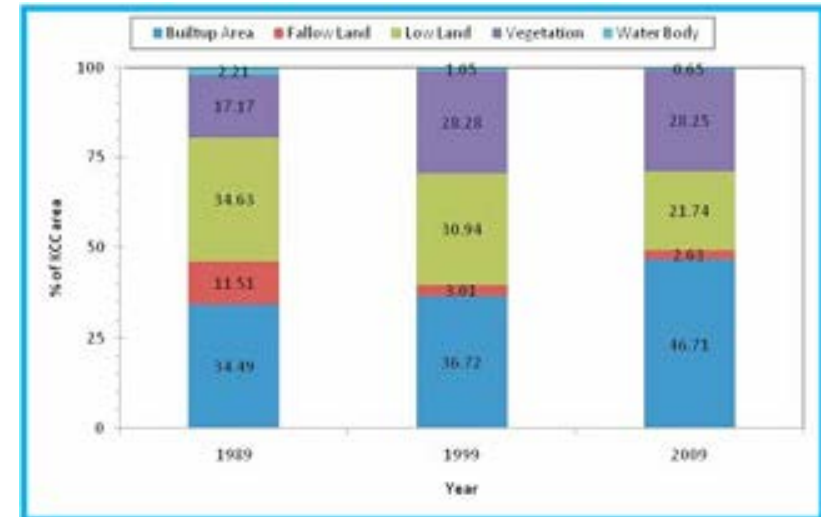
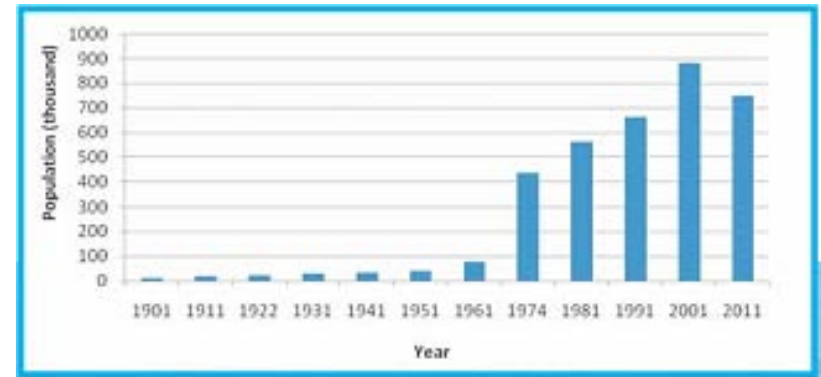
Khulna: Overview

- Set up as a **thana** in 1836, upgraded to a **sub-division** in 1842 and to a **district** in 1882.
- During the **British period**, Khulna was a market town and the seat of regional administration
- Declared a **municipality** in 1884, and was linked with the regional **railway** network in 1885
- Rapid growth during the **post partition** (1947) and **post liberation** (1971) periods

