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URBAN LOW EMISSION DEVELOPMENT STRATEGIES

Narayanganj City, Bangladesh

Climate Risk and Vulnerability Assessment Report

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Title: Narayanganj City, Bangladesh – Climate Risk and Vulnerability Assessment Report

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1. INTRODUCTION

An urban vulnerability assessment is a first step towards the planning and implementation of an urban climate resilience strategy. Under the "Accelerating climate action through the promotion of Urban Low Emission Development Strategies (Urban LEDS II) project funded by the European Commission, ICLEI South Asia has conducted the urban vulnerability assessment for the city of Narayanganj.

The urban vulnerability assessment is the essential and methodological part of developing the "Climate Resilient Cities Action Plan (CRCAP)" for Narayanganj city. The report includes the overview of climate resilient cities methodology, city profile, past hazards and climatic events, climate scenario in the city, climate impact assessment, urban systems analysis, vulnerability assessment, identification of actors and their adaptive capacities, adaptive capacity of fragile urban systems.

1.1. Methodology

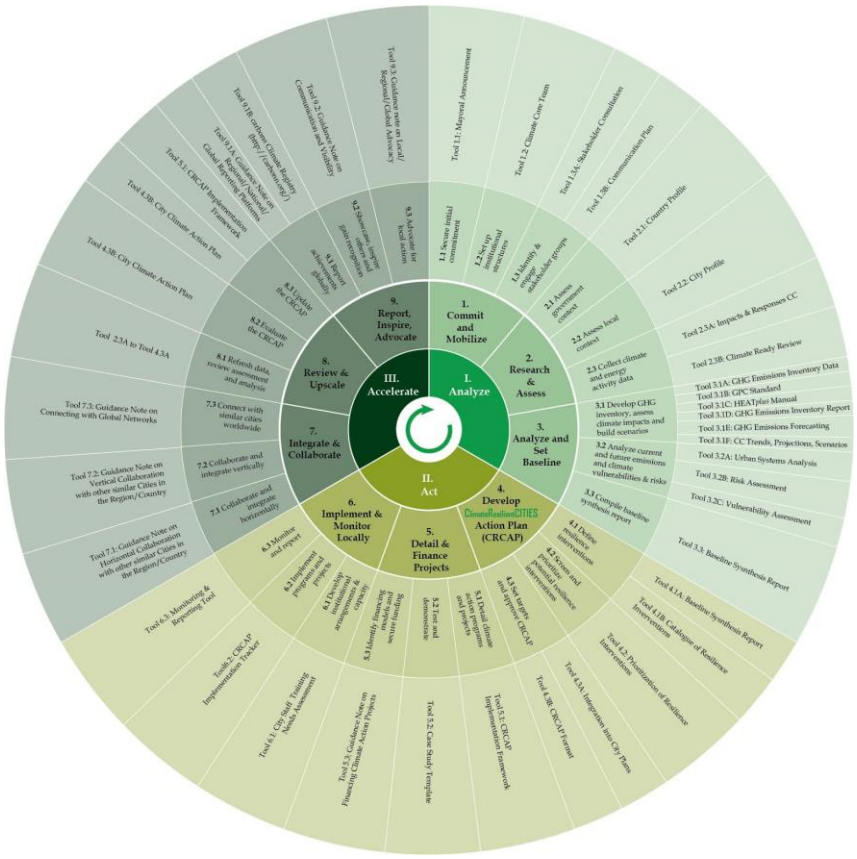
Vulnerability Assessment for Narayanganj has been developed under the aegis of 'Climate Resilient Cities Action Plan (CRCAP)' using the Climate Resilient Cities Methodology. This Methodology is tailor made for Local Governments (LGs), providing **step by step guidance for the development of a Climate Resilient City Action Plan** that addresses both, climate change adaptation and climate change mitigation. This process is based on the premise that **climate resilience refers to both climate change mitigation and adaptation, and linkages therein**.

This process builds on ICLEI's Cities for Climate Protection (CCP) Campaign, ICLEI's flagship mitigation program, the GreenClimateCities (GCC) program and ICLEI's adaptation tool-kit, the ICLEI Asian Cities Climate Change Resilience Network (ACCCRN) Process or IAP toolkit.

