



# Narayanganj City Corporation

Climate Change Vulnerability Assessment  
August 2018

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1.1- Many poor communities are situated in dense areas that suffer from critical waterlogging that leads to pathways becoming inundated. With climate change, hazards, such as heavy rainfall and flooding are becoming more acute, and this makes the poor more vulnerable. The country's continued growth and development will only exacerbate this problem unless proper attention is given to address these issues.

# 1. Introduction

## Climate Change in Bangladesh Today

Climate change is affecting communities throughout the world and its impact is becoming increasingly evident in cities across Bangladesh. Climate change-related hazards, such as riverine and coastal flooding, landslides, cold and heat waves, saline intrusion, and rising sea-levels, are having widespread, negative effects upon poor communities. These impacts include damage to homes, businesses and infrastructure, and the disruption of the economies and environments that they rely on. Rapid urbanization is exacerbating the effects of climate change, creating additional risk and vulnerability, especially for the poor.

Bangladesh is urbanizing rapidly as people are drawn to cities as centers of economic opportunity, where a large portion of the country's assets and economic production is concentrated. Cities now house over 35% of total population (2017); the rate of urbanization is estimated at 3.2%. However, the inability to secure safe housing and jobs has forced new residents into informal settlements that lack infrastructure and services. Evidence demonstrates that climate change accelerates this process, putting more pressure on already overstretched urban services and scarce land resources, leading large numbers of the poor to be exposed to the precarious and vulnerable living in urban areas.

Bangladesh's future lays at the nexus of climate change and urbanization. However, the intersection between these two forces are not well understood. Greater understanding of these forces will allow city governments to better manage urban growth and economic development while ensuring safe living conditions that are resilient against the effects of climate change. Community-level responses will especially benefit poor, urban

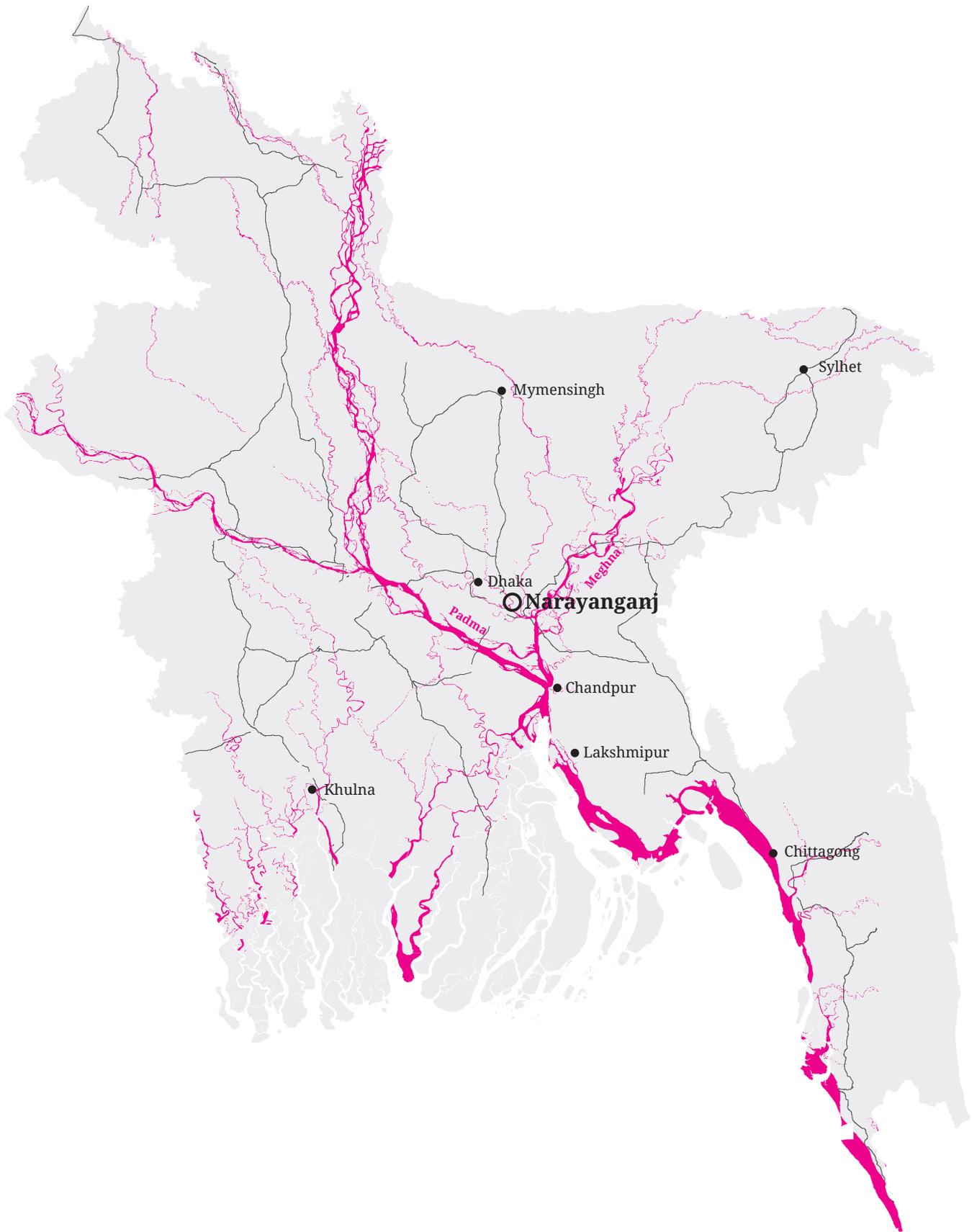
communities in protecting themselves from climate-related hazards.

## UNDP and NUPRP

The United Nations Development Program (UNDP) and the Government of Bangladesh are partnering to build the climate resilience of urban poor communities. The focus is on reducing urban poverty through investments in infrastructure and basic services in order to alleviate poverty. Reducing their vulnerability to climate change can help set them on the path to achieving healthier, more productive, and safer lives. The five-year National Urban Poverty Reduction Programme (NUPRP) seeks to directly improve the lives of 4 million urban poor people, and to introduce a range of progressive pro-poor policies to local governments in urban areas across the country.

## Climate Change Vulnerability Assessment

The Climate Change Vulnerability Assessment (CCVA) helps local governments build resilience for the urban poor to climate change. It facilitates a participatory process that engages local stakeholders, develops their understanding, and supports them in identifying their own solutions to climate hazards. Additionally, it makes available information about the city's climate vulnerability so that stakeholders can be aware of climate change impacts, know the factors that make settlements sensitive to these conditions, and illustrate how climate change can make people, places, and systems particularly vulnerable. The CCVA document can then inform the ways in which cities best respond to climate hazards through the development of a Pro-poor Climate Resilience Strategy (PCRS).



2.1- Narayanganj is touched by three rivers, the Shitalakshya River flows through the middle of the city, while the Dhaleshwari River runs along its southwest, and the large Buriganga River runs the Northwest.

## 2. Narayanganj's Regional Context

Across Bangladesh, different cities experience different vulnerabilities based on their location within the delta and on their connectivity to other cities, so it is important to understand Narayanganj within its regional context. The city is part of a river system and an industrial system, both impact the city in terms of its vulnerability to climate change.

Narayanganj is touched by three rivers, the Shitalakshya River flows through the middle of the city, while the Dhaleshwari River runs along the Southwest, and the large Buriganga River runs the Northwest. These rivers merge in the Southeast corner on the outskirts of the city. The Shitalakshya River touches two third of the wards of the city, it influences a great deal of the lives and livelihoods of the city since many of the city's industries have located along its riverbanks. Significantly the river is not prone to erosion, providing industries relatively stable banks upon which to build on.

Narayanganj's strategic location has spurred its industrial and economic development; it has long served as a center for jute and other industries connected to global markets. With large-scale industries along the riverbanks ships have been able to transport goods up and down the river, and even to ports abroad. Its location within the Dhaka metropolitan region, and so close to Dhaka gives it privileged access to trade and commerce opportunities, as well as educational and health facilities; many residents also live there and commute to work in the capital.

There are also negative aspects of its location in relation to the ecology of the city. A large number of industrial establishments continue to discharge effluents into the river, and very few of them have an active industrial Effluent Treatment Plant so the discharge seriously contaminates river water, pollutes the surrounding natural environment, kills aquatic life, and has led to the extinction of many aquatic species. Industries are also encroaching upon the river channel, which has had the effect of gradually narrowing the river flow; this in turn elevates the riverbed and reduces the navigation capacity of the river. As a consequence the city's strategic location as a functional port is threatened.

There are a number of regional 'push' and 'pull' factors that have contributed to Narayanganj's rapid growth in recent years. On one side the country's rice and wheat production has decreased dramatically over the past decade, due to saline intrusion, sea-level rise, and river pollutants. At the same time in-filling practices have destroyed key wetlands that help wash out pollutants and salinity downriver. This leads to migrants from rural agricultural areas moving to Narayanganj to seek urban jobs, in factories. The large number of industries and factories serves to draw, or 'pull', these people in search of jobs and livelihoods. These factors combine to increase the overall population, and make the city one of the fastest growing cities in the country.



3.2- The poor in Narayanganj live in low income communities which generally receive limited access to public services, such as water, electricity, and sanitation, have insecure tenure, and are often located in areas of physical vulnerability. Climate change can exacerbate these issues, especially given their vulnerability to cyclones and land loss.

### 3. Context of the Poor in Narayanganj

Narayanganj City Corporation is a large city consisting of 27 Wards. The city is located adjacent to the capital Dhaka, the largest city of Bangladesh. The Shitalakshya River flows through the middle of city, it is one of the distributaries of the Brahmaputra River, and it then merges with the Dhaleswari River near Kalagachhiya. The city is experiencing a sustained period of economic growth, one that is driving migration from surrounding rural areas to seek jobs and opportunity. This then leads to problems of urban poverty and vulnerability to climate change, which is magnified due to its location near multiple rivers that frequently flood their banks. Without affordable housing, many newcomers are forced into informal settlements, which occupy areas along riverbanks, and are particularly vulnerable to climate change.

The poor of Narayanganj face many interconnected, pressing challenges: reducing their vulnerability to heavy rainfall / draught, heat waves/ cold waves, cyclones and flooding, improving the conditions of their settlements, and securing their livelihoods. Settlements along riverbanks, and some in the City Centre, are particularly vulnerable. Densely populated settlements with insufficient services, frequent waterlogging, and residents exposed to health risks is acutely vulnerable to climate hazards. waterlogging, and residents exposed to health risks is acutely vulnerable to climate hazards. settlements may experience such hazards and their impacts in different ways.