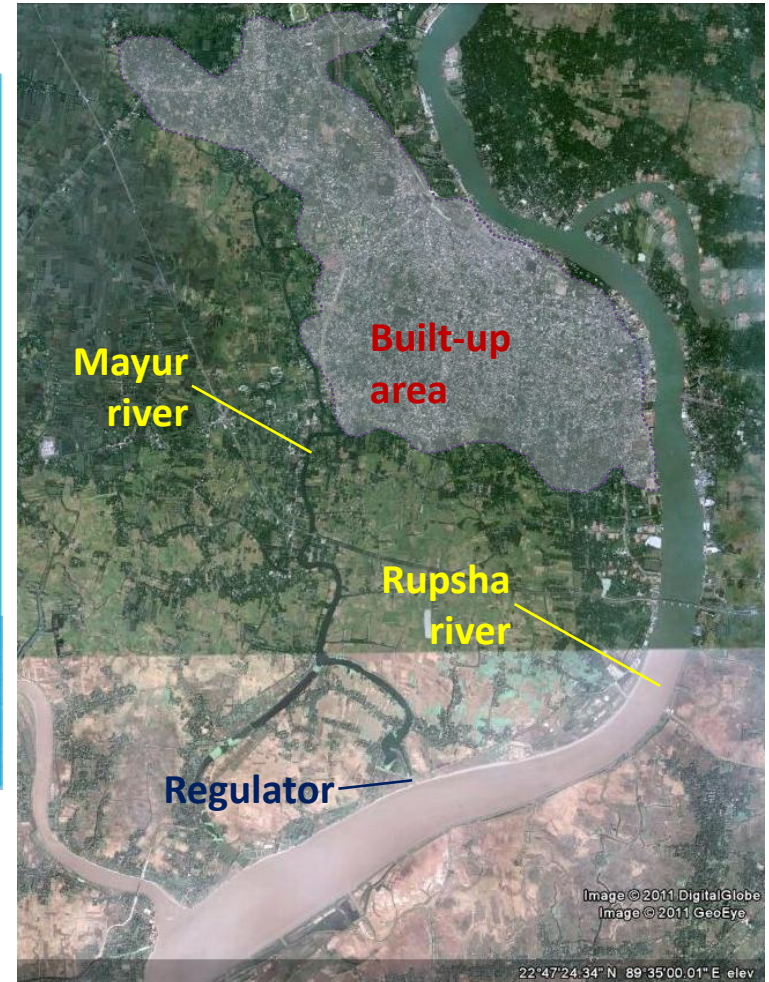
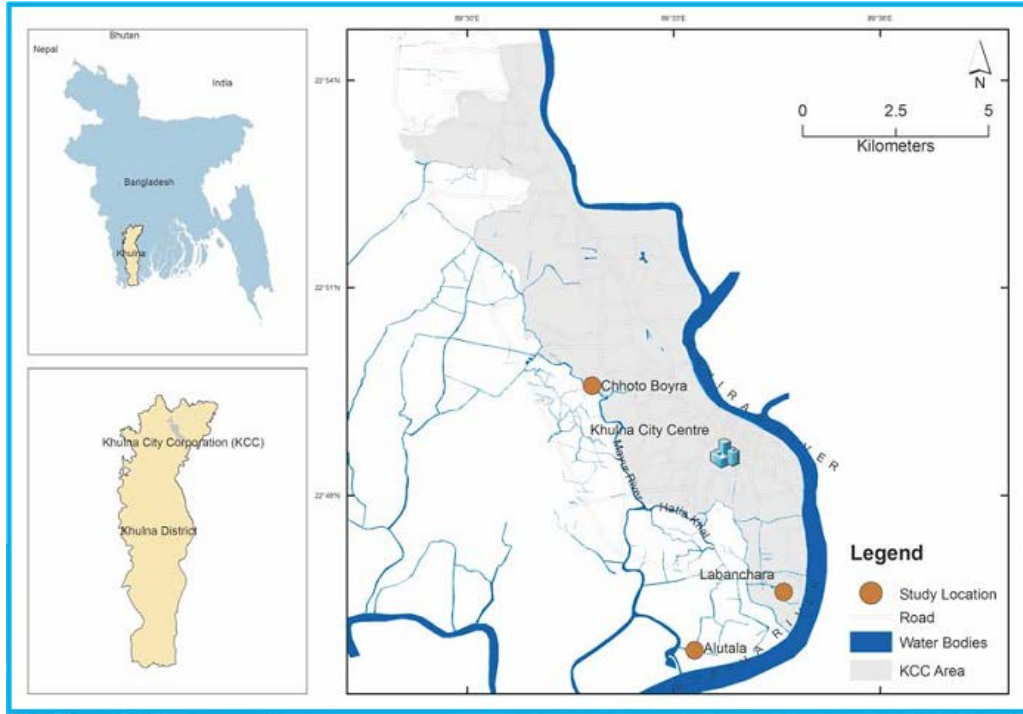


Khulna: Overview

- Spatial growth largely guided by the local **topography**
- City originated at the southern end of a **natural levee** along the western side of the Rupsha-Bhairab river, **linearly** expanded along the levee
- Growth pattern further shaped by **Khulna-Jessore highway**
- **Low lands** and **fallow** lands are **decreasing** whereas the built-up areas are increasing
- Projected that **water bodies** and low lands will **reduce** to 3% and 29%, respectively,
- **Built-up areas** will **expand** to 33% in 2019