1.2. Overview of Climate Resilient Cities Methodology

The Climate Resilient Cities Methodology is a 9-step process in 3 phases: ***Analyze, Act and Accelerate*** **-** each unfolding into three steps - outlining how **climate fragility** can be assessed and **climate resilient options (to achieve low emissions development and climate adaptive development)** can be identified and integrated into urban development policies, plans and processes. It consists of a wide **range of tools and guidance notes** to support local governments to deliver effective local climate action. The figure below shows the various tools used in the Methodology.

Figure 1: Climate Resilient Cities Methodology



1.3. Developing Vulnerability Assessment

The three broad phases for conducting a vulnerability assessment for Narayanganj city involved:

Phase 1 – Commit and Mobilize: This phase began with gaining political support in the city by formulating a Climate Core Team and a Stakeholder Group. The climate core team is responsible for the execution of project activities in the city and comprises of key officials from the city government. The stakeholder group is formed with citizen representatives from various relevant institutions and organizations of the city. The climate core team communicates key messages to the public as required. This is followed by a scoping exercise which helps in gaining insight about the various city services and the problems faced by the city.

Phase 2 – Research & Assess: This step included exploring local policy/legal, governance, economic, social and environmental contexts at the local level, which would impact climate resilient development in the City. This phase identified observed impacts of climate change on the City and assessed its activities. The response of the City to past events was also noted to understand the efficacy of existing response mechanisms and further needs. A climate readiness review helped assess the city's capacities and readiness to tackle climate change.

Phase 3 – Analyze and Set Baseline: Core and secondary urban systems were examined to identify fragile urban systems and to examine the impact of climate change on these fragile urban systems. For each fragile urban system, key vulnerable areas (geographical areas) and the

vulnerable population for each system were assessed and identified. This information was gathered in consultation with the stakeholder group through Shared Learning Dialogues (SLDs). The adaptive capacities of the urban systems were also assessed in this phase. Further, a risk assessment was conducted for fragile urban systems based on the likelihood and consequence of the climate risk statements for those systems. Combining the information generated in earlier steps and against each of the identified climate fragility statements, specifics of the location and people impacted were identified.

In the present report the outcomes of the phase I and II have been incorporated. The core and secondary urban systems have been documented. The urban system analysis, identification of key vulnerable areas and populations through 'Shared Learning Dialogues', and risk assessment have been documented. The outcomes of this third phase will incorporated in the Climate Resilient Cities Action Plan (CRCAP) subsequently.

2. CITY PROFILE

Narayanganj is the 7th city corporation of Bangladesh declared in 2011, combining Narayanganj, Siddirganj and Kadamrasul Municipality under its' administrative boundary through Rule 6 of the establishment of Local Government (City Corporation) Rules, 2010. Historically, Narayanganj has been an important industrial hub for Bangladesh. It has been the salt trading center for a long time, which is still continuing today. Having great connectivity with surrounding cities and being located near the capital Dhaka, Narayanganj has gained the attraction of many industries. It is known as the Dundee of the East for its myriad jute mills. With a great historical importance, Narayanganj will remain in the front line for its relics of settlements of 12 Bhuiyas, Haziganj Fort and Sonakanda Fort, Shahi Masjid, Kadam Rasul Dargah etc.

2.1. Location

The city is located 17 km southeast from capital Dhaka and lies between 23°33' and 23°57' north latitudes and 90°26' and 90°45' east longitude. Being located at the bank of Shitalakshya River and at the vicinity of Dhaka, a large number of industries were developed within the city area. With the increasing industrial and commercial activity in recent years, the emerging city is experiencing rapid population growth. These industrial units are primarily located on two banks of the Shitalakshya River and the eastern bank of the Buriganga River, providing employment opportunities in the city.