#### Migration and Demography

In 2011 the population of the City of Narayanganj was 709,381. Estimates indicate that the population is growing at a rate of 4.05%, which

means that the number of people will increase by almost three times its current population by 2035. Most growth comes from newly arrived migrants from the surrounding countryside and nearby districts. The economic and climatic impacts, cause people to migrate to the city. Another source is administrative expansion. In 2011 the Narayanganj Municipality became a City Corporation and two adjacent municipalities were added, Siddirganj and Kadam Rasul Municipalities. The total number of wards rose from 9 to 27 and the geographic area grew by more than three times. The approximate poor population, according to UNDP's Urban Poor Settlement Mapping Survey (2017) in Narayanganj, is 254,825.

#### Geography and Urban Environment

The Shitalakshya River flows through 18 out of 27 Wards of Narayanganj. Originally the Shitalakshya River attracted industrialization to Narayanganj during the British colonial period, and the city was once known as the Dundee of the East. Since the river is navigable year-round a large number of industries have located along the riverbanks, and industries discharge large amounts of effluents into the river, gradually polluting the environment.

Due to certain conditions, like the slow flow of water, the shallow riverbed, and the disruption of water flow due to industrial activities, the river is gradually being silted and its carrying capacity reduced day-by-day. People also throw garbage and waste into the river. When flooding occurs the contaminated water contaminates settlements, and as a result, environmental risks are high, and waterlogging is common. This can bring increased health risks and limit mobility.

## Jobs and Economic Growth

Narayanganj City is both an industrial and a commercial hub in the district, with very high potential for jobs and economic growth. Opportunities in the industrial and commercial sectors have attracted migrants to the city, with the garment industry the predominant sector today.

Other notable industries include merchandising yarn and dyeing items, import and export business, shipyards, and brickfields. According to the Bangladesh Bank, the district is ranked third in the country in terms of gross national income (GNI) and wealth.

## Public Services, Infrastructure, Urban Systems

The Port area of the city is of significant importance to the functioning of the city due to the historic heavy reliance on the Shitalakshya River by industries in Narayanganj. Besides, the city has a railway station for promoting mass transportation of the commuters to and from the city.

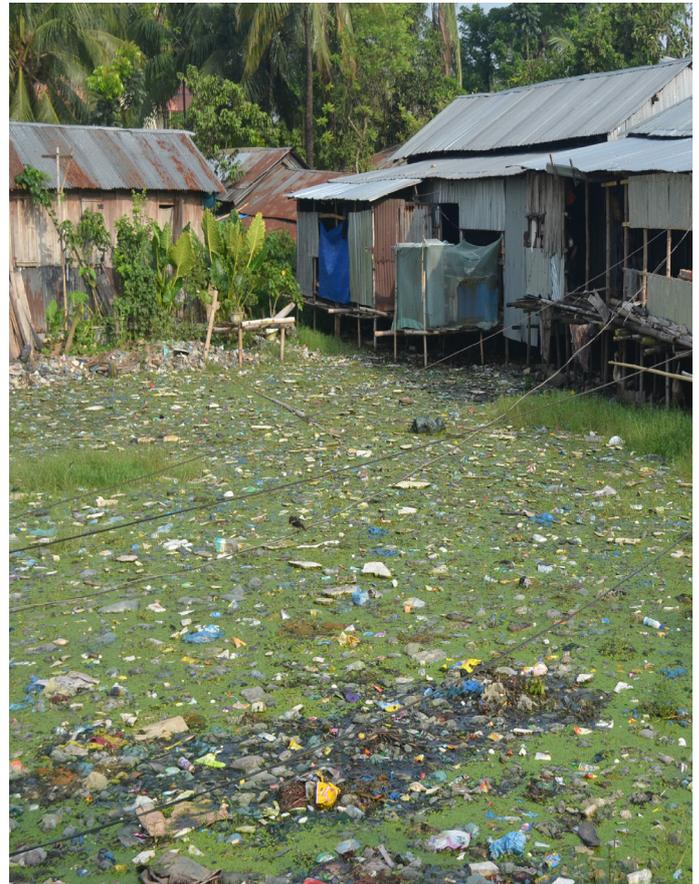
The poor communities of the city center are comparatively better equipped with infrastructure such as pathways and access to public services than other areas where there are poor settlements. More specifically the newly added areas (Wards 1 - 9 and Wards 19 - 27) has very less provision for public services and utility facilities. These are also Wards and communities that are less urbanized and less populated. There is no integrated drainage system in the city, so waterlogging is a problem throughout most wards.

The city's urban poor settlements do not have access to solid-waste management services that results in accumulated problems of water logging, pollution, water-borne diseases and other health hazards. More specifically the poor settlements in the centre of the city are dense and the problem is acute there.

## Urban Trends

The most important city-level trend that affects climate vulnerability and poverty in Narayanganj is urban growth. As previously mentioned the population of Narayanganj is growing, densifying the poor settlements. Services have thus become increasingly overwhelmed. Resources such as latrines and water collection points have, as a result, deteriorated, leading to decreasing access to basic services.

The city corporation is also growing by area. Before 2011, it was a municipality with 9 Wards (an area of 8.82 sq.km, UPSM) whereas in 2011 it turned into a city corporation by adding 18 more Wards with an additional area of 37.27 sq. km making the city size larger than 5 times than previous. Besides the city is gradually merging to the capital city of the country.



*3.2- As more people move to city, poor communities transform the landscape by infilling ponds and canals in order to create room for housing.*

# Urban Poor Settlements in Narayanganj

1,839,457  
population in 2035

709,381  
population in 2011

migration from countryside

### Legend

■ Settlement



*4.1- Exposure to climate hazards such as flooding and heavy rains means that urban poor settlements located in low lying areas, and without adequate drainage, will remain waterlogged for extended periods. This can make the poor more vulnerable because it limits their mobility, puts them at risk of disease and illness, and damages their assets.*



## 4. Exposure

### What Climate Hazards are the Poor Exposed to?

#### Overview of Climate Change in Narayanganj

Bangladesh's location makes it one of the most vulnerable countries in the world to the impacts of climate change. The increase in global temperatures has led to rising sea levels, more intense rainfall during shorter and more erratic seasons, and increased humidity. Unpredictable weather patterns are negatively impacting traditional industries such as agriculture and fishing. This exacerbates living along Bangladesh's rivers, making life in the southern coastal belt more vulnerable to cyclones, flooding, erosion, and saline intrusion. Since the majority of life in Bangladesh is along rivers, the impacts are felt nationwide.

There is no shortage of evidence to support these trends. A four decade-long climate analysis indicates a significant increase in the annual mean temperature (2.4°C), which can be as high as 3.2°C during the monsoon season. Rainfall is becoming erratic and uncertain, it has increased during the pre- and post-monsoon period, and decreased during the monsoon season. Humidity has also increased during the winter and post-monsoon period, but has decreased during the monsoon season. Such shifts have irreparably changed the environment, economy, health, and traditional living patterns of the country. The disruption in the agricultural sector has driven people out of rural areas and into the cities in search of more stable employment opportunities.

Saline intrusion from more intense storms along the coast have, for example, driven people from coastal communities such as Khulna further inland to Dhaka, Narayanganja, and Chandpur, placing enormous pressure on cities as demand for jobs, land, housing, and services hits a critical high.

#### What is *Exposure*?

Climate hazards are naturally occurring phenomena such as cyclones, tidal surges, flooding, that occur in a specific community or place. Exposure refers to the degree to which a place is affected by climate hazards. Nothing can be altered about exposure to climate hazards – the occurrence of rain, sun, high winds, rising sea levels – other than by moving away from a particular place. Some examples of climate hazards in Bangladesh are: landslides, flooding, cyclones, unpredictable seasons, heavy-rainfall, and riverbank erosion.

#### How does *Exposure* to Climate Hazards Impact the Poor?

Poor communities often have the highest exposure to climate hazards because of where they live and work. In cities, the poor tend to be drawn to areas that were uninhabited, these areas are usually the most precarious, perhaps have inadequate environmental conditions, and may have been deemed unfit for occupation by others. These places might be: on riverbanks that flood, in areas suffering landslide or erosion, near railway lines or trash collection sites, and in transitional sites (such as derelict buildings). – [this last sentence can be a sectional diagram.]

Climate hazards are natural phenomena that have both direct (primary) impacts and indirect (secondary) impacts. In general, primary impacts are physical, such as damage to ecosystems or to property and infrastructure. These impacts may lead to secondary impacts, where livelihood, health, and safety are affected. Here are some examples of the primary and secondary impacts of different hazards.

## Impacts of Climate Hazards on the Poor

Climate change hazard	Bio-Physical Effects	Primary Impacts	Secondary Impacts
<b>Sea-level Rise</b>	<ul style="list-style-type: none"> <li>Sea-water floods fields and settlements</li> </ul>	<ul style="list-style-type: none"> <li>Crops are damaged</li> <li>Fields become saline</li> <li>Water availability declines</li> </ul>	<ul style="list-style-type: none"> <li>Farmers lose their livelihoods</li> <li>Rural communities migrate to cities for work</li> </ul>
<b>Heavy Rainfall</b>	<ul style="list-style-type: none"> <li>Crops are damaged</li> <li>Communities experience flooding</li> <li>Water becomes contaminated</li> </ul>	<ul style="list-style-type: none"> <li>Water and mosquito-borne diseases give rise to illnesses</li> <li>Property and infrastructure are damaged</li> <li>Availability of water declines</li> </ul>	<ul style="list-style-type: none"> <li>Decline in local food supply impacts the poor</li> <li>Decline of available water, increases prices.</li> <li>Economic disruption</li> <li>Migration of newcomers from rural areas.</li> </ul>
<b>Flooding</b>	<ul style="list-style-type: none"> <li>Large amounts of water submerge fields and settlements</li> </ul>	<ul style="list-style-type: none"> <li>Homes and assets are damaged</li> <li>Crops are destroyed</li> <li>Infrastructure is damaged or destroyed</li> <li>Decrease in local food supply</li> </ul>	<ul style="list-style-type: none"> <li>Loss of livelihoods</li> <li>Illness due to water-borne disease</li> <li>Communities are forced to flee</li> <li>Local economy suffers and people lose jobs</li> </ul>
<b>Cyclones</b>	<ul style="list-style-type: none"> <li>High winds affect natural environment and houses</li> <li>Waves damage coastline</li> </ul>	<ul style="list-style-type: none"> <li>Property and infrastructure are damaged</li> <li>Crops are destroyed</li> <li>Infrastructure is damaged or destroyed</li> <li>Availability of water declines</li> </ul>	<ul style="list-style-type: none"> <li>Loss of livelihoods</li> <li>Illness due to water-borne disease</li> <li>Communities are forced to flee</li> <li>Economic disruption</li> </ul>
<b>Riverbank erosion</b>	<ul style="list-style-type: none"> <li>Water levels compromise ground</li> <li>Riverbanks are worn away</li> </ul>	<ul style="list-style-type: none"> <li>Loss of property and community assets</li> <li>Housing destroyed</li> <li>Farming and crops destroyed</li> <li>Roads and infrastructure destroyed</li> </ul>	<ul style="list-style-type: none"> <li>Decline in local food supply impacts the poor</li> <li>Decline of available water, increases prices.</li> <li>Loss of livelihoods</li> </ul>
<b>Unpredictable Seasons</b>	<ul style="list-style-type: none"> <li>Seasonal rains arrive late or early</li> <li>Prolonged season without rain</li> </ul>	<ul style="list-style-type: none"> <li>Farmers lose crops</li> <li>Fewer seasons disrupts farming cycle</li> </ul>	<ul style="list-style-type: none"> <li>Loss of revenue</li> <li>Businesses and local economy disrupted</li> </ul>

### Mapping the Exposure of Poor Communities at the City-Level

Now that we've discussed the types of hazards that the poor are exposed to, we can visualize how these hazards impact the city. To do so, we have consolidated the five indicators into one metric, based on a points system. Using a map, we are able to show the cumulative score for exposure that each ward exhibits to each climate hazard.

