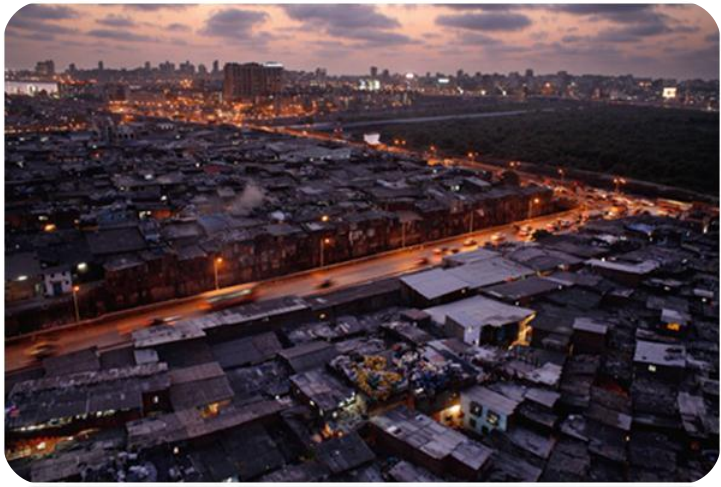
Climate and Disaster Resilience Index of Asian Cities

Coexistence of Contrast

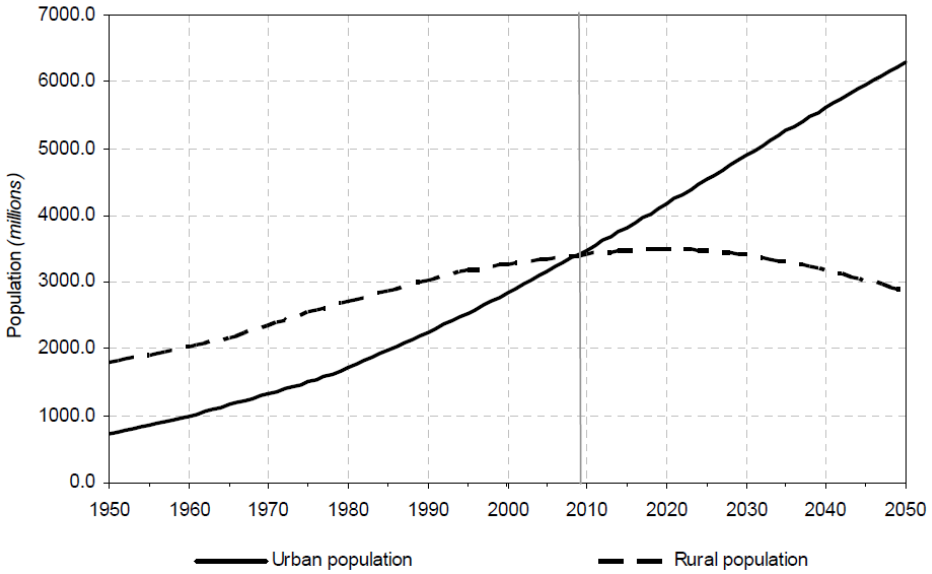


Rajib Shaw

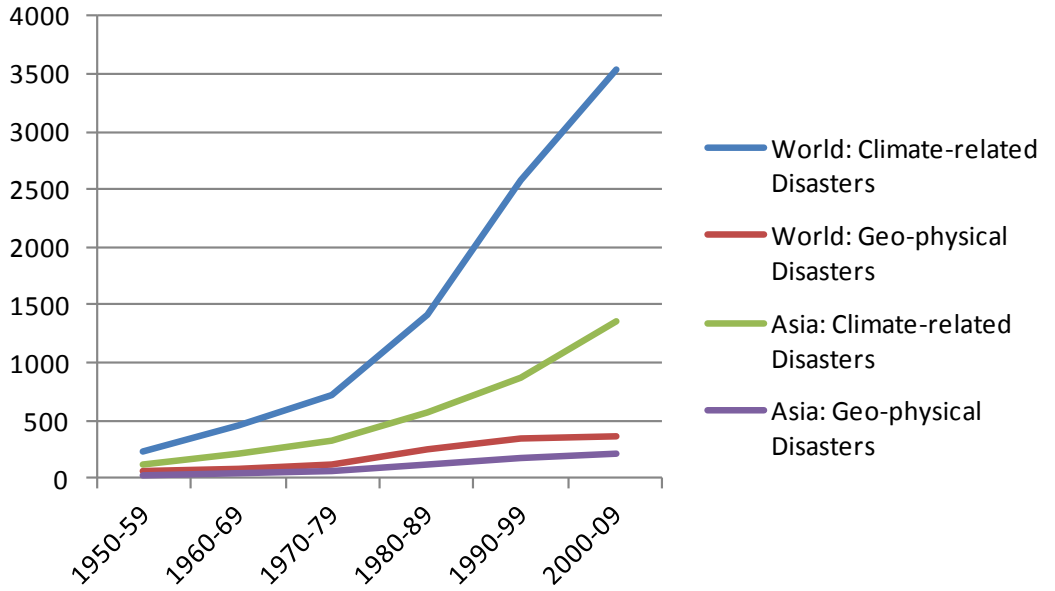
Professor, Kyoto University

http://www.iedm.ges.kyoto-u.ac.jp/

Increasing Trend



Source: UNPD, 2010



Vulnerability

Context

- Urban Context: Complexity
- Climate Context: Uncertainty in downscaling
- Governance Context: Regular city services
- Implementation Context: Community linkages

