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CLIMATE CHANGE AND CONTINGENT ADAPTATION:
STRATEGIES FOR RESOURCE-CONSTRAINED SOUTH ASIAN MEGA-CITIES

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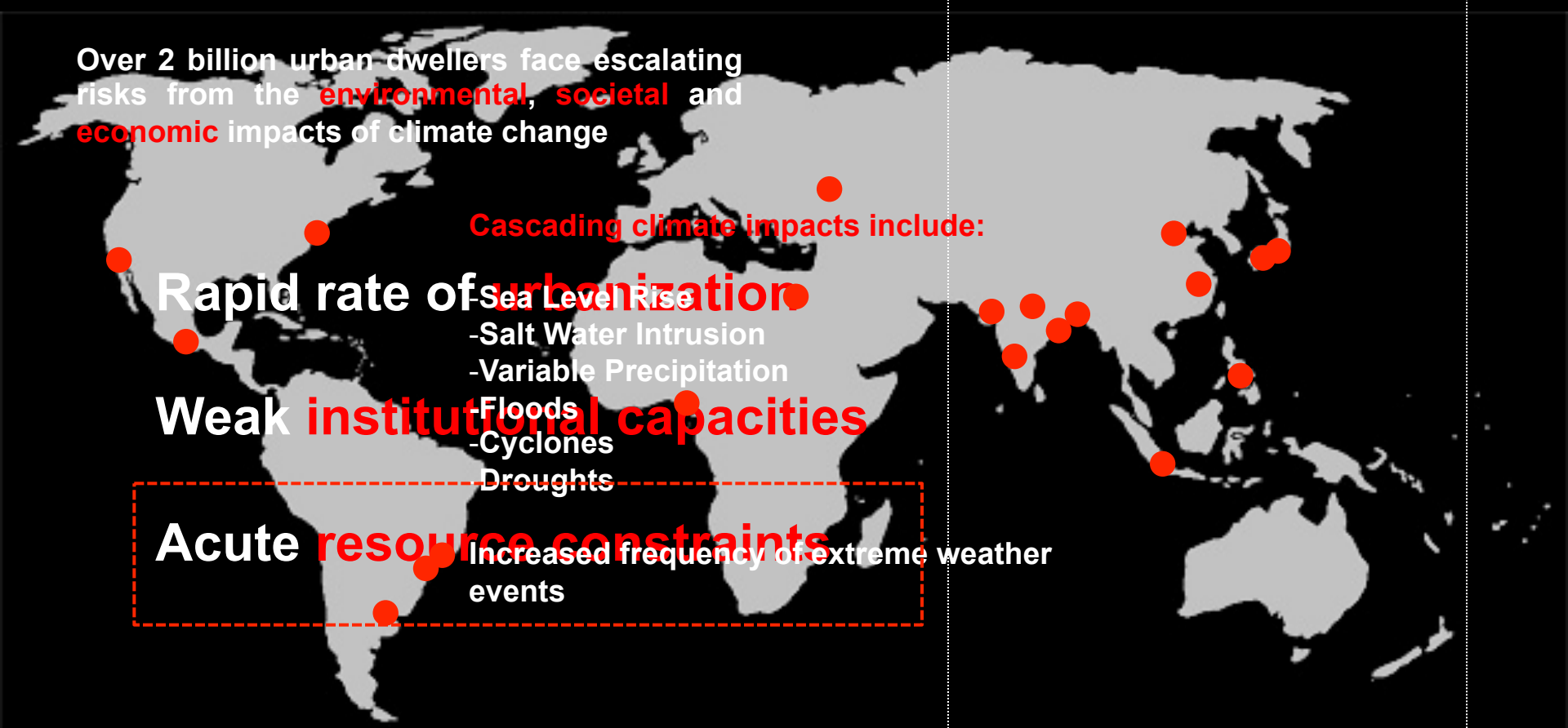
Over 2 billion urban dwellers face escalating risks from the **environmental**, **societal** and **economic** impacts of climate change