If a ward is exposed to both cyclones and flooding, then it has a higher exposure score compared to a ward that is only exposed to cyclones. Similarly, stakeholders have also indicated the intensity at which the wards are exposed to the different climate hazards, on a low, medium, or high scale. The total scoring is then added up to produce an aggregate score of exposure for each Ward across the whole town of Narayanganj.



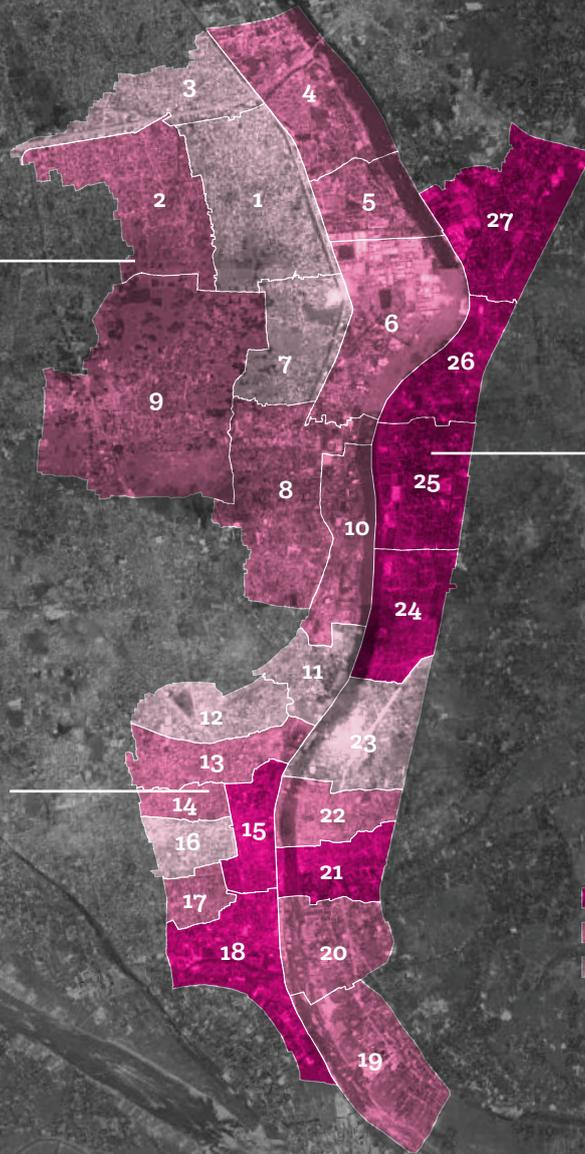
4.2 - Communities are exposed to flooding and waterlogging, increasing sensitivity to climate impacts.

## Mapping Exposure

Wards with medium levels of exposure are located in close proximity to the Shitalakshya River, they are still at risk of flooding, heavy rainfall, and cyclones. In these settlements waterlogging is more acute due to the river's high-water levels, which makes drainage more difficult.

Wards that have much lower exposure to climate hazards are those that are inland and are located in urbanized areas. These are settlements that generally are more protected from climate hazards, in part because they have more greenery, and their exposure levels are lowered.

Urban poor communities in wards located on the riverbanks of the Shitalakshya River are highly exposed to a combination of climate hazards. Historically the expansion of industry on riverbanks has drawn a large number of poor residents to settle in more precarious areas that have been more available for the poor to settle. This means there are high concentrations of poor in areas of the city with the highest exposure. Settlements along the riverbank are exposed to a combination of heavy rainfall, flooding, and heat waves. Especially given greater incidences of heavy rainfall across the country, rivers are constantly overwhelmed with increased water flow, worsening conditions downriver as riverside communities experience the effects of faster and higher rivers.



Climate Hazard Indicators	Low Score (1)	Medium Score (2)	High Score (3)
<b>Heavy Rainfall / Draught</b>	<ul style="list-style-type: none"> <li>Community on higher ground</li> <li>Heavy rain and floods drain easily</li> <li>During hot season, scarcity of water</li> <li>Unusual health problems due to hot weather especially among the elderly and children</li> </ul>	<ul style="list-style-type: none"> <li>Flooding due to heavy rainfall occurs during rainy season</li> <li>Minor waterlogging</li> <li>Due to scarcity of water, its quality depreciates and water borne disease spread</li> <li>Health conditions deteriorates</li> </ul>	<ul style="list-style-type: none"> <li>Long periods of waterlogging</li> <li>Livelihoods disrupted for long periods</li> <li>Assets get damaged and domestic animals die</li> <li>Incidence of human casualty occur</li> </ul>
<b>Heat wave / cold wave</b>	<ul style="list-style-type: none"> <li>Community is greeneries around them</li> <li>Sufficient electricity connection</li> </ul>	<ul style="list-style-type: none"> <li>Communities are on more inland</li> <li>Less greeneries</li> <li>Electricity connection is less or community face frequent load-shading</li> <li>Elderly and children starts to face health problems</li> </ul>	<ul style="list-style-type: none"> <li>Communities are in the centre / in the industrial areas</li> <li>No greeneries at all</li> <li>Health problems like heat rash, hyperthermia etc. starts</li> <li>Human casualty due to extreme heat/cold</li> </ul>
<b>Thunderstorm</b>	<ul style="list-style-type: none"> <li>Communities are on periphery</li> <li>Less frequent events of sudden flood due to thunderstorms</li> <li>No or very little lightning</li> </ul>	<ul style="list-style-type: none"> <li>Communities are dispersed and less dense</li> <li>Events of sudden flood due to thunderstorm is medium</li> <li>Aggravated asthma attack, or arthritis flare</li> </ul>	<ul style="list-style-type: none"> <li>Communities are in the city center and dense</li> <li>Higher frequency of sudden flood due to thunderstorm.</li> <li>Human casualty due to lightning or aggravated asthma attack or arthritis</li> </ul>
<b>Cyclone</b>	<ul style="list-style-type: none"> <li>Community inland and protected from winds</li> </ul>	<ul style="list-style-type: none"> <li>Community partially exposed to winds</li> </ul>	<ul style="list-style-type: none"> <li>Community on riverbank exposed to waves and high winds</li> </ul>
<b>Flood</b>	<ul style="list-style-type: none"> <li>Community on higher ground</li> <li>Flood level does not touch the courtyard in usual cases</li> </ul>	<ul style="list-style-type: none"> <li>Flooding occurs during rainy season</li> <li>Minor waterlogging</li> <li>Flooding disrupts locality and livelihoods temporarily</li> </ul>	<ul style="list-style-type: none"> <li>Long periods of waterlogging</li> <li>Flooding damages homes and infrastructure</li> <li>Livelihoods disrupted for long periods</li> </ul>



5.1- Sensitivity refers to the degree to which a community is affected by climate hazards, and this depends on a number of its non-natural characteristics. For example if a community with poor living conditions lacks drinking water that is potentially contaminated, it is far more sensitive to climate change than communities which access safe drinking water. Urban poor communities are usually more sensitive because they lack adequate basic services.



## 5. Sensitivity

### What makes the Poor Vulnerable?

The impact upon communities of the above climate hazards varies dramatically, not only depending on where you live, but also on what you do, your education level, employment, and access to basic services. Another factor that influences sensitivity is urbanization— the city is constantly changing, and these changes are making some areas more exposed to climate hazards than others. We must challenge ourselves to think about how the impacts of climate change will be felt differently by different communities, and to better identify what these different factors might be.

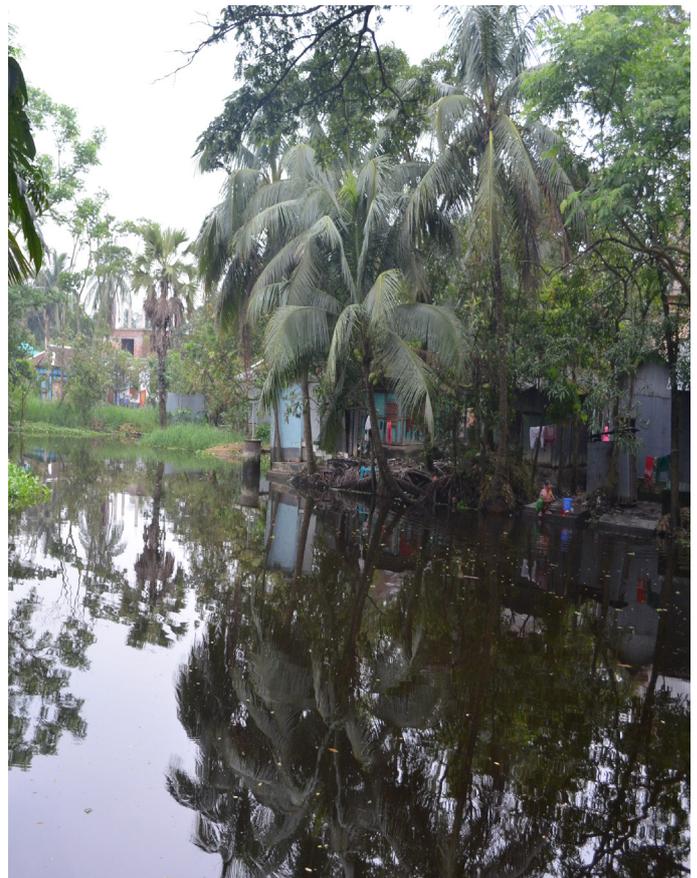
#### What is Sensitivity?

Sensitivity refers to the degree to which a place or community is affected by climate hazards, it commonly refers to the man-made, or non-natural, characteristics about that place or community that make it vulnerable to climate hazards. Examples of factors that make a community more sensitive to climate hazards include: the type of housing materials that residents use, their level of poverty, land tenure status, social issues, the health and education that they possess, and the level of access they have to public services.

For example, while two neighboring households may have the same exposure, because they experience the same climate hazards (rain / heat / wind), their sensitivity may be completely different. Their houses may be of different materials, different jobs and incomes, different education levels, and perhaps options in the event of a major climate event. Consequently, the degree to which each family would be impacted by a cyclone or major flood would be very different, with the one with comparatively worse economic and housing situation would be much worse affected.