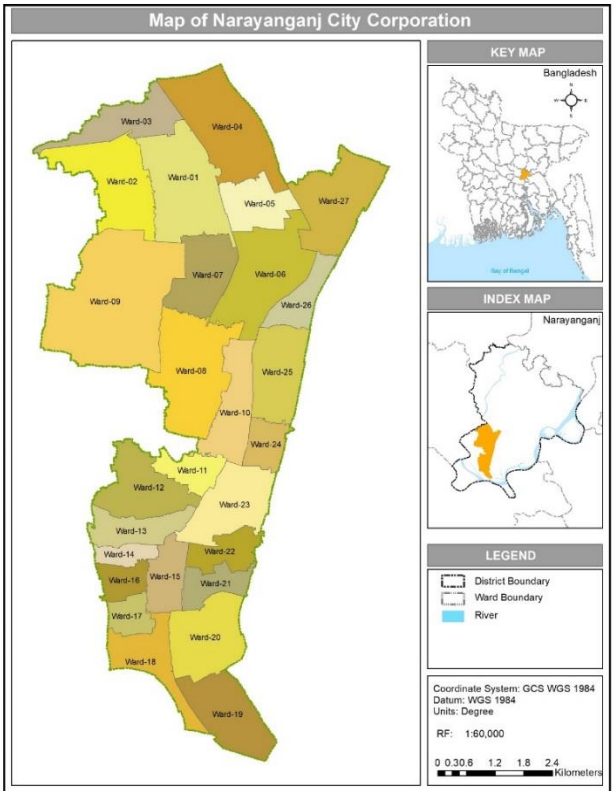


Figure 2: Narayanganj City Corporation

2.2. Demography

With a total area of 47.22 sq. km[1], Narayanganj City Corporation has a total population of 709,336 and a population density of 15,021/sq. km[2]. According to the City Corporation, its' current administrative area is 72.43 sq. km. and the total population is near 2 million[3]. It has a 1.10:1 male to female ratio with total 365174 male and 330909 female in 2011. Table-1 shows the population of 2011 in each ward of the three municipalities – Kadamrasul, Narayanganj and Siddirganj.

[1] Narayanganj City Corporation Action Area Plan 2016
[2] Population Census 2011; BBS
[3] Narayanganj City Corporation; http://www.ncc.gov.bd/site/page/d7dd6dd2-d697-4620-976e-ede6b3485e7f/-

Table 1: NCC Population in 2011

Ward	Population 2011	Male Population 2011	Female Population 2011
Kadamrasul Municipality			
Ward – 01	11822	5977	5845
Ward – 02	17649	8777	8917
Ward – 03	22176	11380	10796
Ward – 04	30728	15633	15095
Ward – 05	30572	15553	15019
Ward – 06	20308	10029	10279
Ward – 07	12636	6431	6205
Ward – 08	6812	3462	3350
Ward – 09	13543	7020	6523
Total	166246	84262	82029
Narayanganj Municipality			
Ward – 01	20489	10685	9804
Ward – 02	24550	12782	11768
Ward – 03	40187	20871	19316
Ward – 04	47079	24400	22679
Ward – 05	29431	15372	14059
Ward – 06	24096	12707	11389
Ward – 07	34496	17659	16837
Ward – 08	35518	18126	17392
Ward – 09	30484	15612	14872
Total	286330	148214	138116
Siddirganj Municipality			
Ward – 01	36592	18961	17631
Ward – 02	25585	13180	12405
Ward – 03	35947	18931	17016
Ward – 04	23385	12240	11145
Ward – 05	18421	9334	9087
Ward – 06	25100	12878	12222
Ward – 07	21888	11165	10723
Ward – 08	42704	22169	20535
Ward – 09	27138	13840	13298
Total	256760	132698	110764
Grand Total	709336	365174	330909

2.3. Economy and Employment

Narayanganj is one of the major industrial towns in Bangladesh. The major economy and trades are mainly based on business and industries for jute and oilseed trade, processing plant, cement manufacturing and textile industries etc. Details of major economic activities and share of population involved is highlighted in Table-2. There is a river port used for shipping of industrial goods of these industries. Apart from manufacturing sector, the other prominent economic sector which employs people are small trades, private sector and government jobs. The city doesn't have any mining, and fishing activities; and has a very small scale agricultural activity.