Rapid rate of **urbanization**

Weak **institutional capacities**

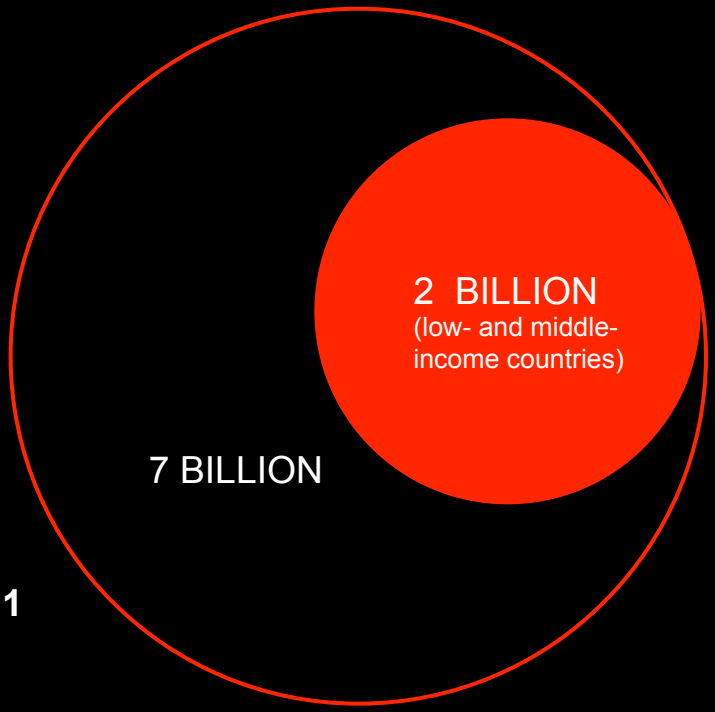
Acute **resource constraints**

Cascading climate impacts include:

- Sea Level Rise
- Salt Water Intrusion
- Variable Precipitation
- Floods
- Cyclones
- Droughts

Increased frequency of extreme weather events

[population = 10m or greater]



By 2025
Most fundamental issues will likely be experienced in the water sector:
2.5 billion people – water-stressed conditions
1.8 billion people – absolute water scarcity

Climate adaptation at the city level remains marginal at best in South Asia

The planning approaches adopted in these Asian mega-cities have far-reaching and permanent implications for the futures of not only the cities themselves but also for the entire region.

Finding ways to adapt to climate change within existing resource constraints is essential to avert or lessen the risks of climate related impacts.

In the face of existing resource constraints, what planning strategies can be most effective for adaptation to climate change in mega-cities of the Global South?

