DESARROLLO URBANO CLIMÁTICO VULNERABLE EN BANGLADESH
Construyendo una gobernanza urbana resiliente al clima en ciudades intermedias

CLIMATE VULNERABLE URBAN DEDVELOPMENT IN BANGLADESH
Building Climate Resilient Urban Governance in Intermediate cities

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ABSTRACT

This article investigates the impact of climate change on the functional systems of intermediate cities in Bangladesh. The aim is to mitigate the immediate challenges posed by the global climate change for small and middle sized cities as future populated urban centers in developing countries. The objective of this study is to formulate a comprehensive framework for climate change resilient urban governance. The conceptual framework of this research adopted the modified structure of S Tyler and M Moench (2012) CRF model incorporating three major components, urban functional system, local urban governance and climate resilience. Five case study cities in Bangladesh have been conceptualized as functional system to identify the change factors. The vulnerability assessment of climate change is to provide the city's exposure of future climate risks on city's functional system. The research initiates a resilience building process based on Mehta's good governance (1998) through a shared learning dialogue (SLD) involving stakeholders.

Key words: Urban functional system, Local urban governance, Climate resilience, Intermediate city.
Topic: Analysis and territorial project.

1. Introduction

Bangladesh is referred as the 'Ground Zero' for global climate change being one of the most vulnerable countries in the world. The impact of climate change will cause a displacement of 30 million people in 2050. Subsequently this vast number of climate migrants will create huge challenges for fast growing urbanization in Bangladesh. UN Habitat says the future of world lies within the development of Intermediate cities and 68% of world population will live in urban areas in 2050. Policy induced monocentric urban development and poor urban governance are the key factors behind unplanned urbanization in Bangladesh (Rahman HZ, 2014).

An integrated urban development policy prioritizing the issue of sustainability and urban resilience must be formulated to mitigate the immediate challenges of global climate change for small and middle size cities as future populated urban centers in vulnerable developing countries. Governance for Urban Sustainability and Resilience is crucial for strategic decision making to respond Climate Change and the relevance of the Built Environment (Jeroen Van der Heijden 2014). As Fernandez-Guell (2006) stated that "Good governance is the result of adding to the action of government collaboration between public administrations, the institutional strengthening, the involvement of agents socio-economic and citizen participation". The line of proposed research will focus on urban governance as major strategic decision-making tool for strategic and spatial planning process for urban areas.

2. Objectives

The objectives of this research are as follows.
a. To investigate the impact of climate change on the functional systems of intermediate cities in Bangladesh.
b. To develop a comprehensive framework for Climate change resilient Urban Governance.
c. To evaluate the implication of this research in the context of Bangladesh and other developing countries affected my Global climate change.

3. Literature review

In the last few years, the concept of resilience has become the prominent way of dealing climate change impact in the urban areas exposed to natural hazards. Many researchers formulated several conceptual models and analytical framework considering resilience as transverse capacity of a city to understand and prevent the disaster risks, to mitigate those risks and to minimize the loss (Spaans & Waterhout, 2017).
Stephen Tyler and Marcus Moench (2012) developed an operational framework or climate resilience framework (CRF model) for urban planning practitioners incorporating the general notion of urban climate resilience. The theoretical and empirical knowledge of the factors contributing to resilience are applied on three components, urban systems, the agents, and Institutions, to their exposers to climate change vulnerability. Structured shared learning approach has been adopted to allow the local planners defining these factors in local context and thus developing practical strategies for local action. The analytical framework is examined through resilient planning activities in 10 cities across Asia through the Asian Cities Climate Change Resilience Network (ACCCRN) funded by the Rockefeller foundation.
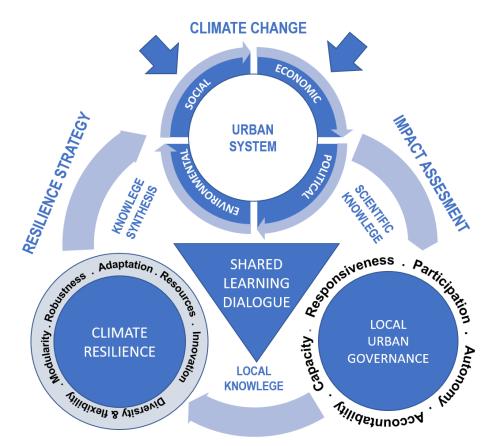To mitigate climate change impact in an urban context a good governance framework is proposed to support building effective resilience in a city (T Tanner & T Mitchell, 2009). The concept of this framework derived from the study of good governance in Asia by IDS fellow Mehta (1998) based on experiences gained from the research works conducted in three cities of India.