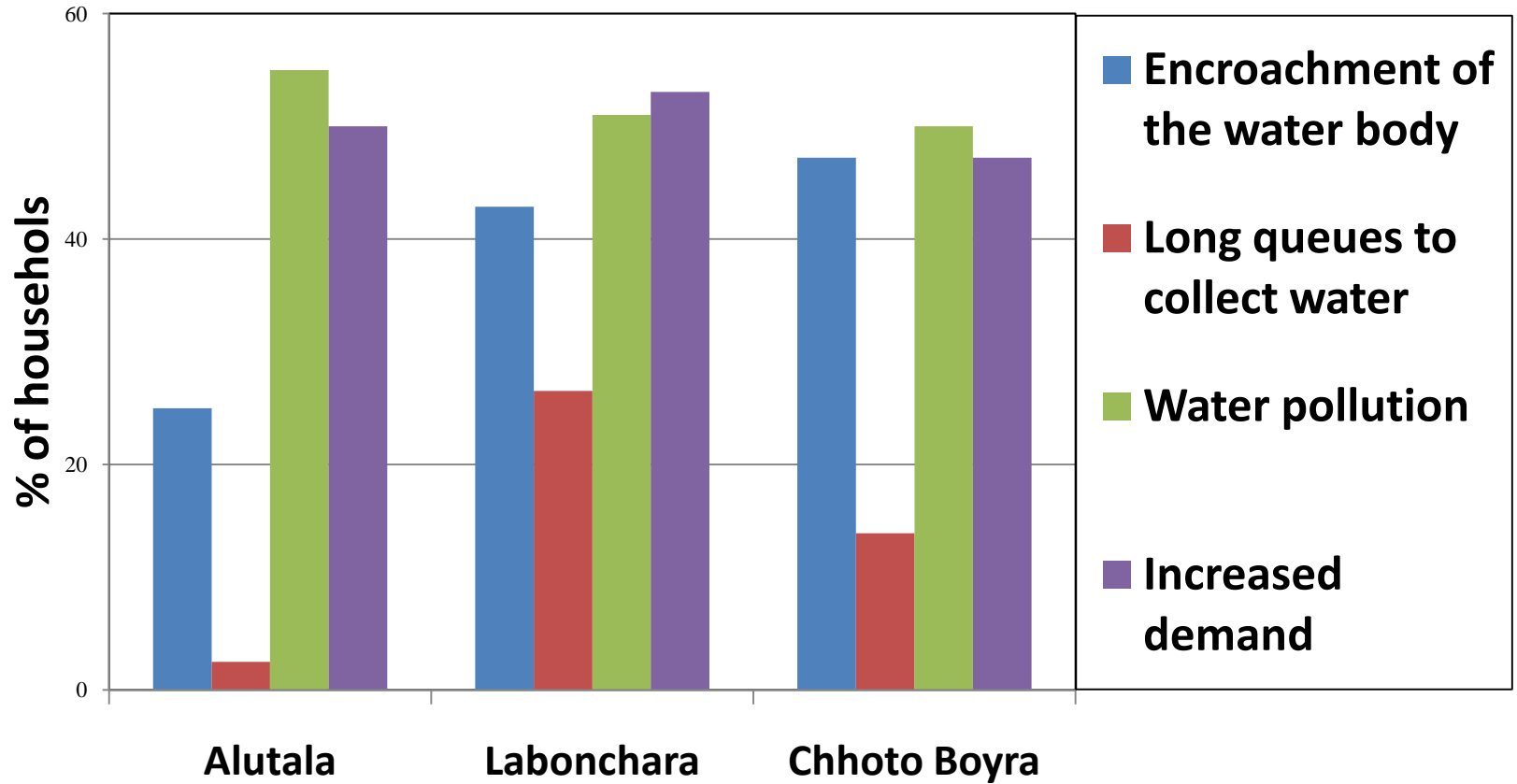
Peri-urban Research Sites



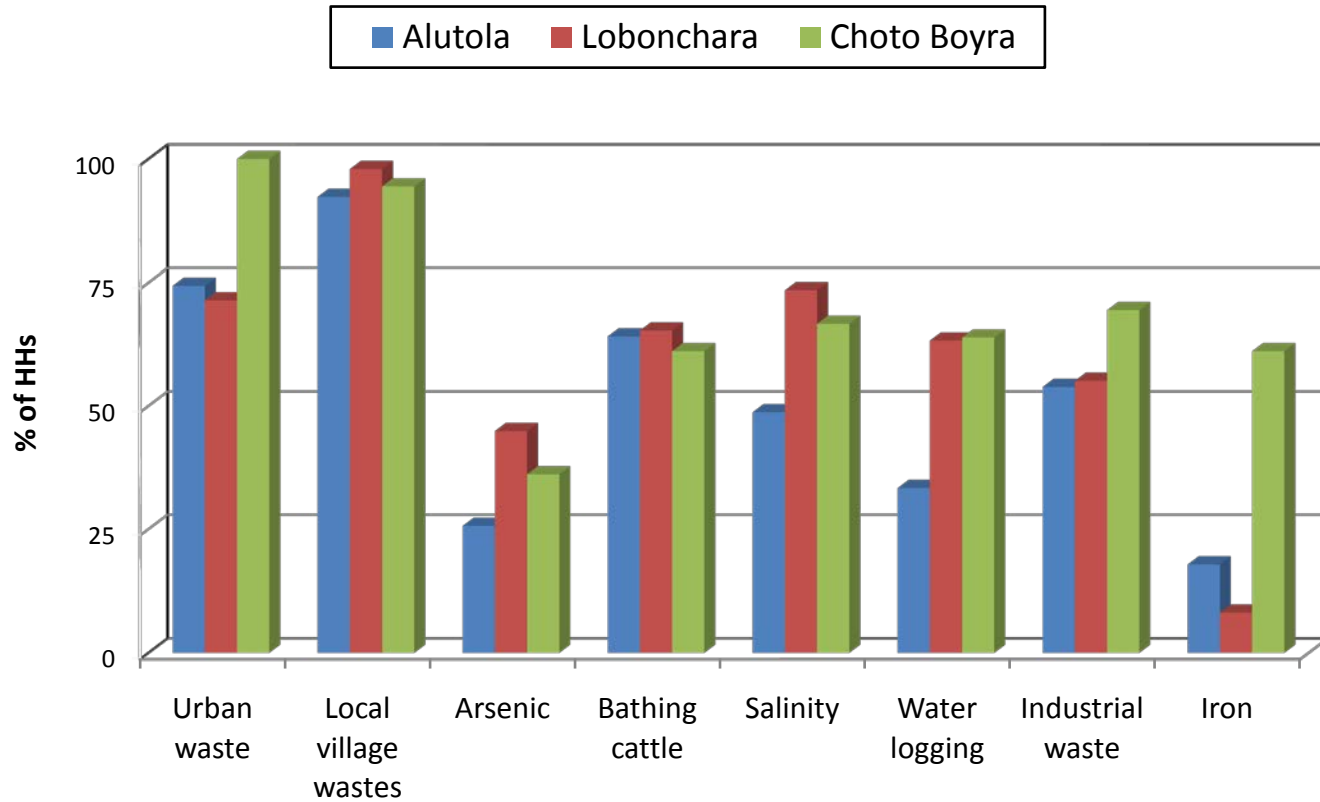
Peri-urban Research Sites

| Location | Socio-economic characteristics | Issues/problems Identified |
|--------------|---|---|
| Alutala | Alutala is 2-3 km away from the Khulna City Corporation (KCC) boundary. It is located in Botiaghata upazila of Khulna district. Agriculture, fisheries and livestock rearing are the major livelihoods options of the local communities. Some are also engaged in the city's informal sector for livelihood | <ul style="list-style-type: none"> Conflict in water use between urban and peri-urban water users of the Mayur. Vulnerable to climate change and sea level rise. Vulnerable to rainfall flooding and water logging. Salinity ingress and arsenic contamination in groundwater. Absence of participatory regulator operation. |
| Labonchara | Labonchara is located near the Rupsha bridge within the city boundary with thousands of households in North and South Labonchara. Most of the people are dependent on informal business in the city and adjacent peri-urban areas | <ul style="list-style-type: none"> Acute water scarcity for drinking, washing and sanitation. Vulnerable to water logging due to absence of drainage system. Salinity and water pollution limit access to safe drinking water and sanitation. Absence of any institutional framework. Existing natural channels are not properly functional. |
| Chhoto Boyra | Land use is still agriculture dominated. Thousands of farmers are dependent on the Mayur river's water for irrigation. A significant number of people are engaged in formal and informal businesses and service sectors in the city | <ul style="list-style-type: none"> Acute water scarcity for irrigation. Conflict in water use between urban and peri-urban users. Vulnerable to rainfall flooding and water logging. Solid waste dumping in the Mayur river. Lack of institutional arrangement for saving the Mayur river. |