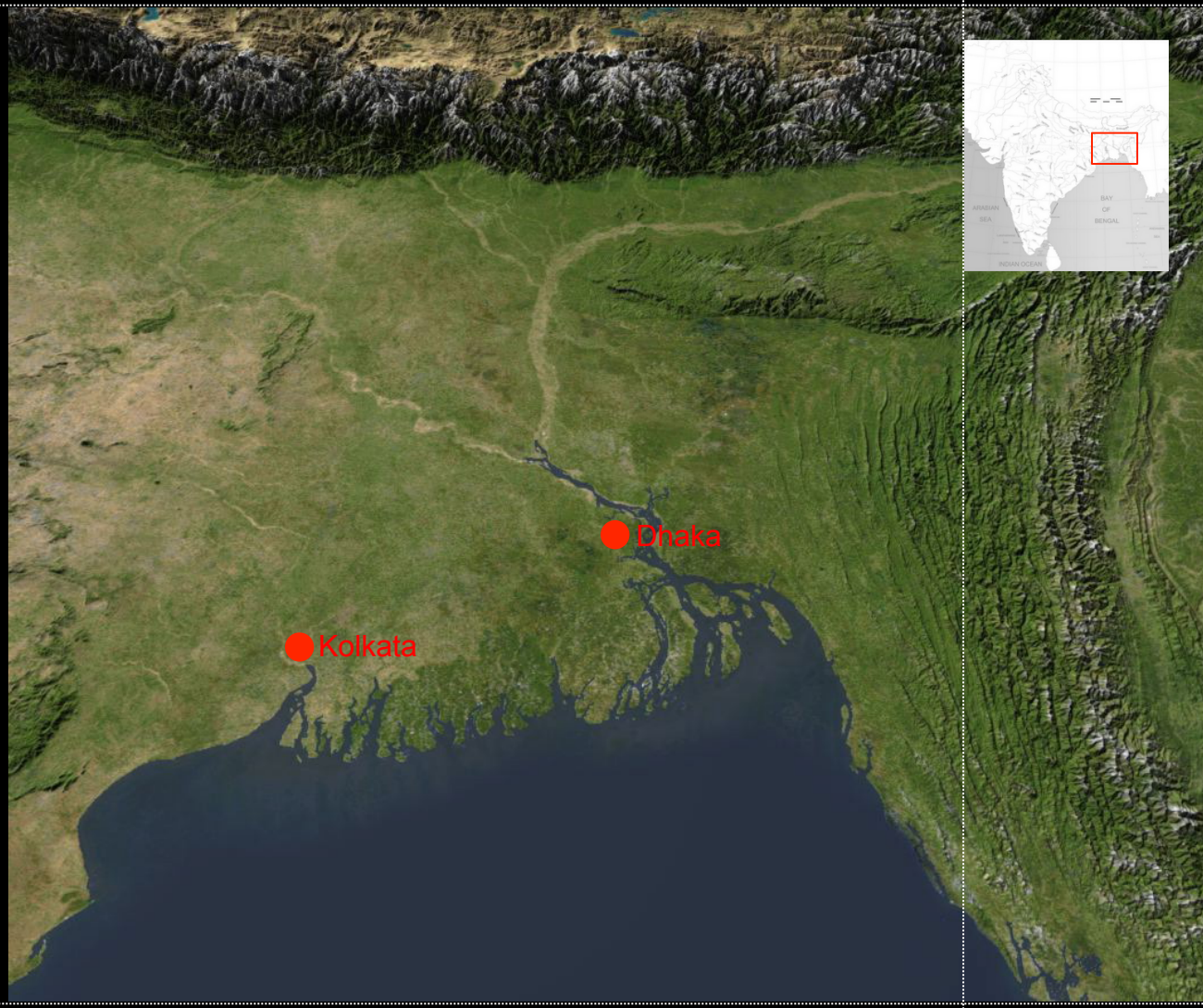
CITIES AT RISK: Kolkata, India, and Dhaka, Bangladesh

VULNERABILITIES

- Sea level rise (above average)
- Intense rainfall
- Cyclonic activity
- Storm surges
- Rainwater runoff (excessive)
- Reduced sedimentation
- Subsidence of land
- Salt water intrusion

IMPACTS

- Loss of mangrove forests
- Reduction in grain production
- Reduced fishing + aquaculture
- Dislocation of population
- Rise in epidemics
- Groundwater contamination
- Storm and sewer infrastructure limitations
- Flooding due to drainage congestion



CITIES AT RISK: Kolkata, India, and Dhaka, Bangladesh

IMMEDIATE IMPACTS

- Floods and drainage congestion
- Water supply and quality
- Destruction of urban wetlands