Josune Hernantes, et al. (2019) developed a Resilience Maturity Model (RMM) having a roadmap for operationalizing the resilience-building process with a sequence of different maturity stages and a set of policies to be implemented improving their resilience level. This RMM model will strengthen the capacity of a

city adapted to shock and stresses, keep functional system running, learn from local experience and increase adaptive abilities to keep critical service functioning and enhance preparedness to future challenges.

Academics and policy makers are concerned with the form of Governance effective for disaster risk reduction, climate change adaptation and resilience. Poor governance at both national and local level poses as critical obstacle for effective and equitable resilience and adaptation planning. Lack of capacity and will among local governments in the Global South to respond to urban resilience leads to huge deficits in service and infrastructure provision, which drives up risk (Satterthwaite, 2011).

This study will examine the role of local urban governance regarding urban system, agents and institutions to enhance resilience building process and formulate resilience strategy due to climate change challenges. The aim is to investigate governance structure and process to be responsive and capable for future climate challenges.

4. Conceptual framework for creating climate resilient urban governance.

Fig. 01 Conceptual framework for climate change resilient urban governance system in intermediate cities of Bangladesh (Own elaboration)

In this research the conceptual framework (Figure-1) adopted the structure of CRF model (Stephen Tyler and Marcus Moench, 2012) for building resilience in urban governance system so that future climate challenges will be addressed in a very specific approach determined with local stakeholders' participation.

The proposed framework incorporates three major components 1. Urban functional system, 2. Local urban governance and 3. Climate resilience. The framework will initiate the process with the understanding of functional systems in specific urban area, the assessment of climate change impact on urban system and

local urban governance and the resilience building process using scientific and local knowledge through a shared learning dialogue (SLD) involving stakeholders.

Since the impact of climate change upon urban functional system and the future influence of local change factors will define the character and dynamics of local urban governance the study will try to find the impact and vulnerability regarding urban system, agents and institutions in light of the characters of good governance (Mehta, 1998). Then a resilience strategy will be formulated integrating resilience components to strengthen urban governance for dealing future climate challenges.
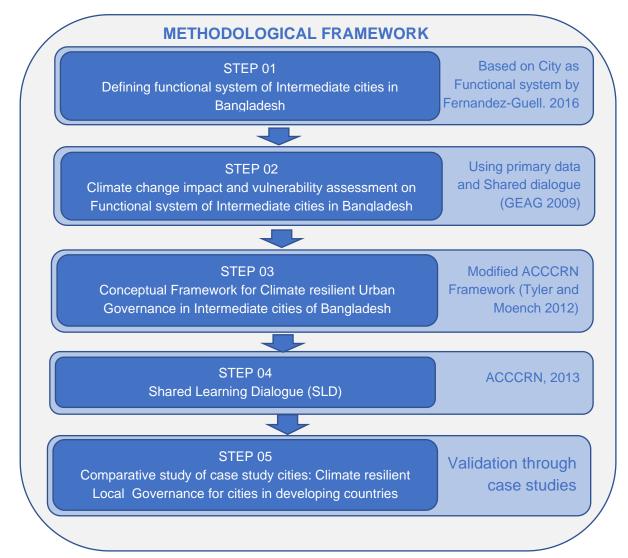
5. Methodology

METHODOLOGICAL FRAMEWORK

STEP 01
Defining functional system of Intermediate cities in Bangladesh

Based on City as Functional system by Fernandez-Guell. 2016

STEP 02
Climate change impact and vulnerability assessment on Functional system of Intermediate cities in Bangladesh

Using primary data and Shared dialogue (GEAG 2009)