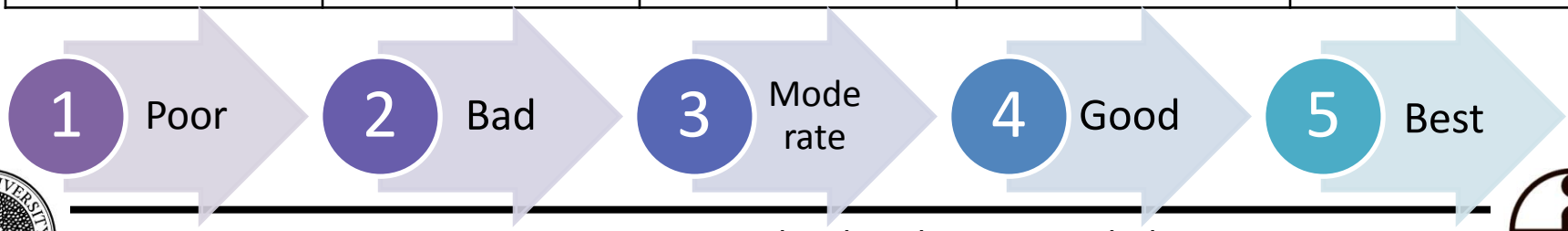
Climate Disaster Resilience Index: CDRI
Methodology

Key Question: How to address climate disaster risk to understand the resilience of a city?

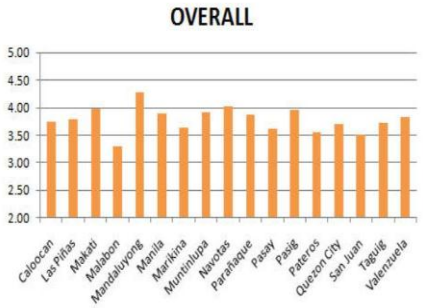
→ CDRI tool: *5x5 matrix, 25 parameters integrating 125 variables*
Analysis: *Weighted Mean Index*

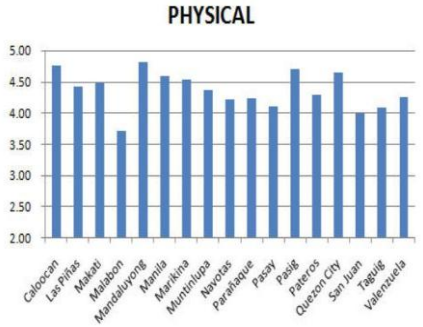
5-5-5 Matrix

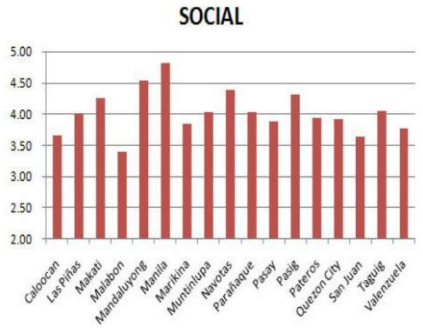
Physical	Social	Economic	Institutional	Natural
Electricity	Population	Income	Mainstreaming	Intensity
Water	Health	Employment	Crisis management	Frequency
Sanitation, Solid waste	Education and awareness	Household assets	Institution	Ecosystem
Infrastructure and Roads	Social capital	Finance and savings	Collaboration	Land-use
Housing and land-use	Social cohesion	Budget and subsidy	Good governance	Environmental policies