#### How does Sensitivity affect the Poor?

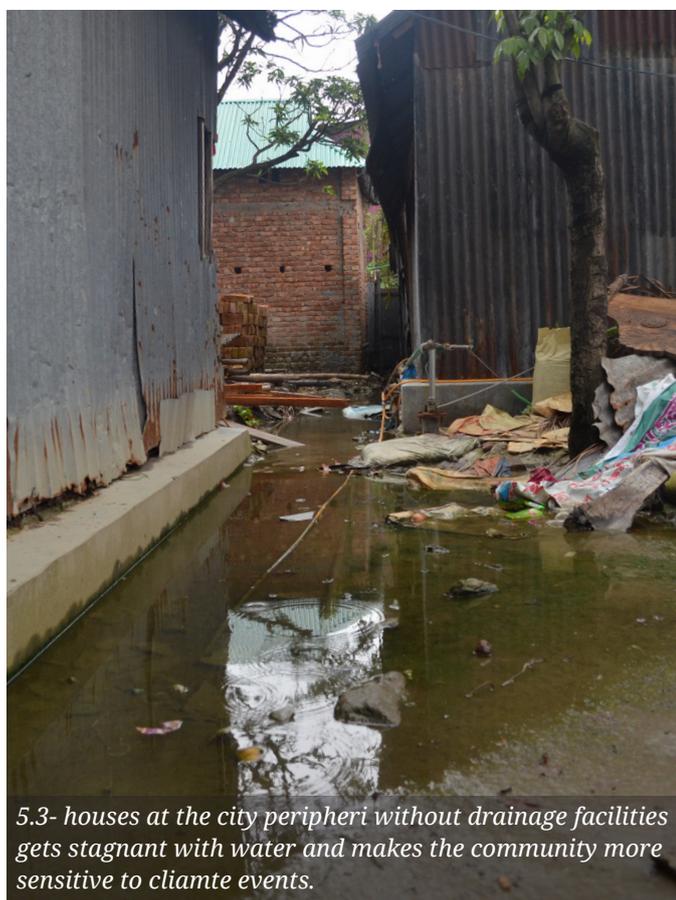
The poor are more sensitive to climate hazards because they have fewer resources, live in poor, more vulnerable conditions, live in more vulnerable locations, and have less access to public services than the rest of the population. These conditions will amplify the impacts of climate change, disproportionately affecting the poor compared to other communities. For example, poor communities may have higher levels of unemployment that lead to social problems, like drug abuse, theft, and potentially violence. Such



5.2- A lack of access to utility services like water supply forces people to use polluted water which becomes even more dangerous (for example by discharging faecal sludge from the toilets) during heavy rainfall.

## Factors that Influence Sensitivity of the Poor

<i>Man-made Factors</i>	<i>Impact on the poor</i>
<b>Poverty</b>	<ul style="list-style-type: none"> <li>• Poor communities build homes with temporary materials that are easily damaged by flooding and strong winds.</li> <li>• The poor don't have a social safety net in case of damages to property or assets.</li> <li>• Fewer resources to protect against hazards leave poor vulnerable to floods and hazards.</li> </ul>
<b>Land tenure security</b>	<ul style="list-style-type: none"> <li>• Poor communities tend to occupy dangerous places since they may be only ones available.</li> <li>• Tenure insecurity means poor risk eviction.</li> <li>• Communities with insecure land tenure invest less in housing construction with robust materials.</li> </ul>
<b>Population Density in Poor Settlements</b>	<ul style="list-style-type: none"> <li>• High concentrations of poverty can indicate impoverished and inadequate conditions.</li> <li>• Basic services shared between more people, leading to insufficient levels of access, and deterioration of shared infrastructures.</li> <li>• Cramped and often unhygienic conditions.</li> </ul>
<b>Lack of Drainage</b>	<ul style="list-style-type: none"> <li>• High levels of waterlogging leads to unsafe living conditions where mobility is limited.</li> <li>• Trash and debris can accumulate.</li> <li>• Stagnant water leads to illness and public health epidemics.</li> <li>• Intrusion of contaminated water into drinking water leads to illness.</li> </ul>
<b>Air and Noise Pollution</b>	<ul style="list-style-type: none"> <li>• Increase in respiratory illnesses</li> <li>• Loss of time sitting in log jams.</li> <li>• Decline in economic productivity and increasing health costs</li> </ul>
<b>Inadequate Housing Materials</b>	<ul style="list-style-type: none"> <li>• Sub-standard housing materials (scrap metal, wood, plastic) leave homes vulnerable to damage from flooding, high winds, and fires.</li> </ul>
<b>Access to public services</b>	<ul style="list-style-type: none"> <li>• Low levels of access to public services mean poor are unable to develop their communities properly.</li> <li>• Lack of access to water and sanitation mean higher incidences of illness and disease.</li> <li>• Lack of access to education facilities means poor unable to access higher earning livelihoods.</li> </ul>
<b>Lack of enforcement of planning regulations</b>	<ul style="list-style-type: none"> <li>• Lack of regulations and enforcement allow poor to locate in places of risk and danger.</li> </ul>



5.3- houses at the city peripheri without drainage facilities gets stagnant with water and makes the community more sensitive to cliamte events.

conditions may lead to fear and intimidation, particularly of women and the elderly, which weakens social cohesion and can affect community collaboration, making the community more sensitive to climate hazards.

### Mapping **Sensitivity** of Poor Communities at the City-Level

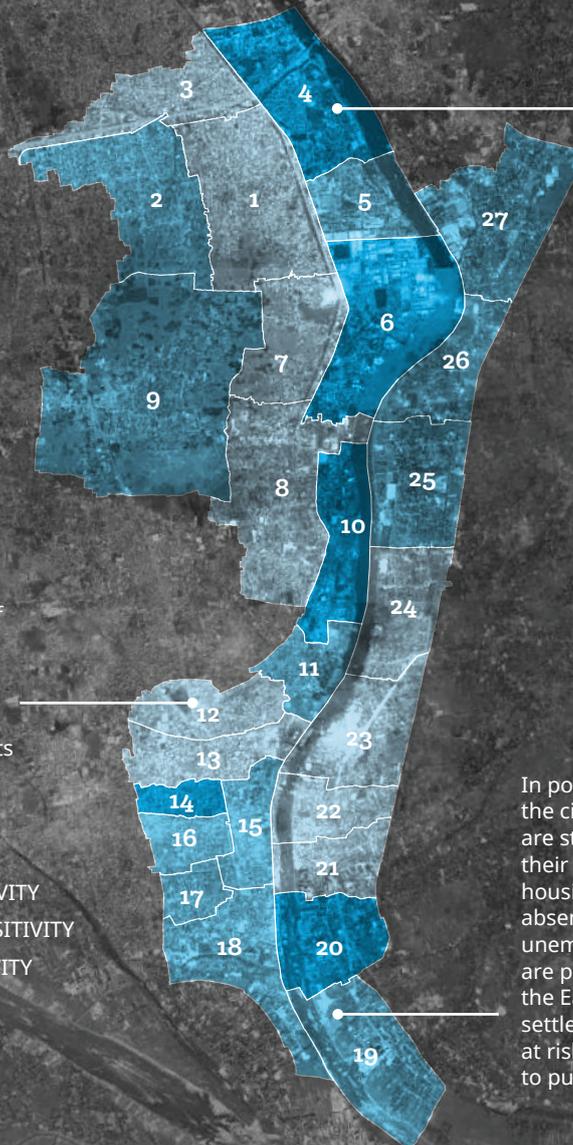
In order to look at sensitivity as a whole, the above indicators are brought together in a map by adding their values together to create a composite. Thus, if a ward has higher than average levels of unemployment and water logging, its sensitivity value is higher than for those with higher than average unemployment alone. Through this mechanism, we can show which wards are most sensitive to climate hazards.

During the 1<sup>st</sup> Climate Change Vulnerability Assessment workshop, the participants identified a number of indicators that can be used to evaluate sensitivity in Narayanganj. The results are shown in the visual on the right.

## Mapping Sensitivity

The city's general sensitivity stems from both the widespread incidence of waterlogging and the lack of trash/waste collection services. As Narayanjanj rapidly urbanizes, infrastructure such as new roads and pavements are being built without proper drainage systems, creating waterlogging problems across the city. Prolonged periods of living with stagnant water – particularly worsened by both industrial and human waste – increase incidences of illness and disease. Even when there are drainage systems, the city's lack of trash collection infrastructure forces residents to dump waste haphazardly, clogging drains and gutters. This prevents waterlogged areas from draining, and natural water catchments – such as ponds – from serving their natural purpose.

- HIGH SENSITIVITY
- MEDIUM SENSITIVITY
- LOW SENSITIVITY



In poor settlements in the North of the city sensitivity to climate hazards is much higher than in the South of the city. Poor settlements in wards in the north have much more insecure land tenure, housing is built of less robust materials, and overall poverty is much worse. This is perhaps due to a greater distance to the city center, jobs and markets, which may make unemployment and poverty levels more critical issues that increase sensitivity.

In poor settlements in the south, of the city sensitivity is medium, but they are still relatively sensitive because of their high levels of poverty, inadequate housing materials, and high levels of absenteeism. In inner-city slum areas unemployment, education, and poverty, are particularly concerning; while on the East bank of the Shitalakshya River settlements have low densities, but are at risk too due to lower levels of access to public services.