STEP 03
Conceptual Framework for Climate resilient Urban Governance in Intermediate cities of Bangladesh

Modified ACCCRN Framework (Tyler and Moench 2012)

STEP 04
Shared Learning Dialogue (SLD)

ACCCRN, 2013

STEP 05
Comparative study of case study cities: Climate resilient Local Governance for cities in developing countries

Validation through case studies

Fig. 02 Methodological framework of the research (Own Elaboration)

6. Research Context

6.1. Country Background

Bangladesh is the 8th most populous country with a population more than 164 million people in 2016, density of 1116 persons per square kilometer and growth rate 1.08% in 2018 (BBS, 2019). Bangladesh has been considered as emerging economy with 7.9% GDP growth in 2018 and ranked as the 39th largest economy in the world.

6.2. Geography of Bangladesh

Bangladesh has 580 Km stretch of coastline on the Southern Bay of Bengal and fringed with largest mangrove forest (Figure3a). it is one of the largest deltas in the world with dense network of tributaries of 405 rivers constituting 24,140 km waterway. Most of the country is less than 10m above sea level and 10% is less than 1m high (Figure3b).
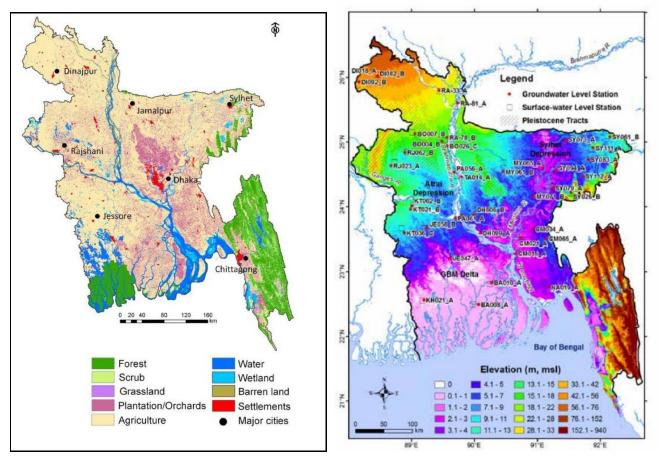

Fig. 03a Land use map (S Reddy C, 2014)
Fig. 03b Elevation map of Bangladesh (M Shamsudduha 2011).

6.3. Climate of Bangladesh

The country has subtropical monsoon climate, and three seasons are distinctly evident whole year- a hot humid summer with 30°C to 40°C (March to June), a rainy monsoon season (June to October) and cool dry winter (October to March) with average 10°C in January, the coldest month of Winter.

During monsoon season the northeastern part receives the greatest average precipitation 4000 mm per year. The dry western part (Figure 4a) has average annual rainfall 1600 mm whereas most regions of the country receive at least 2000mm of rainfall per year. March and April are the least humid months over most of the western part of the country. The relative humidity is over 80% everywhere during June through September.
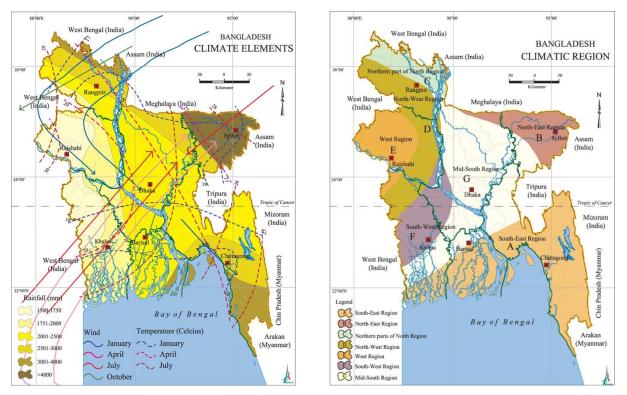
Fig. 04a Climatic regions

Fig. 04b Climate elements of Bangladesh. (Source: Banglapedia http://en.banglapedia.org/index.php?title=Climate)