Table 2: Sector specific Employment in Narayanganj

Major Economic Activities	Total Person Engaged	Percentage
Manufacturing	536,919	62.30%
Wholesale and Retail trade, Repair of motor vehicles	184,866	21.45%
Other Service Activities	48,162	5.59%
Accommodation and Food Service Activities	31,301	3.63%
Education	17,862	2.07%
Transportation and Storage	10,158	1.18%
Other Economic Activities	32,524	3.77%

(Source: Bangladesh Bureau of Statistics, 2013)

2.4. City Administration

Narayanganj is the 7th city corporation of Bangladesh declared in 2011. Besides, the City Corporation, Rajdhani Unnayan Kortripokhkho (RAJUK) is responsible for planning the development of the city and to coordinate all the development related work. Dhaka Water supply and Sewerage Authority (DWASA) is responsible for the water supply system within the city area. Although there is no sewerage system in Narayanganj City Corporation, the city authority is responsible for drainage system management and they are planning to take over the responsibility of water supply system from WASA.

At present, the City Corporation is formed with composition of an elected body headed by the Mayor and comprised of 27 Councilors for 27 wards, who are chaired by an elected member. The Mayor and Councilors are responsible for policy decisions of City Corporation. The administrative head of the City Corporation is the Chief Executive Officer (CEO) who is responsible for functioning of the corporation including tax collection, estate maintenance, project monitoring and other tasks according to legislation. The CEO is an administrative cadre service post and appointed by the central government. Narayanganj City Corporation provides and maintains urban services that include drainage system management, solid waste collection, disposal and management, street cleanliness, construction and maintenance of road and streets, street lighting, maintenance of parks, open spaces, cemeteries and crematoriums, registering births and deaths, conservation of heritage sites, disease control including immunization and vaccination, and maintenance of public corporation schools etc.

Other than the City Corporation, development and planning schemes are implemented by various other government organizations as follows-

Rajdhani Unnayan Kartripakkha (RAJUK) – responsible for preparing city master plan and development policies.

Dhaka Water Supply & Sewerage Authority (DWASA) – was responsible for water supply within the city corporation area. On 31st October 2019, Dhaka WASA has handed over the responsibility of water supply and sewerage management to Narayanganj City Corporation.

Department of Public Health Engineering (DPHE) – responsible for conducting surveys to identify the level of water contamination by chemicals like arsenic and other harmful substances.

Public Works Department (PWD) – is the construction agency of Government of Bangladesh (GoB) and they are responsible for the implementation of government construction projects. They also undertake projects for autonomous bodies as deposit works.

Forest Department – responsible for forest extension, biodiversity and wildlife conservation.

Department of Environment (DoE) - responsible for environmental regulation and management.

Roads and Highways Department (RHD) – responsible for the construction and maintenance of major regional roads and bridges network.

Dhaka Power Distribution Company (DPDC) – provides electricity to the residents, commercial and industrial establishments, and street lights in Narayanganj and Siddirganj municipality.

Bangladesh Rural Electrification Board (BREB) – provides electricity to the residents, commercial and industrial establishments, and street lights in Kadamrasul municipality.

Titas Gas Transmission and Distribution Ltd. – provides Piped Natural Gas (PNG) and Compressed Natural Gas (CNG) to the residents, commercial and industrial establishments within the City Corporation.

3. PAST HAZARDS AND CLIMATIC EVENTS

Narayanganj has experienced severe adverse effects of climate change in the recent years due to its riverine and geographical location. The major climate change impacts that Narayanganj faces are i) Drainage Congestion (Flood) and ii) Heat stress[4]. The city experiences hot, humid summers, short, mild winters, and heavy rain during the monsoon season[5].

According to a study, Narayanganj has moderate risk in terms of multiple hazards with a cumulative score of 18.9. Based on geographic location and historical data, Narayanganj is mostly at the risk of earthquake and tornado[6].

Again, several low-lying area of Narayanganj suffers from frequent and long lasting waterlogging due to the encroachment of canals (natural drains), which is exacerbated by the heavy rainfall during monsoon. Almost all of Narayanganj lies in a meander flood plain and a 56.79 sq. km of area within Dhaka-Narayanganj-Demra is mostly vulnerable to waterlogging and flood. To alleviate the situation, the government had launched Dhaka-Narayanganj-Demra (DND) Area Flood Control, Discharge and Irrigation Project in 1962-1968 period. This project installed 4 pumps and one pumping station, constructed 31.25 km of embankment, excavated 55.20 km of Irrigation canal, 45.90 km of Discharge canal and established 216 Water Control Infrastructures. But in the 1998, the water in Shitalakshya River was flowing at the level of 6.93 m and 7.23 m in Buriganga River. As a result, the embankment was breached by the most severe flood in the history, and many low-lying areas were inundated for 15-20 days. A study indicates that 47% of total DND area was inundated. Out of that, flood depth was less than 1m in 21% of total area, and 1-2m in 15% of total area. The highest depth was recorded 6.67m in rest of the inundated area. Total 250,000 people within DND area was effected by this devastating flood[7].