Sensitivity Indicators	Low Score (1)	Medium Score (2)	High Score (3)
<b>Population Density in Poor Settlements</b>	<ul style="list-style-type: none"> <li>Public services are accessible</li> <li>Conditions are healthy and clean</li> </ul>	<ul style="list-style-type: none"> <li>Moderate density, infrastructure and space is limited</li> <li>Public services periodically inaccessible due to use</li> </ul>	<ul style="list-style-type: none"> <li>Insufficient levels of access to basic services</li> <li>Shared infrastructure in poor condition</li> <li>Cramped and often unhygienic conditions.</li> </ul>
<b>Use of Sub-standard Housing Materials</b>	<ul style="list-style-type: none"> <li>Houses made of robust materials</li> </ul>	<ul style="list-style-type: none"> <li>Houses made of a combination of robust and sub-standard materials</li> <li>Houses partially vulnerable to damage</li> </ul>	<ul style="list-style-type: none"> <li>Houses vulnerable to damage</li> <li>Residents and assets constantly at risk</li> </ul>
<b>Poverty level</b>	<ul style="list-style-type: none"> <li>The overall poverty index of the Ward is high referring to relatively better conditions of the poor settlement</li> </ul>	<ul style="list-style-type: none"> <li>Overall Poverty index is at medium range</li> <li>The conditions of the 16 poverty indicators are poor but not so bad.</li> </ul>	<ul style="list-style-type: none"> <li>Overall Poverty Index is very low</li> <li>The conditions of 16 poverty indicators are very bad.</li> </ul>
<b>Land tenure insecurity</b>	<ul style="list-style-type: none"> <li>Most of the lands belong to the communities</li> <li>Have legal land title</li> <li>Communities do not feel any or very little risk for eviction</li> </ul>	<ul style="list-style-type: none"> <li>Most of the lands belong to either central government or local governments</li> <li>Do not have legal land title. Some may have short term lease agreement.</li> <li>Communities sometimes get the threat of eviction</li> </ul>	<ul style="list-style-type: none"> <li>Most of the lands belong to the private land lords and to different non-government organizations</li> <li>No one has long-term legal agreement</li> <li>Communities often feel the threat of eviction</li> </ul>
<b>Unemployment</b>	<ul style="list-style-type: none"> <li>Most community employed and productive</li> <li>Households have stable income and livelihoods</li> </ul>	<ul style="list-style-type: none"> <li>Mix of jobs and incomes</li> <li>Periodic crime and social disturbances</li> </ul>	<ul style="list-style-type: none"> <li>Social problems, such as crime, drug use, and violence.</li> <li>Residents feel insecure</li> <li>Low social cohesion.</li> </ul>
<b>Education</b>	<ul style="list-style-type: none"> <li>Most of the children of school going age regularly go to school.</li> <li>Education level is relatively high</li> </ul>	<ul style="list-style-type: none"> <li>More than fifty percent of the children of school going age either do not go to school or dropped out from school</li> <li>Education level is poor in the communities</li> </ul>	<ul style="list-style-type: none"> <li>Very few (less than twenty five percent) of the children of school going age do not go to school</li> <li>Education level is critical in the communities</li> </ul>



*6.1- Adaptive Capacity refers to the ability of a community or city to bounce back from the impacts of climate change, or cope with its consequences. Infrastructure like good drains and storm-water drains helps city to keep clean and prevent spread of vector-borne disease. However, poor communities have lower levels of access to the functional drainage facilities.*



## 6. Adaptive Capacity

### What makes the Poor Vulnerable?

Local governments are not powerless in the face of climate change. There are measures that they can adopt to reduce vulnerability: better planning, better policy implementation, better policy enforcement, and better coordination mechanisms. Identifying what mechanisms are most effective in helping cities adapt to climate change can contribute greatly to reducing their vulnerability.

In this chapter, we will introduce the term adaptive capacity, and understand what policies and programs exist that support ‘institutional adaptive capacity’, and discuss how this may be increased in the city.

#### What is **Adaptive Capacity**?

Adaptive capacity refers to the ability of a community or city to bounce back from climate change, by taking advantages of opportunities, and coping with its consequences. While a community possesses these characteristics before a climate event, adaptive capacity refers to how it can respond after the event, to return to a normal state. For example, having good social cohesion, effective community organization, and good roads and communication access, a community that has suffered from a cyclone or major flooding has a better chance of effectively supplying emergency supplies to affected citizens and restoring services. Adaptive capacity operates at three levels: autonomous, collective, and institutional. For the sake of a city-level data analysis we will focus on institutional adaptive capacity. Systemic in nature, institutions have the greatest potential to impact the greatest amount of people on a large-scale. At the city-level, it becomes crucially important, then, to focus on the institutions.

#### Three Types of **Adaptive Capacity**

##### **Autonomous**

Autonomous adaptive capacity refers to actions taken at the individual or the household level to protect livelihoods and assets from climate hazards. These are usually small-scale and effective for low intensity disasters. For example, adapting one’s house to prevent flood waters from entering, or keeping belongings stored so they are easy to retrieve in the event of an emergency.

##### **Collective**

Collective adaptive capacity refers to actions taken by groups, which are usually community initiatives, which reduce vulnerability. Collective adaptive capacity requires more people, coordination, and resources, but is still limited in its geographic scale to the neighborhood or community unit. For example, a neighborhood warning system and evacuation drills, or community-driven embankment-building projects.

##### **Institutional**

Institutional adaptive capacity refers to the capacity of organizational systems, such as government programs, policies, regulations, and human resources. The scale of institutional adaptation generally covers a larger area and aims for systemic and long-lasting solutions. Examples could be: mapping of disaster-prone areas by the National Disaster Reduction Agency, or the systemic improvement of water supply, and social welfare programs for poorer areas of the city.

## Impact of Adaptive Capacity on the Poor

<i>Examples of Adaptive Capacity</i>	<i>Impact on the poor</i>
<b>Social welfare or safety net programs</b>	<ul style="list-style-type: none"> <li>Welfare and safety net programs help the most marginalized, such as women-headed households or families with disabled members, to recover from climate events, for example from damage to their homes and assets.</li> </ul>
<b>Disaster Preparedness</b>	<ul style="list-style-type: none"> <li>Town-level Disaster Management Committee coordinates through ward-level committees to provide emergency response to the poor.</li> <li>Early-warning systems and preparedness education campaigns ensure that school children and households are prepared to react to climate events.</li> <li>Cyclone shelters are available in the event of a climate event.</li> </ul>
<b>Climate-resilient livelihoods</b>	<ul style="list-style-type: none"> <li>Local economy is diversified and not too reliant on climate-sensitive livelihoods such as farming.</li> <li>Government provides educational opportunities to the public to develop a range of skills to access different jobs.</li> <li>Grain storage and refrigeration units help farmers store crops in the event of unpredictable seasons.</li> <li>Local workforce has experience and skills in a diverse set of trades.</li> </ul>
<b>Local infrastructure investment programs</b>	<ul style="list-style-type: none"> <li>Government invests in upgrading of poor communities to ensure they are serviced with pathways, drainage, and water.</li> <li>Poor communities are protected from flooding by embankments and sluice gates.</li> </ul>
<b>Community savings and credit groups</b>	<ul style="list-style-type: none"> <li>Poor community members can collectively save money and offer loans to each other.</li> <li>Small loans can serve to support needy families in the event of an emergency, such as a health problem or recovering from an extreme climate event.</li> <li>Money paid back into the communal savings group can further support other households and profits stay within the community.</li> </ul>

### How does Adaptive Capacity Relate to the Poor?

The urban poor often have lower levels of adaptive capacity because they are not as well-connected to public services, are not recognized officially, and as a result are isolated from the rest of the city. For example, land tenure insecurity prevents the urban poor communities from receiving official water supply service, this makes them vulnerable to public health epidemics and disease. With little intervention by local governments, communities have to be self-reliant. As a result, their adaptive capacity is largely autonomous. At the community and household scale, the collective efforts of various community groups are incredibly important to the adaptive capacity of certain communities. Community mobilization is key in preventing catastrophic loss from disasters.

### Mapping Adaptive Capacity at the City-Level

In our previous workshop, we collected a few indicators that can demonstrate levels of institutional adaptive capacity throughout the city. Please refer to page 20 for our findings.



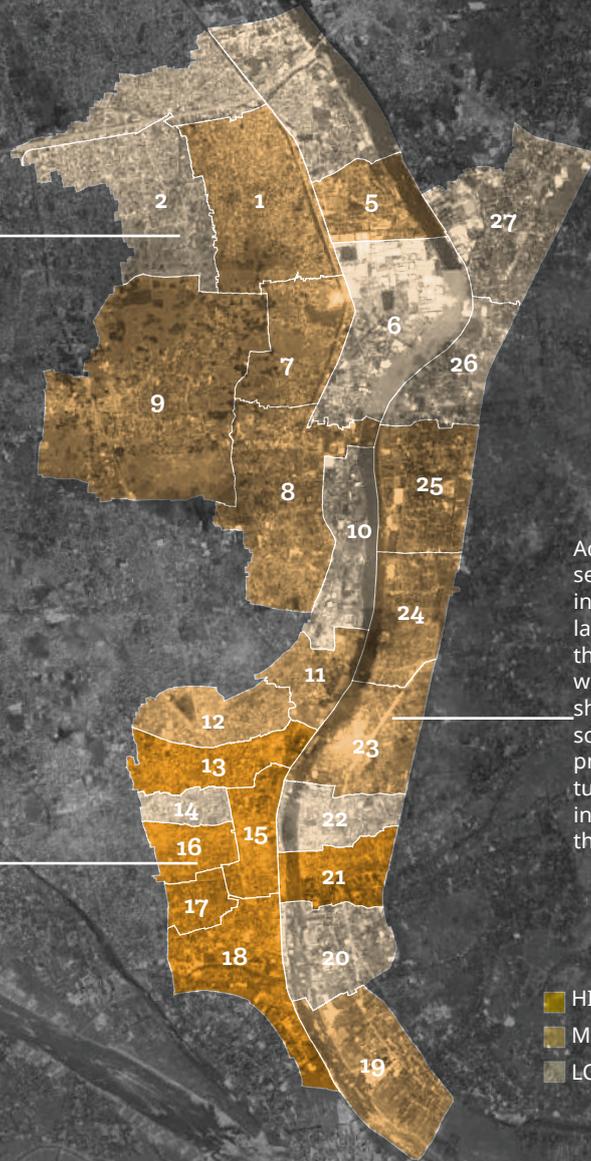
6.3- Access to water supply increases the adaptive capacity of the poor, but in most cases piped water is not available in poor communities. Instead people use hand tube-wells which are not sufficient in number, and during the dry season the water-level is low, so sometimes they are not able to supply water at all.

# Mapping Adaptive Capacity

Adaptive capacity is lower in the north of the city where infrastructure and public services are much less developed, due to only recently being incorporated into the City Corporation. At the same time there is less Government presence, in terms of Ward offices, meaning that local communities are not as well represented and have less access to key services, as those communities which have had fully functional Ward-level offices for longer periods.

In the City Center poor settlements have much higher levels of access to infrastructure and public services, as well as better access to Government offices. This increases their adaptive capacity score.

Adaptive Capacity is also lower in poor settlements along the river, particularly in the south of the city. This is due in large part to the poor connection to the water supply. Due to industrial waste and groundwater depletion, shallow wells – the most common source of water – no longer operate properly, forcing residents to build deep tube wells or search elsewhere. This increases the competition for water and thus the likelihood of social strife.