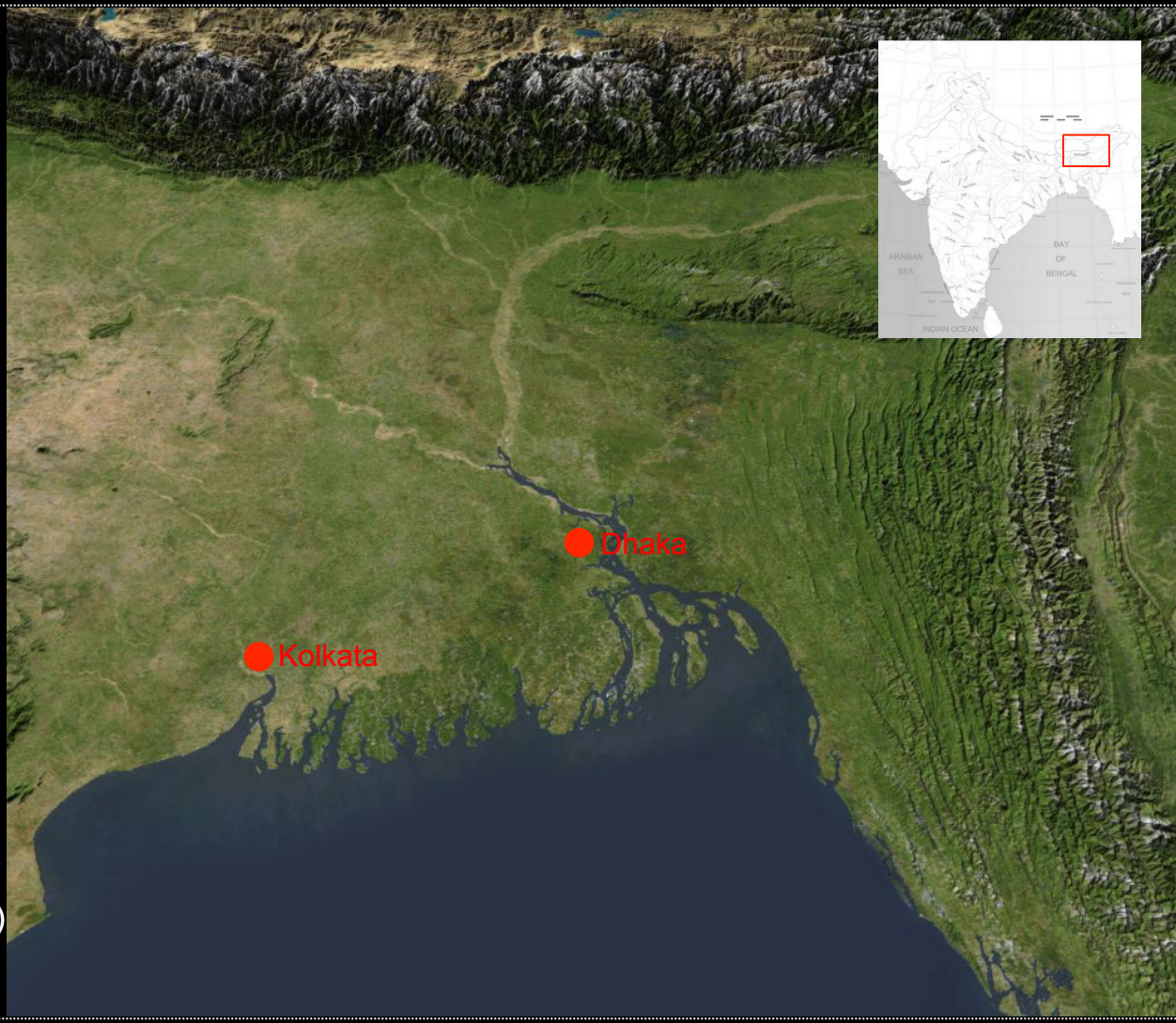
CLIMATIC FACTORS

- Floods
- Sea-Level Rise + Salinity Intrusion
- Cyclones and Storm Surges
- Land Subsidence

NON-CLIMATIC FACTORS

- Geographic
- Topographic
- Developmental

-Population growth and density
-Poverty and sub-standard housing
-Overdevelopment
-Poor infrastructure (eg. storm, water)



In the face of existing resource constraints, what adaptation approaches have most effectively enabled these cities to respond to the risks related to climate change?