In August 2016, the GoB has approved 558.2 crore budget for "DND Area Drainage Improvement Project (Phase II)", which was commenced from July 2016 and will be finished in June 2020. This project will install 2 pumps and 3 pumping plants, re-excavate 93.98 km canal and develop the embankment of 93.98 km[8].

Table 3: Past Climatic Events in Narayanganj

Year	Climatic Event	Impact	Action Taken
1976	Nor'westers and Tornado	No record of damage[9].	
2008	River bank erosion	Bandar and Araihazar area was damaged by the event[10].	
2010	River bank erosion	Bandar area was damaged by the event[10].	

[4] Adaptation options for managing water related extreme events under climate change regime: Bangladesh perspectives; Ahmed, A. U. (2005).
[5] City Profile: Narayanganj; A.H.M. Noman et al.
[6] District-wise multi-hazard zoning of Bangladesh; Uttama Barua
[7] Flood Hazard Mapping of Dhaka-Narayanganj-Demra (DND) Project Using Geo-Informatics Tools; Md. Aminul Islam
[8] Bangladesh Water Development Board
[9] Disasters in Bangladesh: Mitigation and Management; M Hasinur Rahman
[10] BBS District Statistics 2011 - Narayanganj

Year	Climatic Event	Impact	Action Taken
2011	River bank erosion	Bandar area was damaged by the event[10].	
2011	Earthquake	Magnitude of 6.4 and 4.9. No report of damage[11].	
2011	Flood	The residential areas of Narayanganj and other places such as Don Chamber, Khanpur, Missionpara, Amlapara, President Road, Galachipa, Jalutala, Masdair, Iqbal Road, Ukipara, Nawanati, Bhuiarbag, Baburail, Dewvog, Nitaiganj, Tarakpoti and Tanbazar were waterlogged due to the heavy downpour on August 8, 9 and 10, 2011. In some areas there was knee deep water. The people of Jamtoli were marooned. The low lying area in DND embankment was inundated. Several millions of people were marooned. Lack of proper drainage system was the main cause of water-logging[11].	
2011	Lightning	1 child died on May[11].	
2011	Nor'wester	15 students were injured in Sadekul Ulum Madeni Madrasa of Keshoppur Hatkhola of Narayanganj; the tin of the roof fell down on them when they were sleeping at night[11].	
2013	Cold Wave	A cold wave lasted for 7 days in the January with a minimum temperature of 10-12°C.	The GoB allotted BDT 150,000 for blanket for NCC during this event[11].
2015	Waterlogging	Dhaka-Narayanganj-Demra embankment area was submerged under waist-height water for several days.	
2016	Lightning	2 Killed and 1 injured in Char Kishorganj union of Sonargaon upazila[12].	
2017	Waterlogging	Shanarpara, Dogair, Rahim Market, Adamjee, Pagla and Fatullah area was submerged under ankle to knee height water for two months, from July – September.	Development of Drainage System of DND has started a project of four year with a budget of 558.2 crore taka to solve this problem[13].

[11] Bangladesh: Disaster Report 2011
[12] Disaster Incidences in Bangladesh in March 2016; Nirapad
[13]The Daily Star: https://www.thedailystar.net/city/marooned-waterlogging-1458106

4. CLIMATE SCENARIO IN THE CITY

According to the Köppen-Geiger climate classification, Narayanganj has a tropical wet and dry climate[14]. The summer season is hot and dry and lasts from mid-April to mid-June. Monsoon commences in early to mid-May and lasts till mid-October. Around 70-85% of yearly precipitation occurs within this period[15]. Annual rainfall averages 2004 mm in Narayanganj. The average temperature during summer is 29.4°C with a maximum of 34.7°C. In the calendar, the winter season spreads from mid-December to mid-February and the minimum temperature is recorded 13.4°C during January. December is the driest month of the year with average 5 mm rainfall and the precipitation is maximum during July with an average of 374 mm[14].