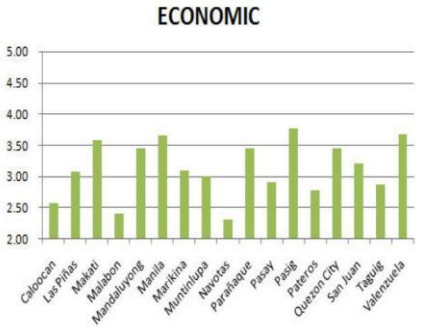


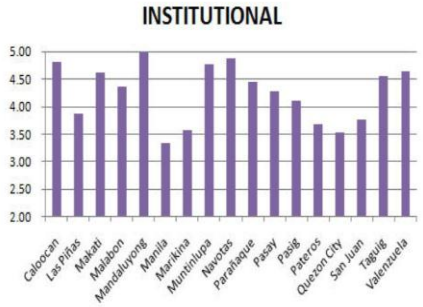
CDRI: City Cluster Level

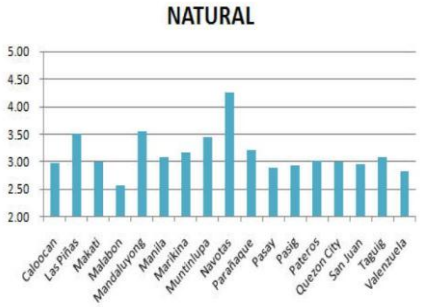


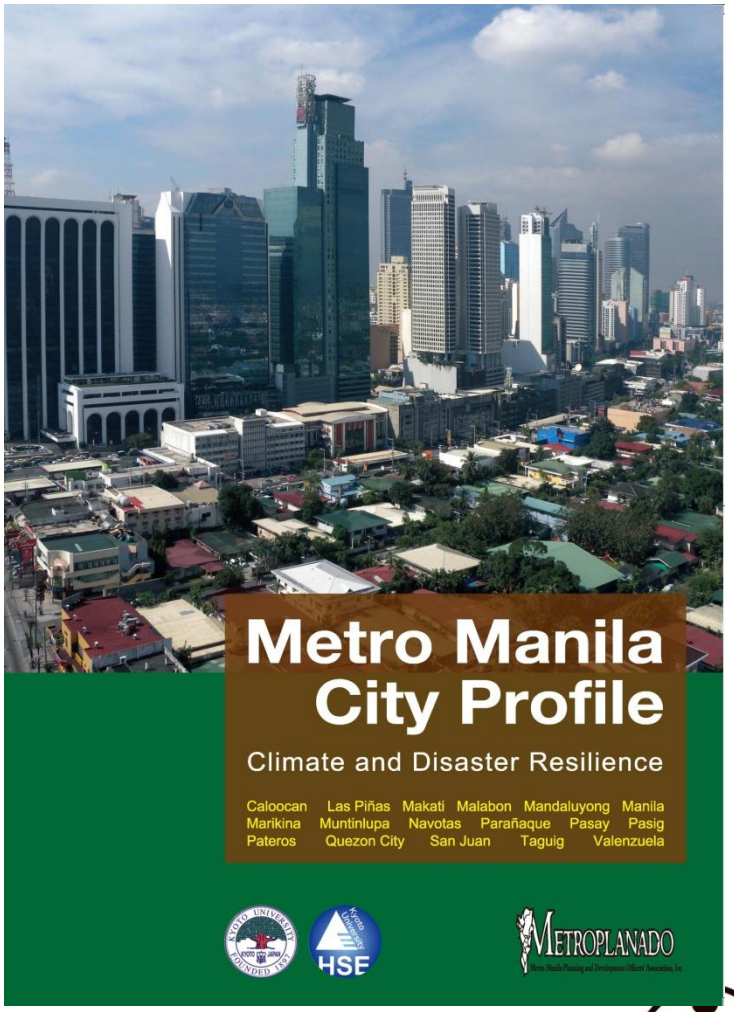






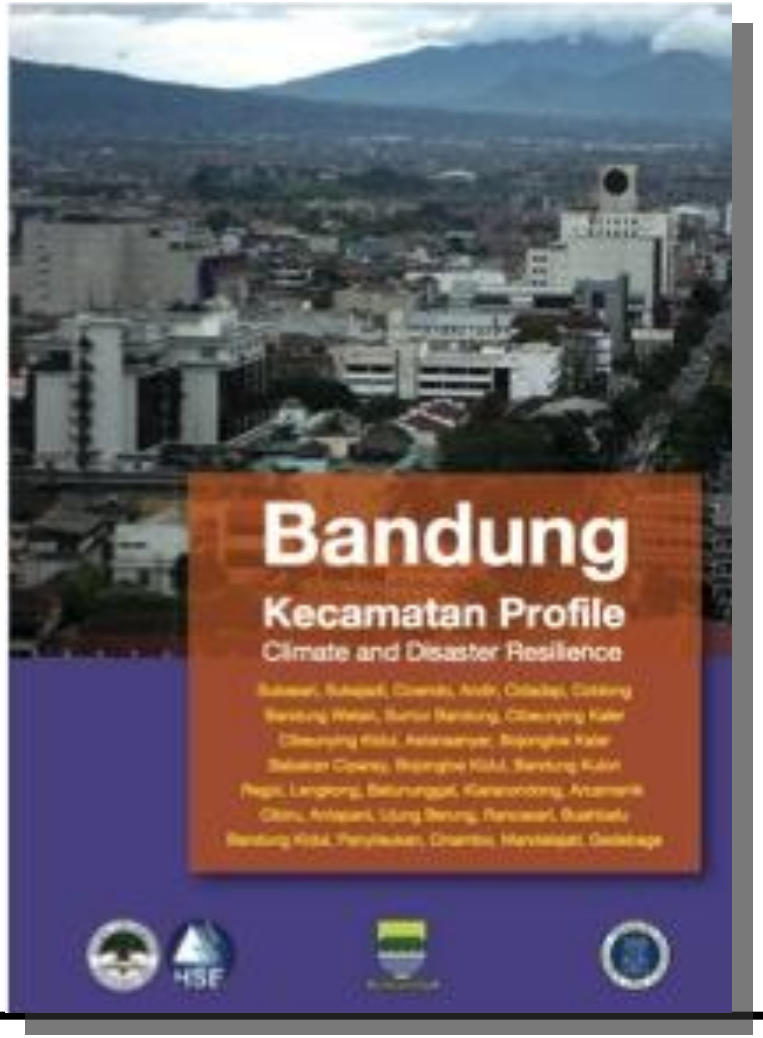






CDRI: Ward/ district / zone level

- Chennai: 10 districts
  - 180 sq km, 5.5 Ml
- Delhi: 9 districts
  - 1500 sq km, 12 Ml
- Makati: 36 barangay
  - 28 sq km, 0.5 Ml
- Bandung: 30 sub-dt
  - 168 Sq km, 2.3 Ml
- Dhaka: 10 zones
  - 360 sq km, 11 Ml