Water Security Issues

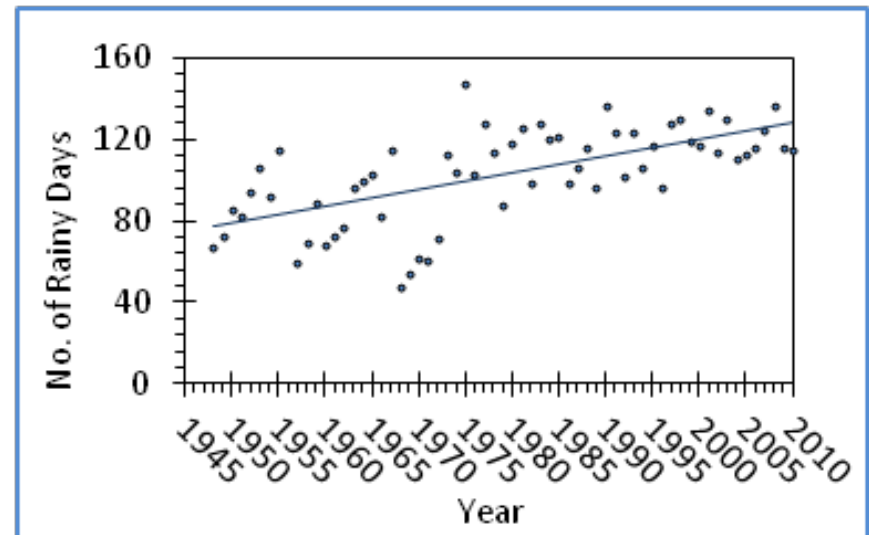
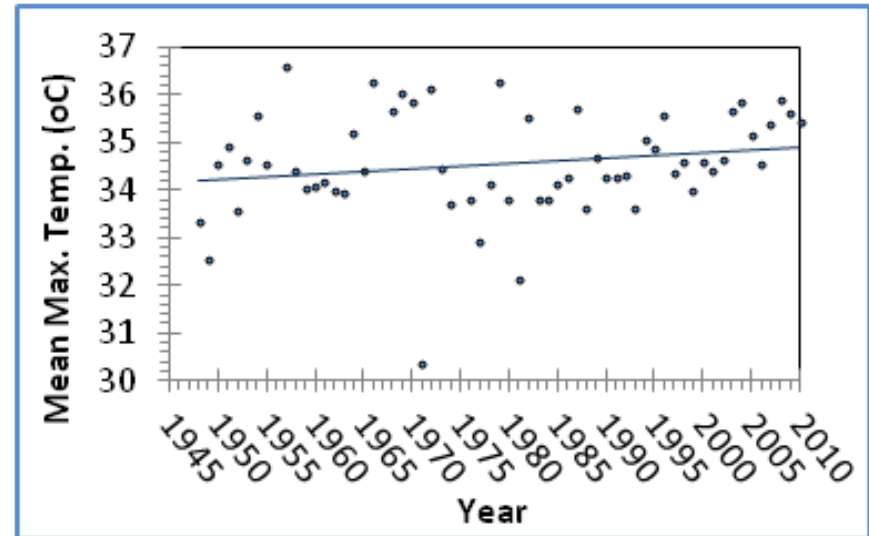