- HIGH ADAPTIVE CAPACITY
- MEDIUM ADAPTIVE CAPACITY
- LOW ADAPTIVE CAPACITY

Adaptive Capacity Indicators	Low Score (1)	Medium Score (2)	High Score (3)
<b>Active Disaster Management Committee with Preparedness Plan</b>	<ul style="list-style-type: none"> <li>Disaster Management Committee (DMC) was formed but never functioned</li> <li>Never has a disaster preparedness plan</li> </ul>	<ul style="list-style-type: none"> <li>Disaster Management Committees (DMCs) are there but they are not functional or poorly functional</li> <li>DMCs do not have preparedness plan</li> <li>Actions by DMC are rarely taken in the event of a disaster</li> </ul>	<ul style="list-style-type: none"> <li>There are Disaster Management Committees (DMCs) in the Wards and they are active</li> <li>Ward DMCs have updated Disaster Preparedness Plan</li> <li>Immediate actions are taken by the DMCs in the event of any disaster</li> </ul>
<b>Effective response by government offices (Town-level and National-Level)</b>	<ul style="list-style-type: none"> <li>Government does not recognize community</li> <li>During crisis or disaster no aid or assistance is provided by Gov.</li> </ul>	<ul style="list-style-type: none"> <li>During crisis or disaster aid is provided after a period of time</li> <li>Gov. does not respond fully to provide support</li> </ul>	<ul style="list-style-type: none"> <li>During a crisis or disaster situation, Local Government responds with aid and assistance immediately</li> </ul>
<b>Active community-based organizations or NGOs</b>	<ul style="list-style-type: none"> <li>Community is not well-organized</li> <li>There are no mechanisms to provide support to needy households</li> <li>There is no source of information</li> </ul>	<ul style="list-style-type: none"> <li>Community organizations are not fully active or only partially cover a community</li> <li>Information sharing, and self-help networks are limited</li> </ul>	<ul style="list-style-type: none"> <li>Community-based organizations (SICs and CDCs) are active in the community</li> <li>They share information, those in need, and provide assistance (e.g. providing small loans and grants)</li> </ul>
<b>Good Sanitation</b>	<ul style="list-style-type: none"> <li>Communities have poorly built unhygienic sanitation system</li> <li>During heavy rains and flood, faecal sludge comes out and badly pollutes the environment</li> <li>Almost all of the households use shared latrines and number of users per latrine is high</li> </ul>	<ul style="list-style-type: none"> <li>Less than fifty percent of the community people have access to good sanitation</li> <li>During heavy rains and flood, faecal sludge comes out and moderately pollutes the environment</li> <li>Most of the households use shared latrines but the number of users per latrine is not that much high</li> </ul>	<ul style="list-style-type: none"> <li>More than fifty percent of the community people have access to good sanitation</li> <li>During heavy rains and flood, faecal sludge usually doesn't come out</li> <li>Many households use shared latrines but the number of users per latrine is less</li> </ul>



7.1- During and following rain urban poor communities are often waterlogged, or become muddy, which can limit the mobility of residents. Waterlogging and puddles affects women, children, the elderly, and disabled people, more than men, It, because it reduces their ability to move freely, and exposes them to illnesses and waterborne disease. Women are often the ones who spend most of their days in such waterlogged communities.



## 7. Identifying the Vulnerability of the Poor

Vulnerability can be understood differently through a number of different dimensions. It must be thought through different perspectives, because this can aid in better designing policies, better targeting the most vulnerable people, and better prioritizing projects and interventions. Think and reflect upon vulnerability in terms of Where? Who? and What? systems are most critical. Thus we will first analyze:

### **Vulnerable Places Vulnerable People Vulnerable Systems**

In order to balance this qualitative assessment, we will also present a quantitative assessment to help us identify vulnerability in the city.

### **Vulnerable Places An Assessment of Two Poor Communities**

To identify how certain areas become vulnerable to climate hazards we looked at two different poor settlement typologies. Each is exposed to different hazards: one suffers from the threat of riverbank erosion, the other suffers from repeated flooding caused by heavy rains, both are exposed to cyclones. The two poor settlements that were studied in more depth were selected with the help of city officials and community leaders. Their selection obeyed the following criteria:

- Poor settlements experience climate hazards on a regular basis.
- Poor settlements are particularly sensitive, have higher than average poverty levels, and have limited access to basic services.
- Poor settlements were representative of other areas in the city, allowing lessons learned from them to be applied more generally.

The two settlements were: (i) Rishipara, in Ward 21, which is located along the Tribeni Canal, on the east side of the Shitalakshya River, where recent improvements to the Canal have created flooding problems for this settlement running alongside it. (ii) Kuripara Phulhar, in Ward 27, sits far away from the city center in the periphery of Narayanganj. In such low density settlements residents struggle to access services and contend with a shifting landscape around them defined by waterlogging, rapid industrialization, and the threat of displacement.

### **(i) Rishipara, Ward 21**

Rishipara, located on the East side of the River Shitalakshya is one of the oldest poor settlements in the city, its first settlers arrived over a hundred years ago. Over time residents have acquired the land they live on, and are able to rent housing to family members and newcomers. It is also located on the Tribeni Canal, which has recently been upgraded. However despite the improvements to the canal, which drains water from surrounding areas into the River Shitalakshya, the poor community has been adversely affected by recent growth to the area, and residents experience more flooding and waterlogging than before.

The Tribeni Canal often floods during periods of heavy rainfall, over spilling into adjacent communities and making Rishipara highly vulnerable to the effects of climate change. The area around it has grown rapidly in a dense, unplanned manner. The scarcity of space leads newcomers to build unsafe housing that encroaches on the banks of the Canal. Without sanitation, these households directly pollute the Canal, which makes the overspill that much more dangerous when it floods the

lower lying Rishipara and results in stagnant water. Furthermore, new road infrastructure has been developed without adequate drainage infrastructure, cutting off natural drainage routes to the canal. This both worsens waterlogging in surrounding areas, already contaminated by pollutants and human waste, and allows trash to accumulate in the canal. Residents complain of endemic diarrhea and skin diseases. The one clean water source is insufficient for the community, resulting in competition for safe water.

The conditions threaten the health and wellbeing of the community, because waterlogging persists for so long, and because inadequate access to water is a longstanding problem. As the population of Narayanganj doubles in the size over the next 20 years, these issues will likely become more pronounced and endemic if there is no intervention.

### **(ii) Kuripara Phulhar, Ward 27**

At the very edge of the city is the poor community of Kuripara Phulhar. This community is representative of low density settlements that are transitioning from rural land uses to industrialized activities, and are becoming more urban in character. Located along the Dhaka-Chittagong highway, there is a lot of economic activity in the area, such as little roadside markets, small-scale informal textile workshops, and workers who recycle waste from the garment industry. While these residents are able to access work, they are unable to access drainage infrastructure, water and trash collection services, which puts them at a serious disadvantage.

Waterlogging is an almost permanent issue in the settlement, such that pathways are set up on sandbags, and the ground is covered by green algae and water. With many of the economic activities centered around homes and workshops within the community, these drainage conditions present problems for productivity, and health problems for workers and residents. It demonstrates the many trade-offs that the poor must make in which they sacrifice their safety and wellbeing for access to jobs and a place to live that is close to economic centers. This situation increases their vulnerability in terms of waterlogging, health, and safety.



## Kuripara Phulhar, Ward 27



7.2- Kuripara Phulharan example of a community at the periphery of the city, is adjacent to the Dhaka-Chattogram Highway. Despite its location near the major road it does not have drainage facilities, and as a result the health risks of this community are serious.

## Rishipara, Ward 21



7.3- Adjacent to Bandar Thana, this community both benefits and is negatively impacted by the Tribeni Canal. People are continuously throwing waste into the canal and creating blockage in the water that prevents water flow and pollutes the environment.

## **Vulnerable People**

### **Four Accounts of Vulnerability in Narayanganj**

Varying and diverse perspectives are useful ways to think about vulnerability. Climate events, such as extreme heat, or heavy rains, affect people differently depending upon their age, their physical condition, their jobs, their education and their access to services. Throughout the city there are different kinds of people; they can all experience vulnerability in a variety of ways. Below are four profiles based on interviews conducted throughout the city in areas of high exposure and sensitivity that have experienced the effects of extreme climate events. Their narratives document the way climate change affects people and the struggle to reduce their vulnerability.



#### **The Disabled and Elderly**

The disabled and elderly are susceptible to climate hazards because their limited mobility and restricted agility means that they require additional assistance and support to move around. During an emergency or disaster situation, or if the settlement is waterlogged, they would not be able to evacuate quickly, or easily take their belongings with them. They may also be seen as a burden, and further put them in a vulnerable position.



#### **Ethnic Minorities**

Ethnic minorities, such as the Bihari Community in Narayanganj suffer from a variety of issues that make them vulnerable in a variety of ways. Factors such as their social stigma and lack of land tenure security increase their vulnerability, because they have less recognition by authorities,

and therefore lower institutional adaptive capacity. The Bihari Community for example has occupied a plot of land for over 60 years, but still is threatened with eviction, meaning they are not able to invest in building their homes with robust housing materials. Also, while many are qualified workers they struggle to find jobs as they have been socially stigmatized, this lowers their wage-earning capacity, and increases economic vulnerability.



#### **Women**

Women are more vulnerable to climate change than men, as they generally earn lower incomes, making them economically dependent, and they bear a larger burden in terms of child bearing and childcare responsibilities. In Narayanganj many women work in large- or small-scale factories, in many of these cases women are exposed to workplace hazards such as poor safety conditions, walking alone late at night from late shifts, and pollutants from chemicals. Under these conditions women are exposed to higher levels of risk than men.



#### **Children**

Children are also very vulnerable to climate change, they have more limited mobility, resources, and a high degree of dependency on others. During a climate event, they may not have enough awareness or means to evacuate, and are more limited in terms of adapting to new conditions and ways of living. Climate change increases the risk of disease and death among children, such as waterborne and food-borne diseases. For example relocation may disrupt school attendance and ultimately reduce literacy capacity.

## Vulnerable Systems

Vulnerability can also be thought of on a much larger scale, in terms of urban systems. Urban systems are networks of services that cover large areas of the city, or the entire city. They provide services for many citizens, like clean water delivery system or the drainage canal system. These systems can also be vulnerable to climate hazards.

If these systems are damaged or fail, problems can be widespread, and thus quite critical for a functioning city and its population. Systems such as roads and electricity can serve tens of thousands, and sometimes hundreds of thousands of people. Some of the critical systems identified for Narayanganj are: the informal sector economy, the garment industry, the drainage, water supply, sanitation, and the trash collection systems.



### Informal Sector Economy

Many of the urban poor in Narayanganj work in the informal economy, which is largely made up of small-scale garment work outsourced from the large factories, as well as workers who recycle waste from the garment industry. Other informal sector activities include preparing and selling food, driving rickshaws, hauling goods, and providing supplementary services to formal sector businesses. Workers in the informal sector economy are vulnerable because labor laws do not protect them, they constantly have to find new work, and they receive unstable pay. With such a reliance on the garment industry if demand were to slow, potentially large numbers would be impacted. Under these conditions poor households suffer a high degree of economic vulnerability, which can impact the lives of their families in times of crisis.



### Garment Industry

The local economy is heavily reliant on the garment sector for both its income and employment, this represents a vulnerability because fluctuations in the demand for clothing exported from Bangladesh may cause serious hardships for the city, and may lead to many workers losing their jobs. In addition, not only is the formal sector reliant on the garment industry,

the informal sector is too. Vulnerability can be reduced by diversifying the local economy, for example by developing other sectors of the economy such as hotels, services, and other industries, to ensure that the city is not overly reliant on one sector.