Bandung Climate Disaster Resilience

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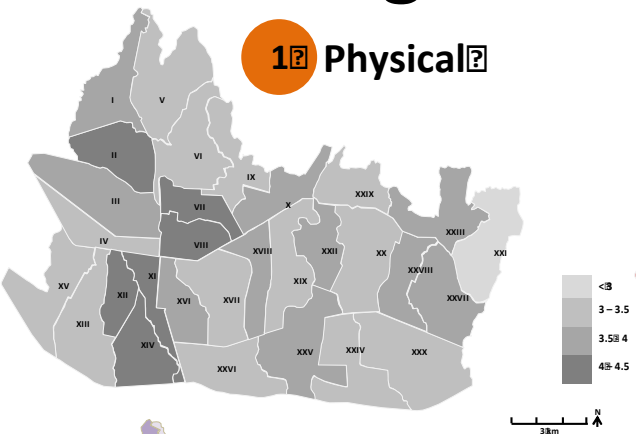

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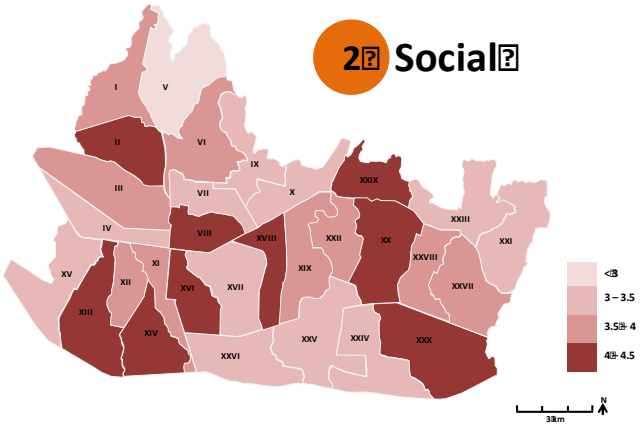
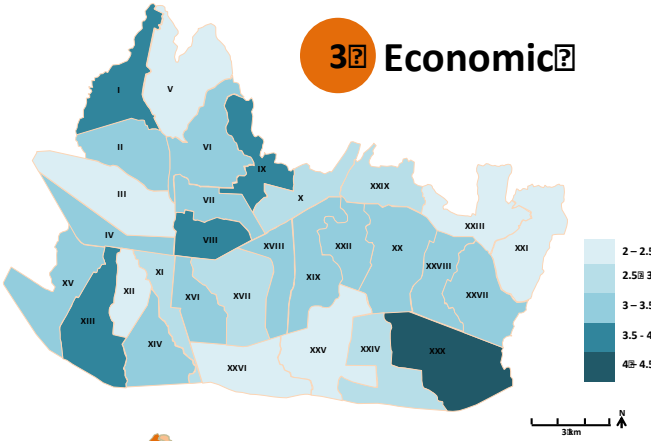
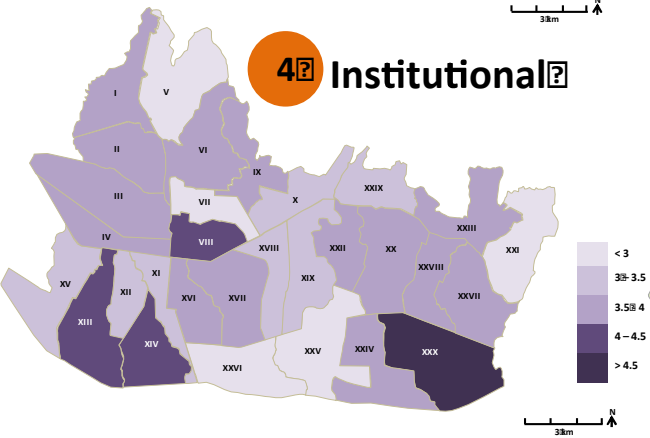