6.4. Urbanization in Bangladesh

The total urban population of Bangladesh is 64.8 million (2019) increased from 7.6% in 1970 to 38.2% in 2020 with a growth rate 3.17%. and It will reach to 56% by 2050. The country has more than 570 urban centers. The Capital city, Dhaka is a megacity with 44.26% of total urban population and the other 25 urban centers have more than 0.1 million people. Islam (2015) identified three factors for rapid urban growth which are (a) a persistently high natural increase of native urban population; (b) the territorial extension of existing urban areas to rural centers; and (c) rural to urban migration.
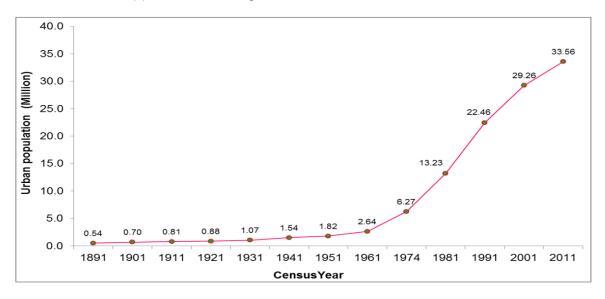

Fig. 05 Trend of urbanization in Bangladesh, 1891-2011 (BBS, 2014)

6.5. Urban Governance in Bangladesh

Urban local government of Bangladesh had to go through series of changes from Mughal period (16th Century) through British rule (18th and 19th century) to present democratic system. Article 59 and 60 of the Bangladesh Constitution specifies that local government in every administrative unit will be composed of persons elected in accordance with law and parliament, having the power to impose taxes for local purposes, to prepare their budgets, and to maintain funds (P Panday, 2007). Different successive governments since the British rule used to impose control on the municipalities. After 1991 the parliamentary democracy was restored, and the urban local government got into the process of democratization (Local Govt. Act 1994). Due to very limited resources the Municipal authority still has to rely on the central government even for the financing for mandated projects and there is no space for autonomy to function independently (Figure-6).

Fig. 06 Organizational constraints for urban governance in Bangladesh (Source: Own elaboration)

6.6. Intermediate cities of Bangladesh

55% of the global urban population living in small and intermediate cities in 2015 will be increased to 60% in 2025. Intermediate cities create important bridges between rural and urban areas, offering rural population an opportunity to access basic facilities and services. The Global report of UN Habitat 2006 asserts that attaining Millennium Development Goals (MDG) largely depends on strengthening local economic development and improvement of living and working conditions in small towns.

Bangladesh has monocentric urban growth (Fig-7a). The other cities have less urban population comparing to Dhaka (Table-1). People from rural areas are being migrated to urban areas because of being affected by natural disasters and to avail employment opportunities, education and health services, other amenities.

Fig. 07a Distribution of urban population in Bangladesh
Fig. 07b Urban centers of Bangladesh

District	Rank	Population in 2020 (Millions)	Area (Sq. Km)	Elevation (Meter)	Climate change risks
Dhaka	1	21	306	4	Flash Flood
Chittagong	2	5	155	29	Cyclone
Khulna	3	0.95	50.61	9	Cyclone, Salinity
Sylhet	4	0.9	97.18	21	Flash flood
Rajshahi	5	0.85	41.85	35	Drought
Bogra	6	0.77	69.19	20	
Comilla	7	0.59	23.44	72	
Barishal	8	0.48	69.19	1.22	Cyclone, Salinity
Rupganj	9	0.48	41.85	3	
Mymensing	10	0.46	70.89	19	

Table. 01 Cities Ranking in terms of population in Bangladesh (UN World population prospectus 2019)

Disaster-prone Districts

DISTRICT	MAIN RISK
Bhola	Cyclone
Barguna	Cyclone
Patuakhali	Cyclone
Pirojpur	Cyclone
Cox's Bazar	Cyclone
Noakhali	Cyclone
Tangail	Flood
Faridpur	Flood
Bagerhat	Cyclone
Khulna	Cyclone
Jessore	Water Logging
Satkhira	Cyclone
Netrokona	Flash flood
Jamalpur	Flood
Sirajganj	Flood
Rajshahi	Drought
Gaibandha	Flood
Nilphamari	Drought
Habiganj	Flash flood
Sunamganj	Flash flood
Total number of children at risk:	