Water Security Issues

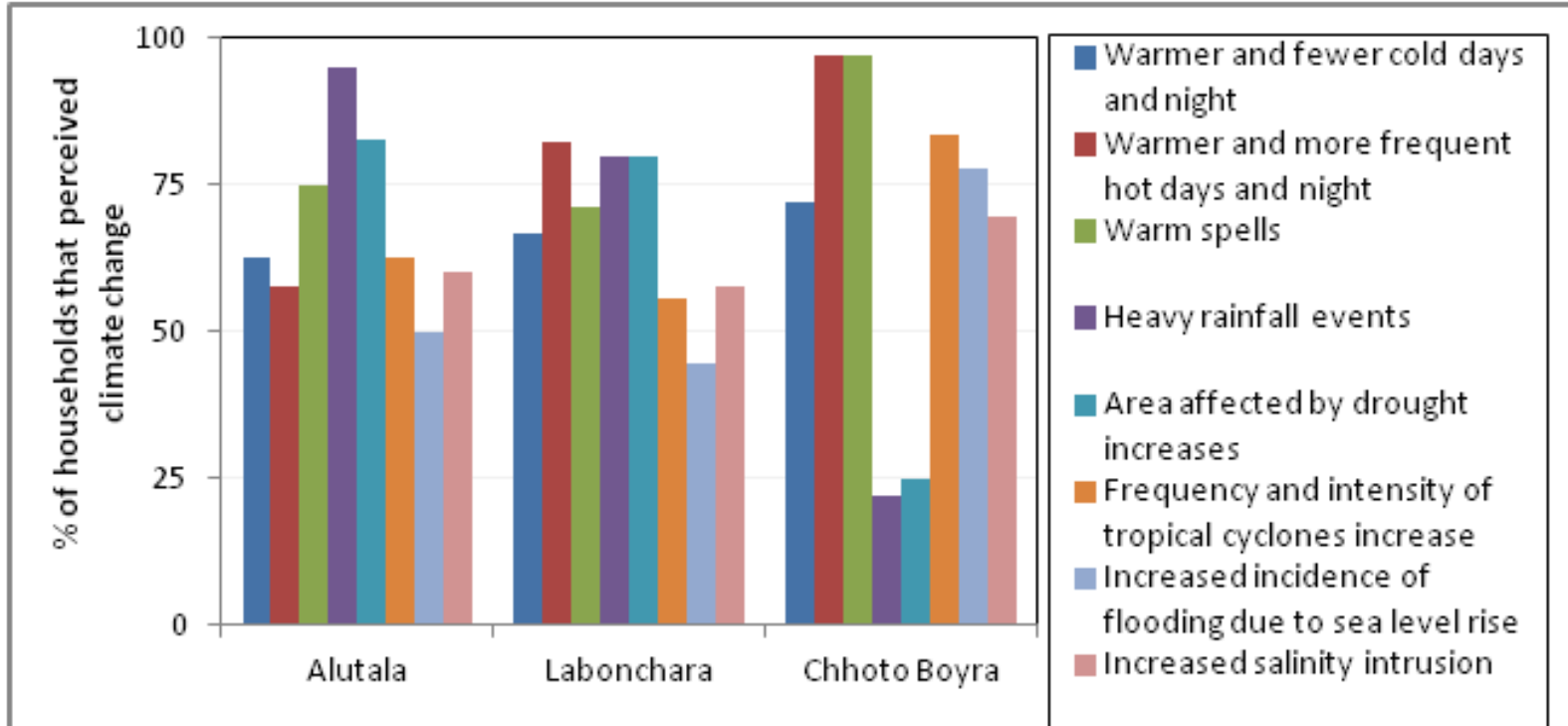


Climate Change: Assessing from Observed Data

- **Temperature** is rising very fast since 1980
- Number of extremely **cold nights** is decreasing and the **heat index** is increasing
- **Sunshine** duration has a **decreasing** trend
- **Humidity** has an **increasing** trend
- **Rainfall** is **increasing** in terms of both magnitude and **number of rainy days**