4.1. Past Climate Trends

The nearest station of Bangladesh Meteorological Department (BMD) for Narayanganj is in Dhaka. The past climate trend for Narayanganj is assessed considering the data of Dhaka. According to the data of BMD, the figures bellow shows the temperature trend of the year 1980-2012. Each of the graphs shows an upward trend for annual maximum temperature, annual minimum temperature and annual average temperature. A study analyzed the temperature data within 1995-2016 and also concluded with increasing trend. The study projected that the monthly minimum temperature will increase upto 6.8°C and the minimum temperature in the winter will increase upto 13°C in the next 100 years[16].

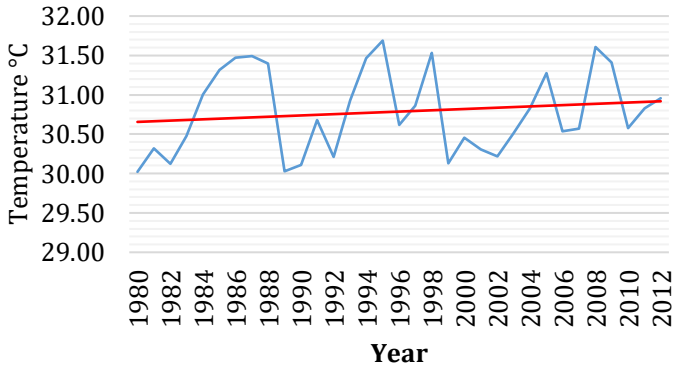


Figure 3: Annual Maximum Temperature of NCC

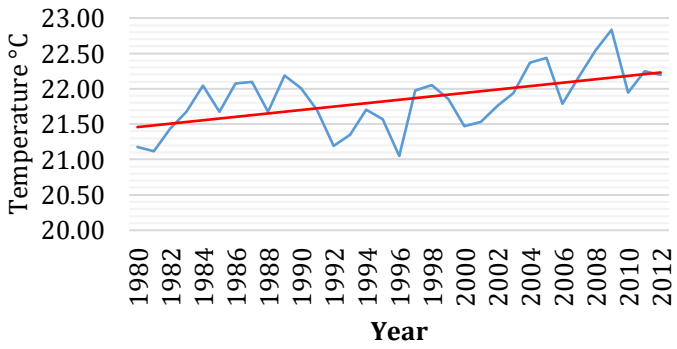
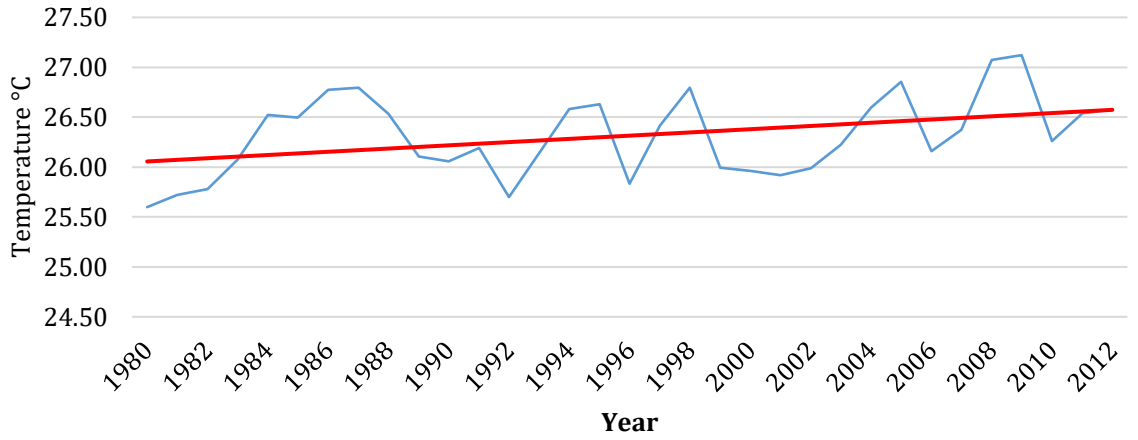


Figure 4: Annual Minimum Temperature of NCC

[14] https://en.climate-data.org/asia/bangladesh/dhaka-division/narayanganj-33722/
[15] http://en.banglapedia.org/index.php?title=Season
[16] An analysis of the temperature change of Dhaka city; Hossain Mohiuddin et.al.