* UNICEF estimate of child population per district

Legend
- Cyclone
- Flood
- Drought
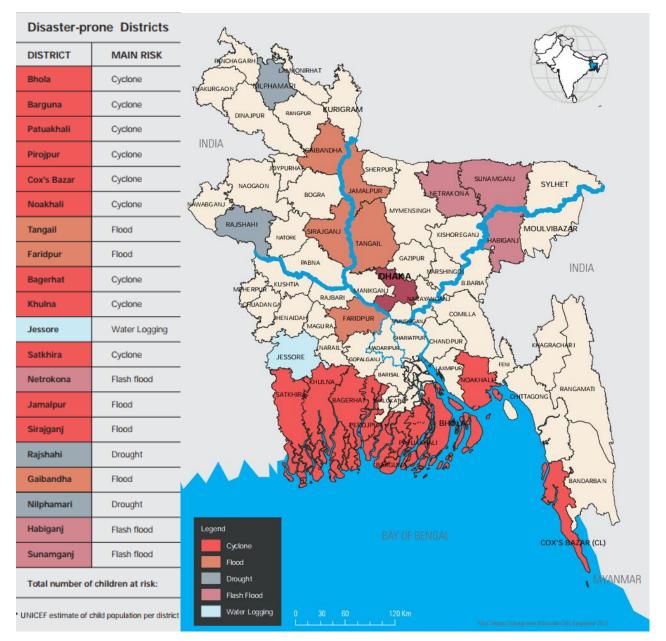- Flash Flood
- Water Logging

Fig. 08 Disaster-prone districts in Bangladesh (Map: Disaster Management Information Cell, Bangladesh 2012)

For our research purpose 05 (five) cities of Bangladesh have been selected as the intermediate cities based on their location, demography and geographical vulnerability (Fig-8) to climate change. Khulna and Barisal are located in coastal zone with elevation of 9m and 1.2 m respectively. Both cities are highly vulnerable to natural disasters like cyclones and flood. Rajshahi and Rangpur are districts subject to drought because of climate change. Sylhet is in the region highly vulnerable to heavy rainfall and flash floods.

7. Methodological framework applied to Intermediate cities of Bangladesh.

To test the proposed framework case studies were conducted for the selected intermediate cities to understand the functional system of the cities, climate change impact on functional system and risk analysis to create a resilient strategy for future urban governance.

7.1. Defining urban Functional system of intermediate cities in Bangladesh.

To deal with the complexity, diversity and uncertainty of contemporary cities and to interpret the mounting challenges it is necessary to conceptualize the city as an evolving functional ecosystem (Fernandez-Guell, 2016). The STEEP analysis done in this research is to identify social, technological, economic, ecological and political factors that influence the development of intermediate cities of Bangladesh. The factors identified from the relevant research papers and publications with the help of experts will be used to conceptualize each city as a functional system (Fernandez-Guell, 2016).

The next task is going to be done by the stakeholders with the questionnaire form (PAPI- Paper and Pen personal Interview) to select the most important key factors in each group with the help of group of stakeholders. Within a specific time perspective until 2050 the stakeholder group will asses the importance and predictability of the factors by means of 7-level Likert scale using PAPI survey.

SOCIAL FACTORS	TECHNOLOGICAL FACTORS	ECONOMICAL FACTORS	ENVIRONMENTAL FACTORS	POLITICAL FACTORS
1. Diverse mix of socio-economic group.	1. Adaptation to new technology	1. Informal economic activities	1. Climate Change impact	1. Development control guidelines
2. Rural-Urban Migration	2. Access to high-speed internet & telecommunication	2. Liberalization of economy and privatization of industry.	2. Air pollution	2. Management of urban services
3. Access to education and health services.	3. Vernacular technology for agricultural production	3. Public- private partnership	3. Water pollution	3. Poltical stability
4. Spontaneous growth of neighborhoods	4. E-governance	4. Rise of small entrepreneurship	4. Change of natural drainage system	4. Corruption
5. Affordable housing demand	5. Use GM crops in agriculture	5. Economic vulnerability due to natural disasters	5. Vulnerable food production sector	5. Local election process
6. Amusement and leisure activities	6. Industrial automation	6. Flow of foreign remittance	6. Waste management system	6. Disaster management
7. Increased consumerism	7. Lack of Research & Development	7. Steady GDP growth	7. Environmental management	7. Public participation in decision making
8. Woman empowerment	8. Poor infrastructures	8. Energy security	8. Urban vegetation	8. Effectiveness of Local governance
9. Higher living cost & low wages	9. Digital discrimination	9. Monetary Inflation	9. Unplanned urbanization	9. Accountability and transparency