TASK

"Adaptation" approaches that have the ability to overcome:

-Existing resource constraints
-Institutional limitations

and have

-Higher likelihood of adoption

and those

-That can be easily integrated in this context

East Kolkata Wetland Systems

-- One of the largest wetland systems in South Asia
-- Encompasses an area of 12500 hectares
-- 46% consists of water bodies (intertidal and salt marshes, salt meadows, lakes, and seasonal ponds as well as settlement ponds and oxidation basins)

East Kolkata Wetland Systems Management Project

Aims

-Preservation of wetlands
-Sewerage and drainage improvements (e.g. canal rehabilitation, desiltation of of storm and sewer lines)
-Solid waste management
-Construction and rehabilitation of sewage pumping stations and treatment plants, new sewage and storm water networks
Desiltation of canals, sewer and storm water lines
-Construction, upgrades and rehabilitation of solid-waste pumping stations, treatment plants, and secondary and trunk sewer lines

Outcomes

-Protected wetlands
-Reduced drainage congestion
-Improved infrastructure
-Obviated the need for additional sewage treatment plants and pumping stations
-Provided socio-economic benefits

Integration of Climate Management and Infrastructure Development

Additional benefits:

The wetlands act as sewage farms and further purify the water, which is then channeled into larger sewage-fed fish farms and ponds, ultimately contributing to urban livelihoods.

Downstream, the treated water from the wetlands (particularly those in water bodies that are relatively purified) is used for agriculture in the surrounding areas.

The wetlands produce approximately 13,000 tons of fish and 150 tons of vegetables per day which allows for local and economical food sourcing.

Integration of Climate Management and Infrastructure Development

Identification and preservation of natural drainage areas and flood-flow zones

Extension, rerouting and desiltation of canals and sewer trunks to feed into the larger ponds and lakes – part of infrastructure planning initiatives

Planning of wetland areas to serve as a “natural purifier” which process approximately 250 million gallons of sewage per day

Implications for Policy and Practice

The coupling of planning objectives related to climate risk management and developmental initiatives that produce synergistic outcomes, increases the likelihood that such measures will be prioritized, funded, and implemented by city-level public agencies.

Climate-adaptation strategies and specific measures that can be easily identified and integrated with existing infrastructure projects are generally given precedence and are implemented in a more effective and timely manner than are stand-alone climate initiatives.

Implications for Policy and Practice

The most effective and readily applicable approaches are those that factor in development and adaptation criteria in an integrated way.

In doing so, the resources allocated for local development can simultaneously address adaptation needs for the city without substantial additional investments, which is an important consideration for local agencies in resource-constrained regions.

Moreover, since such projects are already part of the ongoing planning initiatives, they do not require more extensive "specialized adaptation" planning and technical expertise.

CONTINGENT ADAPTATION

Such an approach, which I term ***contingent adaptation****, is defined as a planning approach that articulates adaptive criteria at its inception, fulfills specific long-term adaptation goals, and in the interim serves as a viable substitute for dedicated adaptation planning; the precise elements of this approach are* *contingent* *upon the developmental goal* in question (e.g., augmentation of the urban water supply).

Discussion

THEORIES

"Development as Adaptation"
(e.g. Susskind 2010; Schipper, Cigaran, and Hedger, 2008; Schipper, 2007; Callaway 2004; Lavell, 2004; Srivastava and Heller, 2003; Callaway, 2004; Schipper, Cigaran, and Hedger, 2008; Heltberg, Siegel, Jorgensen, 2009; Smith, Vogel, 2009; Smith and Lenhart,1996; Smith, 1997; Hitz and Smith, 2004; Carter, 1996))

Disaster Risk Reduction
(Adger et al., 2005; Alam & Rabani, 2007; Birkman et al., 2009; Hewitt, 1983, 1997; Kousky et al., Posner, 2005; 2009; [illegible], 1996)

RESEARCH

Data Sources
- -90+ semi-structured field interviews
(city-level planners, government officials, academics, other private entities)
- -Review of archival and policy documentation
- -Current academic scholarship
- -Climate risk assessments

EVALUATIVE CRITERIA

- -Does the project address any local climate risks?
- -Does the project tackle any planning, developmental, or infrastructural objectives?
- -Were explicit policies or planning measures to deal with these climate risks already in place before the project commenced?
- -Were the climate risks assessed prior to the implementation of the project?
- -Were new measures integrated into existing projects to manage climate risks?
- -Are there any specific metrics or standards for the success of the project?
- -Does the project display any synergies among the involved sectors?
- -Did the project lead to relevant innovations?