### Trash Disposal System

Most poor communities do not receive trash disposal service and as a result trash piles up in their communities, or is dumped into drainage, along the side of roads, or in the river. The health and wellbeing of the poor is constantly at risk of public health epidemics, bad odors, and congestion in already cramped communities. During climate events, such as flooding or extended periods of extreme heat this can drastically increase sensitivity and vulnerability, especially for children and the elderly.



### Drainage System

One of the critical issues in Narayanganj is periodic flooding and waterlogging. Besides blockages, the deterioration of the existing drains, and mixing of drainage with sewage have all compromised the effectiveness of the system. Poor communities are not connected to the city's drainage network, leaving settlements waterlogged for long periods. Waterlogging is a major concern of them as it leads to the spread of waterborne disease and public health epidemics.



### Water Supply System

Most poor settlements in Narayanganj have little or no access to municipal piped water supply system; in the north and east of the city. The situation is critical in wards that used to be Siddirganj and Kadam Rasul Municipalities. Poor communities in these locations are almost entirely dependent on deep tube wells, which may worsen groundwater depletion rates. They may also draw water that is polluted with pollutants from the jute and garments industries. Connecting poor settlements with the city's water supply network would not only resolve the water supply problems of the poor, but it would also significantly increase the municipal revenue collection.

## **How does Vulnerability Affect the Poor?**

From the analysis and discussions with stakeholders over the course of city-level workshop, we can identify some of the critical issues that Narayanganj is facing in terms of its vulnerability to climate change.

### **1. Poor communities in the north of the city are more vulnerable than those in the south**

The poor communities in the north of the city combine higher levels of exposure and sensitivity, together with lower levels of adaptive capacity, resulting in them being the most vulnerable areas of the city. The north is experiencing the greatest levels of urban sprawl as industry expands to areas that have been recently annexed. As a result, government presence and services in the area have not caught up with the speed of such expansion. The lack of infrastructure, combined with increased rates of pollution, have created hazardous conditions in these areas. At the same time these are areas where new poor settlements are growing rapidly. The combination of these trends leads to greater levels of overall vulnerability.

### **2. Riverbank communities along the Shitalakshya River are vulnerable and at risk**

Poor communities in wards along the Shitalakshya River have the highest levels of vulnerability in the city, they are most exposed and vulnerable to climate hazards. Decreased water flow and pollution – due to both industry along rivers and upriver conditions – have created unfavorable groundwater conditions for riverbank communities. The groundwater is often contaminated with arsenic and industrial effluents. Furthermore, communities can no longer safely use the river as a source of shared livelihood, making daily activities such as laundry a hazardous task. As industry on its banks pollute the river, protective riverbank habitats have degraded. Actions are necessary to protect the riverbanks and mediate the impacts of industrial activity, which have been damaging and threatening to poor communities.

### **3. Poor communities need better access to public services, especially in the periphery of the city**

Access to public services, including water supply, drainage, paths, and sanitation, is very limited in the areas of the city that are most vulnerable to climate hazards. This increases their sensitivity and indicates low levels of adaptive capacity. To decrease their vulnerability, efforts are needed to identify the gaps in basic services for poor communities and improve service delivery there. Access to public services is particularly low in the periphery of the city, especially in the north, which is mostly made up of newly annexed wards, these conditions imply that they are more isolated and out of touch with the local government. As a result, they are more vulnerable to climate hazards, and have more difficulty adapting to the impact of climate hazards. By improving basic services, including access to healthcare, their sensitivity and overall vulnerability can be reduced.

### **4. Rapid urbanization can reduce vulnerability for some, while increase it for others**

Narayanganj is growing rapidly, with obvious improvements in wages and jobs, as well as new infrastructure such as roads and services are developing the city. This can decrease vulnerability by increasing adaptive capacity, and reduce sensitivity, but new infrastructure can also cause negative impacts like waterlogging, and pollution, and be inaccessible to the poor. New road infrastructure without proper drainage can lead to acute waterlogging, as is the case along the Tribeni Canal. Poor communities are particularly vulnerable because they are rarely connected to drainage networks.

### **5. Councilors and urban poor communities are not always working together**

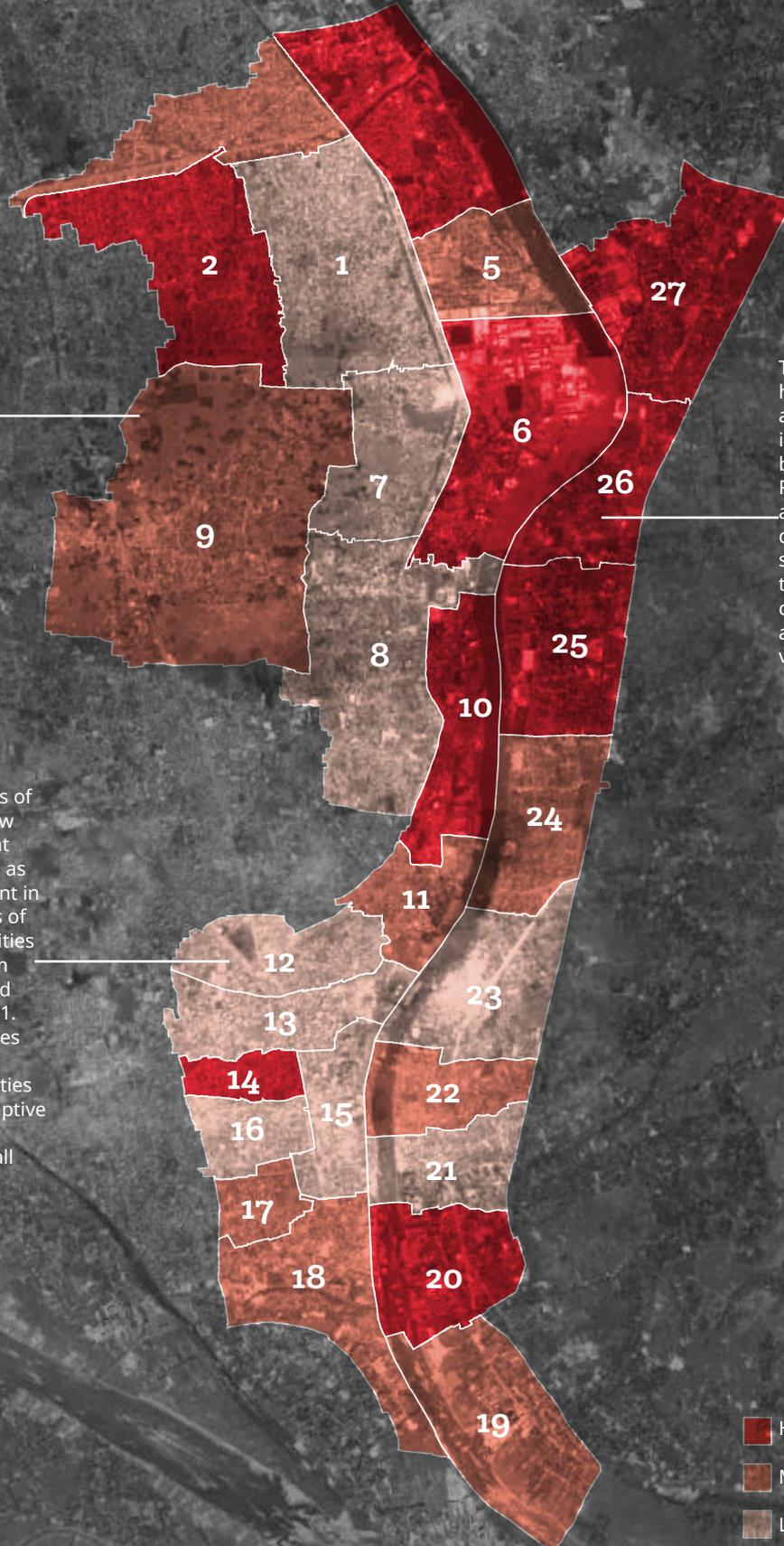
During the workshops, community leaders identified a multitude of issues increasing their vulnerability: the lack of engagement by their councilors, their connection to services, and insufficient infrastructure. Misrepresentation by councilors lowers adaptive capacity and weakens inter-community networks and connections. This makes it difficult for residents to receive adequate support.

## Vulnerability

Medium vulnerability levels are dominant to the north and south periphery of the city.

The overall vulnerability is high in the newly added areas of the city especially in the Wards along the bank of the Shitalakshya River. Although these areas are relatively less dense they lack municipal services, and this reduces the institutional adaptive capacity significantly and thus increase the vulnerability.

One third of the Wards of Narayanganj have low vulnerability index that include the city centre as well. This is also evident in the earlier city centres of the old two municipalities (Siddirganj and Kadam Rasul) that were added to Narayanganj in 2011. Because the city centres has better access to municipal service facilities that increases the adaptive capacity of these areas and reduces the overall vulnerability.



- HIGH VULNERABILITY
- MEDIUM VULNERABILITY
- LOW VULNERABILITY



8.1- Small businesses, such as this local temporary kitchen market, allow poor community members to develop their livelihoods and empower them to be more independent and less dependent on farming or other climate-sensitive livelihoods. Small business start-up grants can help urban poor households develop their own businesses. Having access to permanent market-shed is necessary for ensuring the sustainability of their business.

## 8. Recommendations

The following recommendations are derived from the CCVA's in-depth analysis of socio-economic and climate vulnerabilities of the urban poor of Narayanganj. They are directed towards the local government, but require the involvement of urban stakeholders, in particular urban poor communities and community organizations. The recommendations are as follows:

**-1-**

### **Improve basic service delivery to poor settlements including healthcare**

Urban poor communities across the city are vulnerable to climate hazards due to the inadequate access they have to basic services. Lack of access to basic services including water, sanitation, drainage, access paths, education, and public health care, increases their sensitivity and significantly lowers their adaptive capacity. Efforts need to be directed at increasing access to basic services in poor settlements throughout the city, the following recommendations support this initiative:

- Drains should be constructed in poor settlements and connected to the drainage master plan, and also be cleaned and maintained regularly. This will reduce waterlogging, and improve public health conditions.

- Improve public healthcare for poor communities by building linkages between the urban poor and private and NGO health care providers to ensure their access to primary health care.
- The Local Government should identify the poor communities with most critical development conditions, engage in dialogue to identify their infrastructure and service needs, and invest in implementing them.
- Ensure that poor settlements are able to access municipal services such as trash collection.
- Drains should be constructed in poor settlements and connected to the drainage master plan, and also be cleaned and maintained regularly. This will reduce waterlogging, and improve public health conditions.
- Improve public healthcare for poor communities by building linkages between the urban poor and private and NGO health care providers to ensure their access to primary health care.
- The Local Government should identify the poor communities with most critical development conditions, engage in dialogue to identify their infrastructure and service needs, and invest in implementing them.
- Ensure that poor settlements are able to access municipal services such as trash collection.