Table. 02 STEEP factors influencing Urban functional systems of Intermediate Cities of Bangladesh (Source: Own elaboration)

7.2. Climate change impact upon functional subsystems of intermediate cities in Bangladesh

Each city of case studies has been assessed for climate vulnerability to provide basis for understanding both direct and indirect impact of future climatic hazards on people, infrastructures, and urban system specific to their city. The assessment will include the city's exposure of climate risks in terms of its impact on people and

city's functional systems. The study will also examine the existing capacities to adapt and provide information to plan the city for a resilient future (Sarah Opitz-Stapleton, et al., 2009).

Intermediate City in Bangladesh	Social subsystem	Environmental subsystem	Economic subsystem	Political subsystem
Khulna Karim, R., et al., 2013 Shamsuddoha, M. & Karim, R., 2007	1.Forced Migration 2.Increase of homeless people	1.Salinity increases due to sea level rise. 2.Cyclone causes huge damage on Sundarbans, largest Mangrove forest in the world.	1.Loss of agricultural production a2.Loss of livelihood	1.Illegal settlements in Khulna city 2.Lack of services 3. Deterioration of law and order
Sylhet Akhter, S., et al., 2019 Shahid, S., et al., 2015	*Loss of livelihood affects living standard	1. Reduced rainfall affects the discharge of Surma river. 2. increased temperature reduced cold waves	Negative agricultural production and unstable livelihood	Migration to Assam in India creates religious ethnic tensions
Rajshahi Kamaker, S., et al., 2018	1. Increase of social problems 2.Child and women health became vulnerable	1. Use of ground water increases 2. Use of chemical fertilizers increases	1. Decrease of agricultural production 2. Increase of health cost	Political pressure increases to revise water treaty with India
Rangpur Chakrvaorti, BK et al., 2018 Zinnatul-Bassar, ATM., Habib, M. A., 2017	1. Less access to work 2.Migration to urban area	1.Increase of lightning and thunderstorm causes huge dry air in summer season. 2.Riverbank erosion due to flood	1.Property damage and loss of life 2.Food insecurity, 'Monga' due to drought	Poverty causes rise of radicalism

Barishal Akter, T., et al., 2015 Hasan, M. M., et al., 2018	1. increases rate of migration due to loss of livelihood 2. increases social conflict and poverty	1.Water logging blocks drainage of storm water. 2.Cyclone and thunderstorm destroys plants. 3.Sealevel rise causes reduced upstream flow and causes salinity intrusion in surface and ground water. 4. Excessive siltation and accretion of land causes loss of navigability. 5. Declining aquatic resources	1.Erratic and irregular rainfall causes loss in crop production 2.Livestock production is affected 3. Irrigation cost rises during drought and Commodity price rises 4.increase occupational changes, reduce employment and income, loss of valuable wealth, increases health problem,	Increases political tension

Table. 03 Climate change impact on functional system of intermediate cities in Bangladesh based on secondary data from journal papers. (Source: Own elaboration)

Table 3 shows Khulna is mostly affected by the sea level rise facing cyclones, storm surge, salinity intrusion and flooding. Barishal is subject to same hazards since it is located in the low-lying coastal zone. Rajshahi and Rangpur have the similar trend of severe drought because of decreasing rainfall. While Sylhet experiences regular flash flood due to heavy rainfall and incoming water flow from rivers originated in Himalaya.