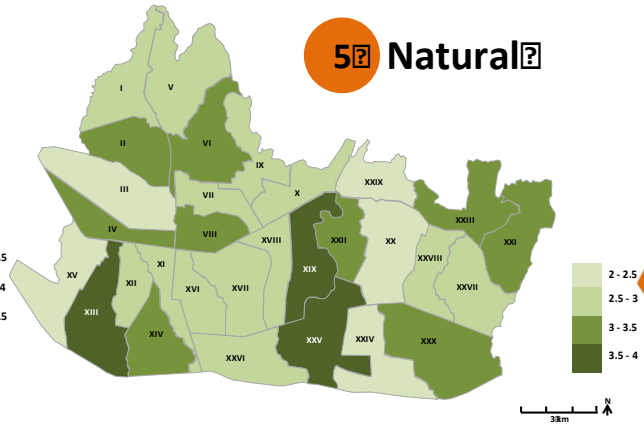
3 Economic



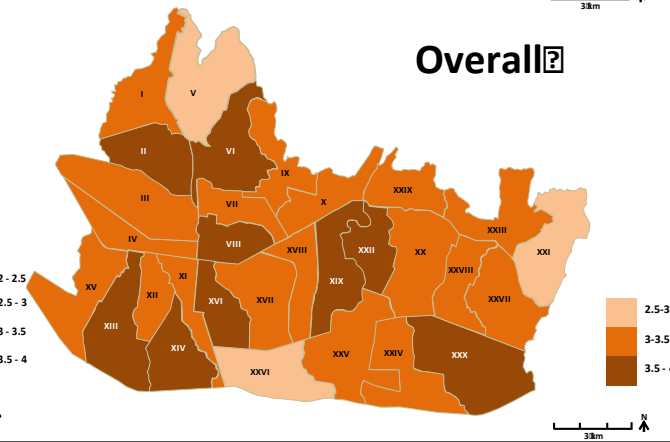
4 Institutional

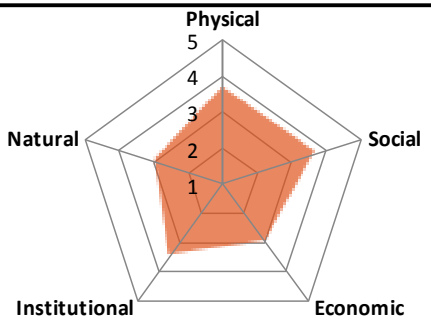


5 Natural



Overall



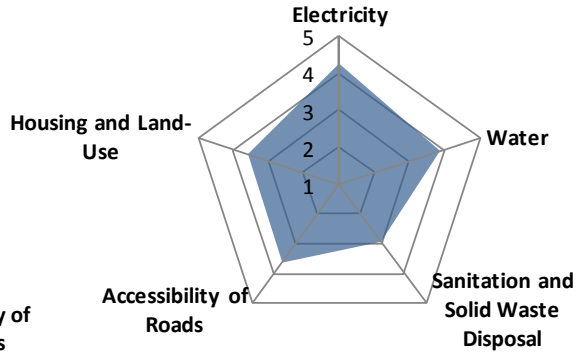


- Health, Electricity and Social Capital are **the highest parameter values**
- Finance and Savings, Frequency of Hazards, and Budget and Subsidy in DM are **the lowest parameter values**

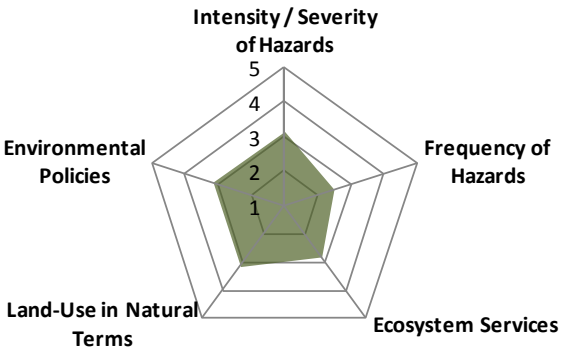
Kyoto University

International Environment and Disaster Management
Graduate School of Global Environmental Studies