Climate Change: People's Perception



Climate Change: Implications for Water Security

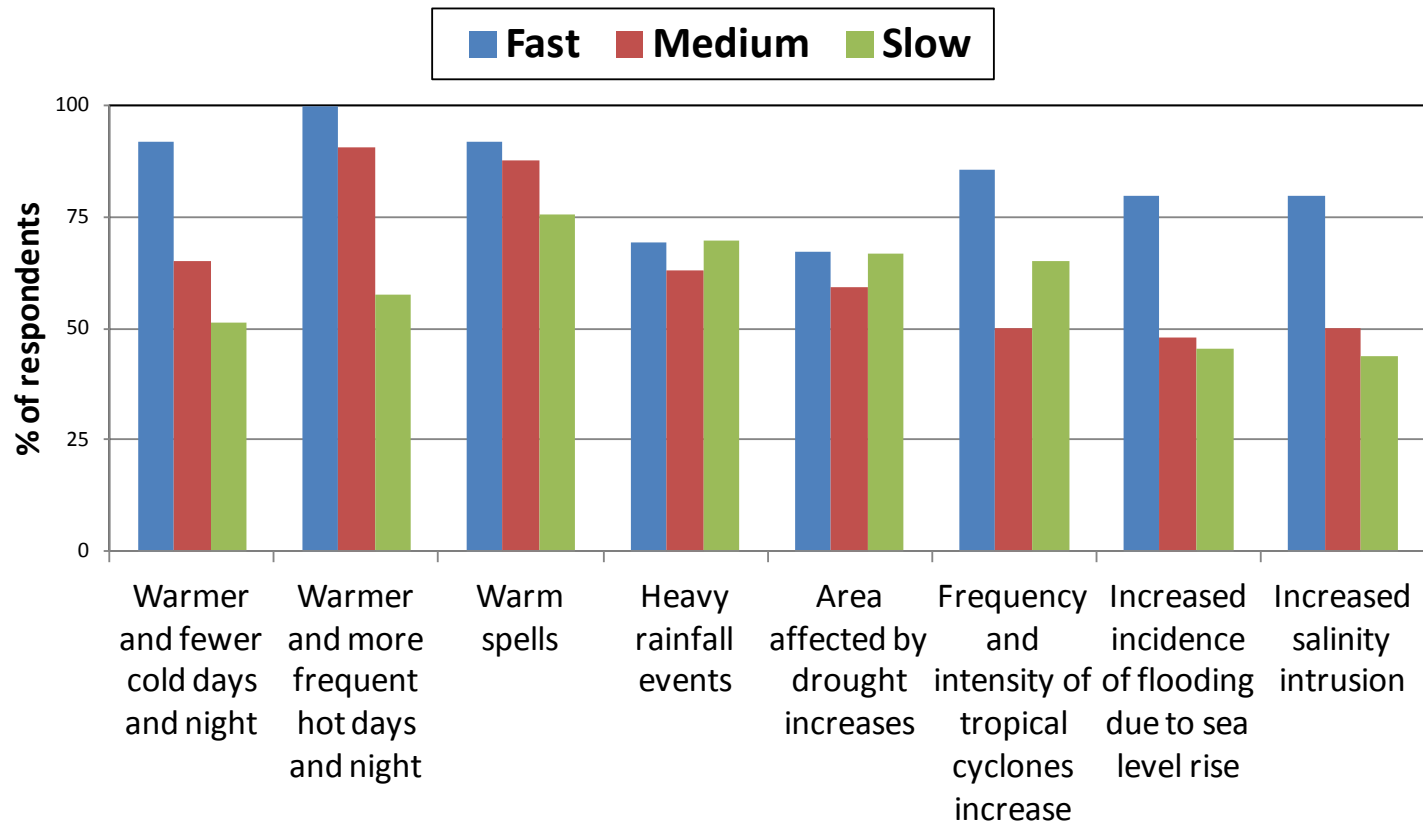
- Changes in **rainfall pattern**: irrigation water and crop production
- **Tidal water** level and **salinity**: agriculture and drinking water
- **Temperature** rise: **work stress** and comfort level
- Groundwater **recharge** and changes in the **hydrologic cycle**
- Rainfall intensity and temperature: **human health** and well-being
- Frequency and intensity of **climatic disasters**

Urbanization and Climate Change: Compounding Stressors

- **Urban flooding** from extreme rainfall
- **Groundwater recharge**
- **Urban heat island effect** and local micro-climate



Urbanization and Climate Change: Compounding Stressors





Vulnerability: Behind the Scene

- **New demands and claims** over land and water makes peri-urban residents more vulnerable
- **Conversion** of agricultural **land**: water availability, access and quality
- **Contestation** for resources creates **conflicts** and weakens resilience - increases vulnerability
- **Urbanization** degrades peri-urban **biophysical** systems and processes
- These are **further degraded** by **climate change impacts** including sea level rise and salinity intrusion

Examples: Urban **land development** projects, **Urban elites** taking control over peri-urban water resources, Urban wastes and **wastewater flows** to the peri-urban areas, Urban **heat island effects** spill over to the peri-urban areas and change the local environment and **micro-climate**.



Adaptation Practices

- **Technological** (RWH, building dikes around agricultural plots)
- **Institutional** (new forms of **collective institutions** – tubewells, ponds)
- **Changes in livelihood strategies** (shift in **cropping pattern**, **salinity tolerant crop**, switching to **culture fisheries**, **non-agricultural livelihoods**, **migration**)



Action and Advocacy

- **Village plan:**
Needs, mobilization, action
- Climate change and adaptation awareness/trainings
- Community based **solid waste management**
- Art/debate/quiz **competitions**



Action and Advocacy

- **Multi-stakeholder platform** aided by short-term studies
- **Policy interventions**
- **‘Save the Mayur’ campaign**



Thanks!