7.3. Climate vulnerability assessment of intermediate cities of Bangladesh

The framework for urban climate risk assessment has been adapted from Meherotra (2003) and Rosenzweig and Hillel (2008). The specific objectives of this framework are Characterizing the hazards associated with climate change at city level, Identifying the most vulnerable segments of the city and Assessing the city's ability to adapt to anticipated changes in climate.

HAZARDS	Reference	KHULNA	BARISHAL	RAJSHAHI	SYLHET	RANGPUR
Temperature observed trend	MG Ferdous, MA Baten 2011	Increasing trend (1961-2010) by 0.016°C/yr		Decreasing trend (1961-2010) by 0.0134°C/yr	Increasing trend (1961-2010) by 0.016°C/yr	Decreasing trend (1961-2010) by 0.0262°C/yr
Precipitation	MG Ferdous, MA Baten 2011	Decreasing trend by 0.742 mm/year	Decreasing trends by 0.131 mm/year	Decreasing trend by 3.0698 mm/year	Decreasing trends by 0.463 mm/year	Increasing trend by 3.0698 mm/year`
Sea level rise	G M Sarwar 2007, World bank 2000	Bangladesh has 710 km coastline gently sloped to South. 35.1 million population live in the coastal zone. It is predicted that 25 cm in 2050 and 1m sea level				

			rise in 2100. This rise would inundate 4% and 17.5% of the country.				
Extreme events	Cyclones	N.J. Ericksen 1997	Barishal cyclone, May 11, 1965. Total death 16456, 160km wind speed and 3.7 – 7.6 m storm surge, Bhola cyclone, 11 Nov, 1970, death 0.3 million, Cyclone in 1991, total death 1,38,868. 19.27% of total land mostly coastal areas were affected. Cyclone Sidre, Nov 15, 2007, 223 km wind speed claimed 3363 lives. Cyclone Aila, 2005,				
	Flooding	Babul Hossain et al, 2020	As a result of climate change, Bangladesh faces further recurrent extreme flood events every year. For example, in the 1988 and 1998 respectively, floods wreaked havoc and submerged 61 districts totaling approximately 68% of the area				
	Salinity intrusion	G M Sarwar 2007	A comparative study of the Soil Salinity map of SRDI (1998b, 1998c) for the period 1973- 97 shows that south-western part of the country had become salinized in course of last 24 years.				
	Drought	N.J. Ericksen 1997		Severe drought of 1978/79 to 1979/80 directly affected about 42 per cent of the cultivated land and some 44 per cent of the population			

VULNERIBILITY

Population	Bangladesh Census 2011	1,046,341	339,308	763,952	526,412	328,777
Density		3,913/km^2	10,524/km^2	2,026/km^2	9,123/km^2	4,846/km^2
Percent poor or slum dwellers	Bangladesh Slum Census 2014	3.47	1.61	1.72	2.01	1.06
Urban area susceptible to flooding	In 1988, 61% of Bangladesh was inundated with 2000~ 6500 deaths. Almost every year at least 10% of the country is flooded.					

City % of national GDP	Bangladesh Economic census 2013	12.8	4.8	15.1	4.5	13.5
ADAPTIVE CAPACITY						
Institutions and governance measures affecting climate change actions	Bangladesh Climate change strategy and Action plan (BCCSAP), 2009	CPI Country Ranking 146, Score 26 in 2020. Centralized decision making, Local needs are neglected.				
Willingness of city leadership to address climate change		All city corporations/municipalities are responsible for Climate change mitigation and low carbon development under energy and water efficiency in built environment according to T5P9 of National Climate change strategy and Action plan 2009. Local government institutions partnering with NGOs and donors are to implement climate change initiatives.				
Information and resources comprehensive analysis of climate risk for the city		Government supports range of research program under climate change Action plan 2009. Mostly universities, research centers, NGOs are disseminating research-based knowledge for climate change initiatives.				
Administrative unit assigned to address climate change		Ministry of Environment and Forests to address climate change issues at all levels. No city specific local authority to address climate change problems.				
Balance between adaptation and mitigation		**Mitigation >> Adaptation** Climate change initiatives prioritize adaptation and disaster risk reduction through building capacity and resilience				
RISK		**VERY HIGH**	**HIGH**	**MEDIUM**	**LOW**	**MEDIUM**
		Climate hazards: Sea level rise, coastal flooding, storm surge, salinity intrusion and heat waves. **Vulnerability**: The industrial production, large slum	**Climate hazards:** Sea level rise, storm surge and salinity intrusion coastal flooding. **Vulnerability:** Livelihood in coastal	**Climate hazards**, Inland flooding, and drought. **Vulnerability:** Agriculture sector is highly vulnerable to drought,	**Climate hazards**: Heavy rainfall with flash floods **Vulnerability:** Currently large population are vulnerable	**Climate hazards:** Heavy rainfall with flash floods. Vulnerability: Large poor population. **Vulnerability:** Large population is exposed to