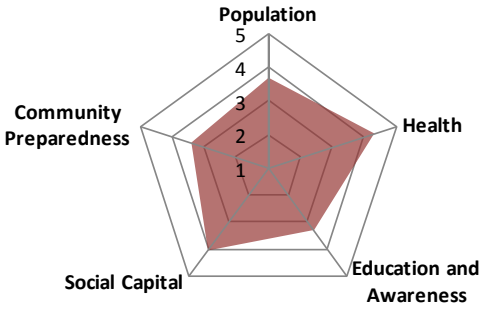
Physical



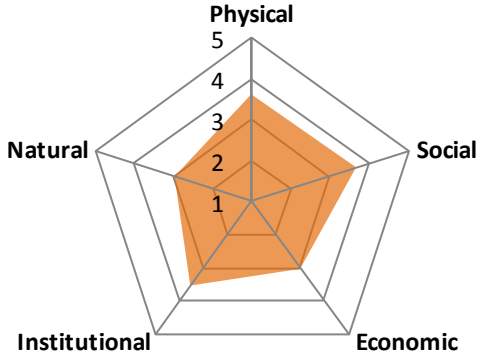
Natural



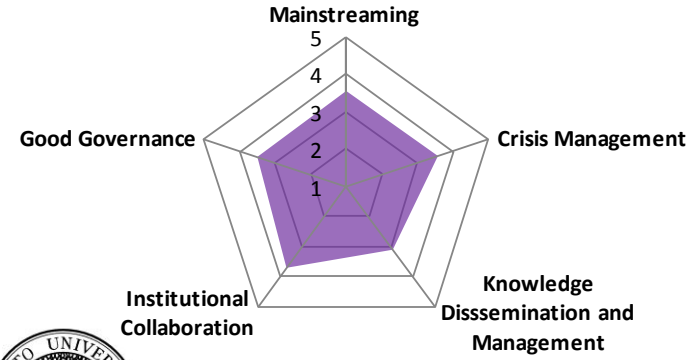
Social



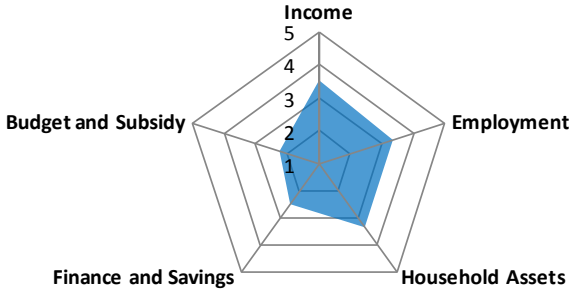
Overall Resilience



Institutional



Economic



Bandung CDRI Synopsis

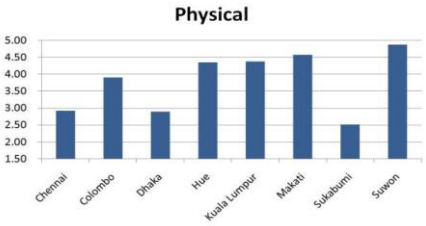
Parameter	CDRI Score
Health	4.31
Electricity	4.24
Social Capital	4.07
Water	3.88
Institutional Collaboration	3.72
Population	3.69
Accessibility of Roads	3.62
Housing and Land-Use	3.6
Crisis Management	3.58
Mainstreaming	3.54
Income	3.52
Good Governance	3.5
Community Preparedness	3.42
Employment	3.35
Education and Awareness	3.31
Household Assets	3.25
Environmental Policies	3.16
Land-Use in Natural Terms	3.15
Knowledge Dissemination and Management	3.12
Intensity / Severity of Hazards	3.11
Sanitation and Solid Waste Disposal	2.93
Ecosystem Services	2.81
Finance and Savings	2.49
Frequency of Hazards	2.49
Budget and Subsidy	2.26

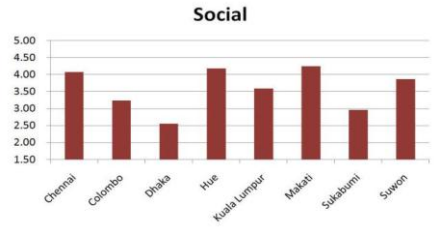
↑ Social, Physical, and Institutional Resilience

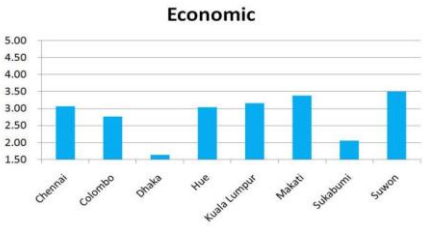
Confirming the need for actions

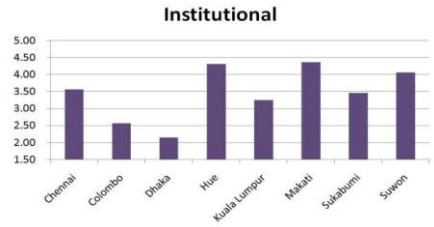
↓ Economic and Natural Resilience

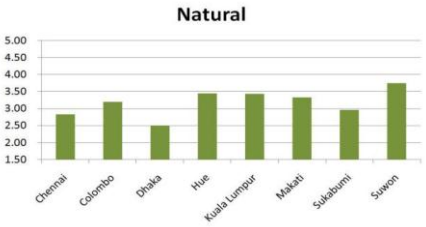
Time Series Analysis







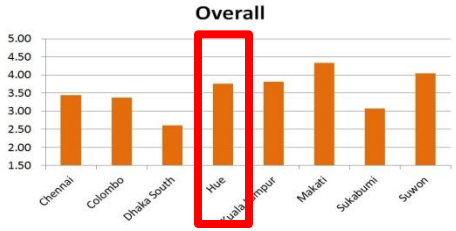


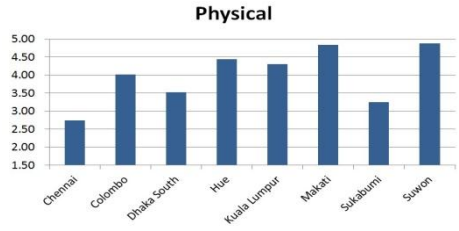


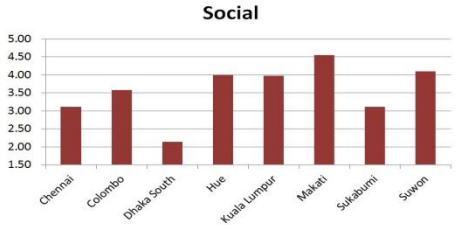
2010

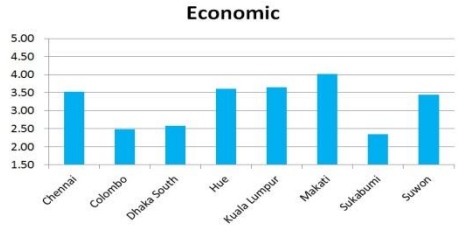
Chennai, Colombo, Dhaka, Hue, Kuala Lumpur, Makati, Sukabumi, Suwon