-2-

## Improve disaster preparedness



The workshops revealed that Narayanganj City Corporation is not adequately prepared to face for a natural disaster or climate hazard, and so disaster preparedness is essential to reduce the vulnerability of local inhabitants. This requires leadership from local government, and a systematic approach to ensure that awareness and capacity exists in communities across the whole town. The following recommendations can help prepare Narayanganj in the event of a climate event or disaster:

- Form Disaster Management Committees (DMC) at the Town- and ward- Levels and build the capacity of these committees through providing training and arranging occasional disaster drills.
- Develop town- and ward-level disaster preparedness and response plans— prepared by and executed by DMCs. They serve to increase the awareness of citizens and poor communities about disaster preparedness, response and recovery.
- Develop emergency evacuation routes and response procedures.
- Encourage community organizations to collaborate by raising awareness and developing the capacity of the poor to respond to climate hazards.
- Improve coordination between relevant Government agencies, and linkages between them, such as the city authority, BWDB, DRR, and LGED. This can ensure better preparedness, response, and recovery.

-3-

## Strengthen linkages between the urban poor, ward Councilors, and service providers



One of the reasons why poor communities are vulnerable to climate change is because they are not well recognized or represented by Ward Councilors very well, and as a result they do not receive the same kinds of services, recognition, and support from the local government. To reduce their vulnerability the poor should be better integrated into the town's governance mechanism, so that their issues and conditions are better recognized and addressed. The following are a few recommendations that support this approach:

- The Mayor should encourage Ward Councilors to be more proactive and engage with poor communities and ensure that basic service providers (such as WASA) can provide services to them.
- Ward Councilors should regularly engage with Community Development Committees (CDCs) and CDC Clusters to discuss local development issues, so that there is mutual agreement and collaboration on the resolution of local problems and proposals. To do so they could host open, regular meetings at the Ward Councilor's offices.
- Municipal Government and Ward Councilors should become more responsive and transparent to working with residents by making more information publicly available. Publishing public notices, providing information and maps, and encouraging residents to call to make inquiries about public services and other issues, can achieve this.

-4-

### Build economic resilience and diversify the skills of those dependent on climate-sensitive livelihoods



The economy of Narayanganj relies to a large part on the industries and river port, industry-based and informal business-based livelihoods. The city is sensitive to in-migration from surrounding districts like Narsinghdi, Munshiganj etc. There is diversity of the economy but very high density of population make the demand far greater than the supply in the existing job market. Initiatives should be taken to increase economic resilience, especially that of the urban poor:

- Develop a pro-poor economic development strategy that develops the skills and capacity of the poor in urban-based economies, so they are not overly reliant on climate-sensitive sectors like farming.
- City Authorities should engage with local business community, civil society organizations (such as NGOs), and the CDC Federation to discuss ideas to promote local pro-poor economic development, and link the poor to jobs and opportunities. They could facilitate regular citywide forums that put forward ideas on job creation, and improvements to the business environment.
- Municipal Government can commission and lead studies on local conditions, for example related to the informal sector, wages, workplace safety, and mobility, to actively seek ways to improve working conditions and the business environment. Such research could lead to initiatives that improve the skills of workers, and spur further business investment.

-5-

### Develop plans for sustainable low-income settlements in the periphery



With rapid expansion in the periphery almost certain to take place, and with limited capacity and planning in new Wards on the outskirts of the city, Local Government should be proactive about planning. If they are not thinking ahead and investing in necessary services, increasing capacity, and planning for low-income housing, then the periphery will become disorderly and problematic. This will not improve housing options for the poor, but worsen them.

- Local Government should place an emphasis on building the capacity of Ward Councilors, investing in areas of the periphery, and better connecting these areas (especially to the East of the river) to the infrastructure networks of the rest of the city.
- Ward councilors in Wards in the periphery should engage regularly with CDCs about meeting their development needs, facilitating the CAP process, and building workable relationships. This will help ensure consultation and consensus in terms of Government programs and policies.
- Local Government should work with public services companies, such as WASA, to extend networked infrastructure to peripheral areas of the city, in anticipation of future growth there. By having infrastructure in place, such as water, drainage, and sanitation, before settlements are constructed allows for more orderly and sustainable urban development.



8.2- Waterlogging is a common phenomenon in low-income urban settlements, especially in the dense and congested city center. No drainage facilities are available in most poor communities which makes the entire community vulnerable.

## i. Appendix

### Mapping Vulnerability in the City: A Quantitative Approach

Having reflected upon the different ways of thinking about vulnerability we can also use the indicators to show us where vulnerability is concentrated. This is called our quantitative approach. Because the scale is that of the neighborhood, the precision of our measurements cannot reach specific locations. However, our approach will help in understanding how vulnerability is distributed across the basic administrative unit, the Ward. This unit may be helpful in indicating ways for vulnerability to be reduced through the city's planning and policymaking mechanisms, which act through this administrative unit.

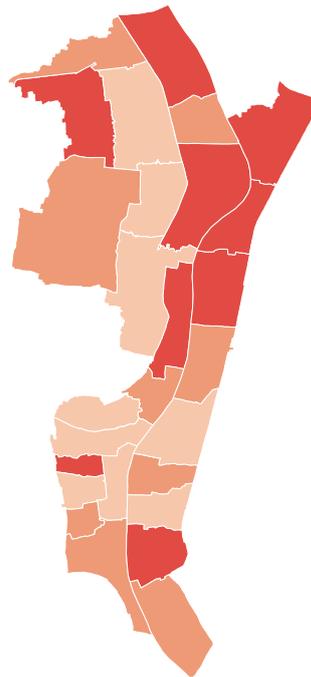
We use the standard definition used by the Ministry of the Environment and the UN:

$$\frac{\text{Exposure} \times \text{Sensitivity}}{\text{Adaptive Capacity}} = \text{Vulnerability}$$

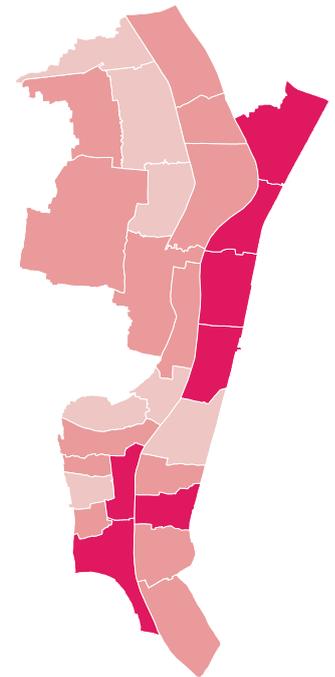
The overall vulnerability of each ward is calculated by taking previously selected indicators and organizing them into a data sheet.

An important note: evaluating vulnerability does not simply mean identifying the areas most exposed or with highest sensitivity. Because the formula divides these by adaptive capacity, it is important to understand where the city government currently has extended services, or has institutional capacity, to respond to climate hazards and disasters. Areas with good roads, services, and medical facilities have high adaptive capacity, whereas those areas that are remote often have low adaptive capacity.

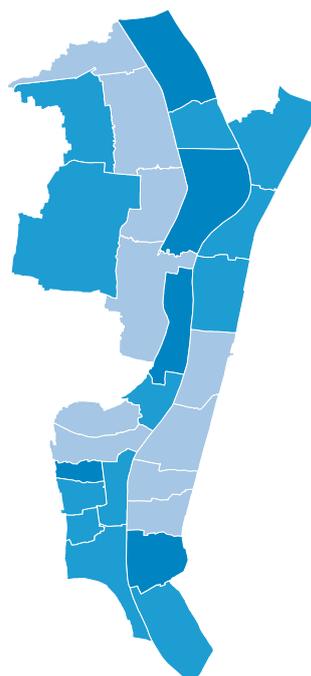
Vulnerability



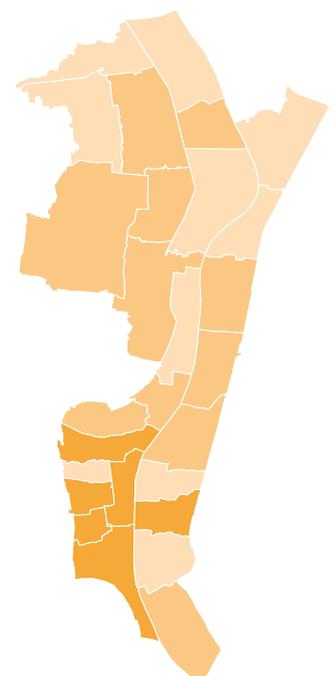
Exposure



Sensitivity



Adaptive Capacity



## CCVA Workshop Attendees 10/06/2018

sl	Name	Address	sl	Name	Address
1.	AFM Ehteshanul Hoque	NCC	28.	Masud	NCC
2.	Amir Hossain	CGP	29.	John Taylor	NUPRP, Dhaka
3.	Md. Nazrul Islam	NUPRP, NCC	30.	Noor Hossain	CDC
4.	Khondoker Tauhid	ADPC	31.	Hasina	CHDF
5.	Md. Anisur Rahman	ADPC	32.	Farjana	New Palpara CDC
6.	Nusrat Jahan Parva	ADPC	33.	Reshma Akhter	NCC
7.	Mitu Devnath	CHDF	34.	Md. Zahirul Alam	NCC
8.	Nadia Sultana	CHDF	35.	Siam Hossain	NCC
9.	Asia Kanom Sume	CTF	36.	Kiran	Cluster
10.	Nazma	9 no Cluster CDC	37.	Reya Akter	NCC
11.	Md. Moshir	26 No ward, NCC	38.	Liza Akter	NCC
12.	Salma Sultana	CHDF	39.	Saiful Islam	NCC
13.	Md. Abul Kalam	NCC	40.	Md Esahaq Hossain	NCC
14.	Anowara Begum	NCC	41.	Md. Sajjadul Islam	NCC
15.	Shahnaj Begum	CTF	42.	Ciara Stein	UNDP
16.	Md. Kabir Hossain	NCC	43.	SM Al-Masum	NUPRP, Dhaka
17.	Md. Mosharref Hossain	NCC	44.	Shaoan Angkon	NCC
18.	Pooja Rani	Eklaspur CDC	45.	Dr. Sheikh Mustafa Ali	NCC
19.	Md. Ali Shabab	NCC	46.	Md. Moniruzzaman	NCC
20.	Md. Shakhawat Hossain	NCC	47.	Md. Amir Hossain	NCC
21.	Asit Barman Biswas	NCC	48.	Md. Nazmul Hossain	NCC
22.	Md. Hemayet Hossain	NCC	49.	Alamgir Hiron	NCC
23.	Md. Asgor Hossain	NCC	50.	Md. Shahid	NCC
24.	Monowara Begum	NCC	51.	Ibrahim Khalil	NCC
25.	Andy Lee	UNDP	52.	Jakir Hossain	NCC
26.	Kamruzzaman Palash	NUPRP, Dhaka	53.	Md. Jakir Hossain	CGP
27.	Md. Iqbal Hossain	NUPRP, Dhaka	54.	Uttam Das	NCC