		population are subject to frequent cyclones and coastal surge,	areas and agricultural sector are vulnerable to natural hazards and possibility to turn as climate refugees.	Slum people has lack of access to housing.	to flash floods and heatwaves. Agricultural sector is vulnerable to future drought.	inland flooding, river erosion.
		Adaptive capacity: Since all policies are decided by central government, there is no local initiative for building capacity. Local authorities are only responsible to implement national action plan in coordination with NGOs.				
RESPONSE						
		Poor governance, Policy from Central government, Lack of public participations and awareness, No funding for local initiatives.				

Table. 04 Climate change vulnerability assessment of intermediate cities of Bangladesh.

8. Results and Discussion

Because of the location, geography and climatic pattern each intermediate city of Bangladesh has been facing different climatic events and their consequences. To understand the climate change impact on functional systems of intermediate cities, four subsystems of each city and surrounding regions have been analyzed. The data has been collected from secondary sources like reviewed journal papers and publications of relevant organizations. The outcome of this research will be used for the assessment of climatic risks and formulation of resilient strategy for each city.

Table-3 show that the social subsystem of Khulna has been altered by the displaced people from coastal areas due to climatic hazards. The flora and fauna are in the risk of loss by cyclones and salinity. The economy is largely affected by the loss of agricultural production. Thus, these changes have severe impact including lack of services and political tensions. In Sylhet the climatic events have negative influence on food production and livelihood forcing people migrating to neighboring state of India and thus creating ethnic tensions. With the reduced rainfall, increased use of ground water and withdrawing water from Padma river by India, Rajshahi faces extreme weather condition with frequent drought and loss of food production, thus creating social tensions and affecting people's health and living standard. Rangpur has been experiencing extreme poverty due to lack of employments. The riverbank erosion and drought cause losses of livelihood and forcing people to migrate or involve in radicalism. The increase rate of migration is resulting social conflict in Barishal. The aquatic environment is severely damaged by the erratic climate change events and creating tensions in political arena.

Being 3rd populated city in Bangladesh and located in coastal area, Khulna has large sprawl of slums occupied by mostly climate refugees who lost their livelihood due to salinity in agricultural land. The poor people from Barishal mostly migrates to Dhaka having easy transportation through river way. Experiencing frequent drought, the rural population in Rajshahi and Rangpur mostly migrate to urban areas and create informal settlements causing stress on city's infrastructure and service systems. In Sylhet poor people from surrounding rural areas come for their livelihood and providing cheap labor to city's informal economic activities and service systems.

Khulna became very high-risk zone due to frequent climatic hazards, while population in Barishal city has same high risk. Population in Rajshahi and Rangpur cities is vulnerable due to lack of employment opportunities. Sylhet has a vibrant economy created by large share of remittance from expats living in UK and Europe (Table-4).

All the cities in case study areas have similar problems, Poor governance and dependency on central government created lack of support and services for climate change induced migrated people as well as cities' infrastructures.

9. Conclusion

The research works are being progressed as planned according to the methodological framework. Based on secondary data from referred journal articles we have the understanding of climate change implications upon functional system of selected urban areas as well as the risks and responses due to the climate hazards. Following this step, the analytical framework will initiate the shared learning dialogue (SLD) integrating stake holders' experiences and incorporate the knowledge from three major components, urban system, climate resilience and urban governance to get a comprehensive outcome for building resilient urban governance dealing future climate challenges.

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