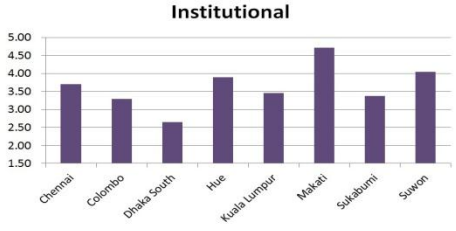
2013

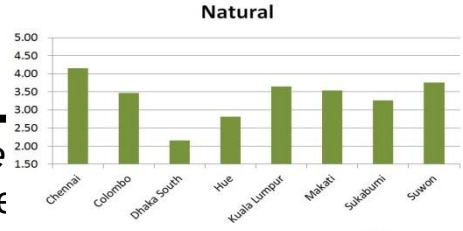












Change in Trends: 2010-2013

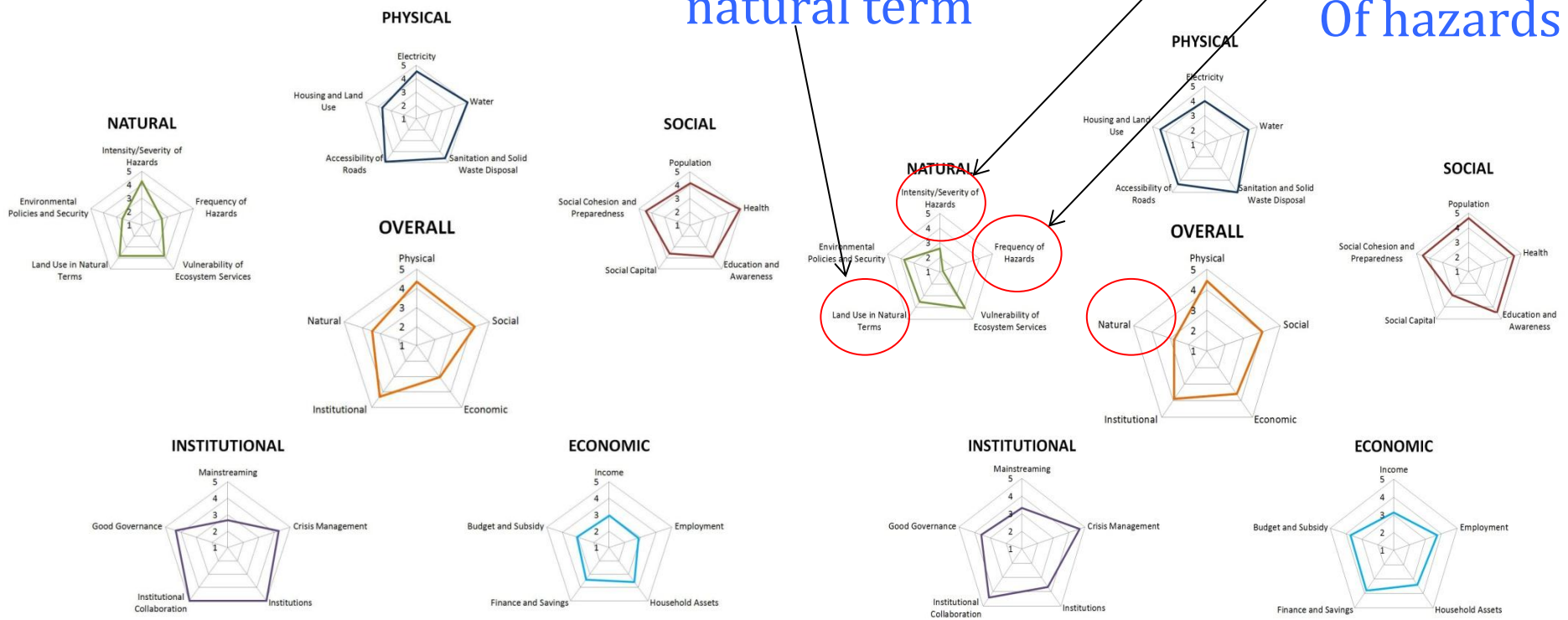
City name	Overall		Physical		Social		Economic		Institutional		Natural	
	2010	2013	2010	2013	2010	2013	2010	2013	2010	2013	2010	2013
Chennai	3.29	3.44	2.92	2.74	4.08	3.11	3.06	3.52	3.56	3.70	2.83	4.15
Colombo	3.14	3.37	3.91	4.02	3.23	3.58	2.77	2.48	2.57	3.29	3.20	3.47
Dhaka	2.35	2.61	2.90	3.53	2.56	2.14	1.64	2.58	2.15	2.65	2.51	2.16
Hue	3.87	3.75	4.35	4.44	4.18	4.01	3.04	3.60	4.31	3.90	3.45	2.81
Kuala Lumpur	3.57	3.81	4.38	4.30	3.60	3.98	3.16	3.65	3.26	3.46	3.44	3.64
Makati	3.98	4.33	4.58	4.84	4.25	4.55	3.38	4.02	4.36	4.71	3.33	3.54
Sukabumi	2.79	3.07	2.51	3.25	2.96	3.11	2.05	2.35	3.46	3.38	2.96	3.26
Suwon	4.01	4.04	4.88	4.88	3.87	4.10	3.50	3.44	4.06	4.04	3.75	3.75

Hue 2010-2013

Intensity of hazards

Land use in natural term

Frequency Of hazards



2010

2013

Flood in 11/2012

Source: http://nld.com.vn/thoi-su-trong-nuoc/mua-lon-duong-pho-o-hue-ngap-lut-20121117021850398.htm

Flood in 10/2011

Typhoon No 10 in 9/2013

Source:https://www.facebook.com/tpHue

Coastal areas in Hue Province

A view of coastal area in Hue Province

A school in Phu Vang District, Hue Province

Chennai *Climate Action Plan [CAP]*

Physical resilience:

	Short-term (< 2 yrs.)	Medium-term (2-5 yrs.)	Long-term (> 5 yrs.)
Action 1	Involvement of community in waste segregation practices	Saving of energy and increasing the use of solar power	Amendment of building codes, aiming for higher energy standards
Action 2	Stricter enforcement of Development Control Rules	Identification of areas for development and open space	Enhanced use of rain-water harvesting technique to increase available water (tanks, individual houses)
Action 3			Provision of long-term strategy to reduce the solid waste → introducing tax incentive system

Waste

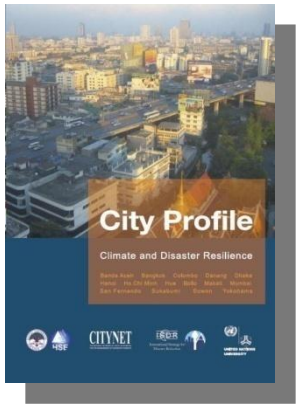
Electricity

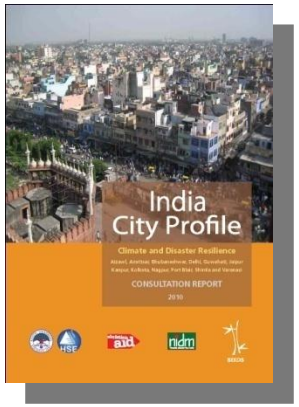
Social resilience:

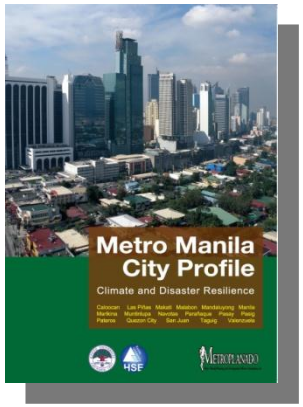
	Short-term (< 2 yrs.)	Medium-term (2-5 yrs.)	Long-term (> 5 yrs.)
Action 1	Education programmes for family planning, particularly for women	Improvement of basic amenities (sanitation facilities, safe drinking water, roads, community welfare centres, parks, etc.)	Development of action plan to eradicate diseases
Action 2	Community-level early warning systems; conduction of drills in school	Community-level disaster recovery plans	

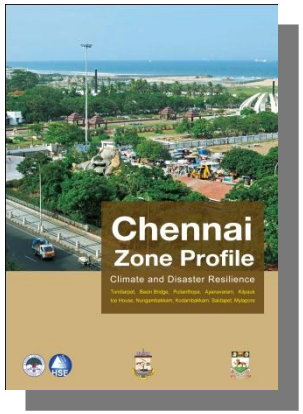
Summary

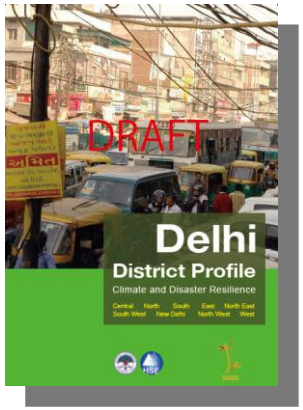
- Urban complexity, especially related to climate related hazards
- Need to desegregate risk / resilience to the city services [water, electricity, sewage, housing etc.]
- Need to find the appropriate entry point [solid waste, welfare, health etc…]
- Need to find the suitable change agents

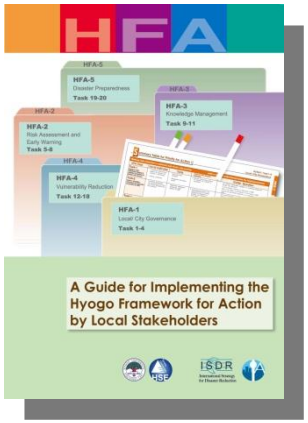


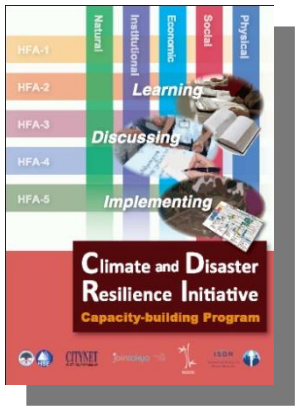


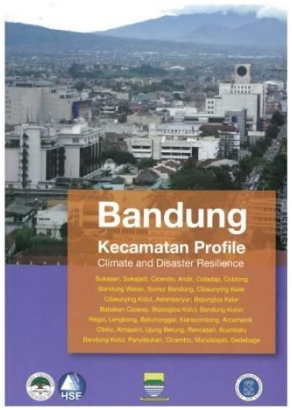


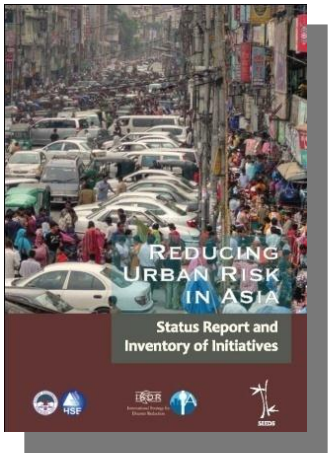












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