Figure 5: Annual Average Temperature of Narayanganj



The annual precipitation data of Dhaka for the last 33 (1980-2013) years shows a downward trend. Only the graph of rainfall during monsoon displays a slightly increasing trend over the year. But the total rainfall of other seasons is decreasing rapidly. It indicates the annual rainfall is decreasing but rainfall intensity for a few months is high.

On the other hand, a study on annual daily rainfall in Dhaka indicates an increase rate of 4.54 mm per year for the last 57 years. However, in the recent years (2000 to 2009), the increase rate is 55.90 mm per year[17].

Another study on the regional temperature and rainfall trend shows no significant change of trend in rainfall of Dhaka city[18].

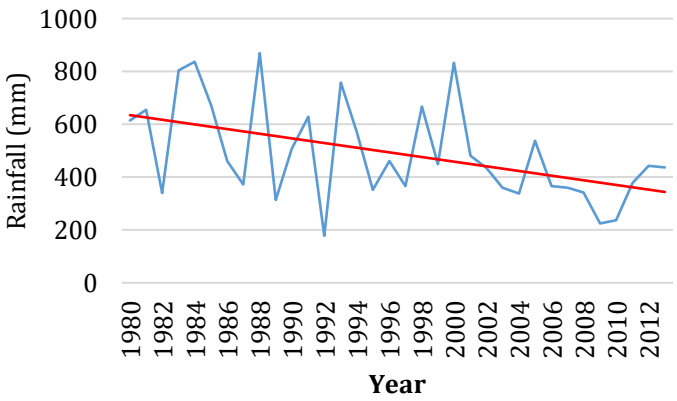


Figure 6: Total Rainfall in Summer (Mar-May)

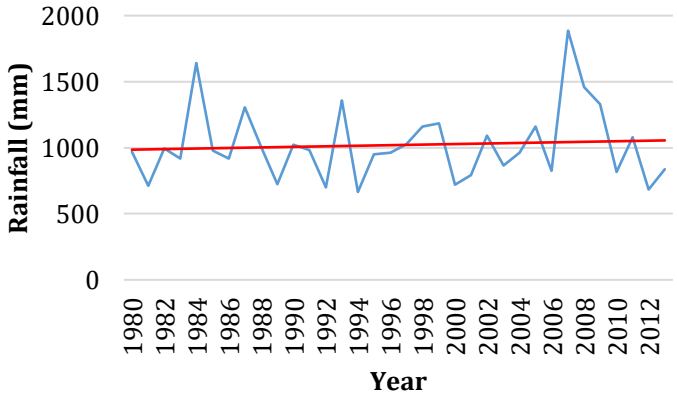


Figure 7: Total Rainfall in Monsoon (June-Aug)

[17] Variability of annual daily maximum rainfall of Dhaka, Bangladesh; Faisal Ahammed et al.
[18] Regional Variation of Temperature and Rainfall in Bangladesh: Estimation of Trend; Abdur Rahman et al.

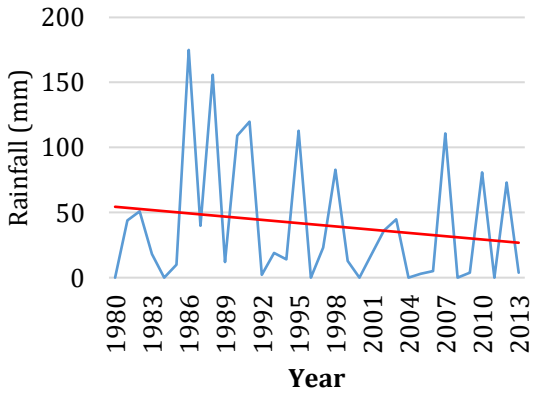


Figure 9: Total Rainfall in Winter (Nov-Dec)

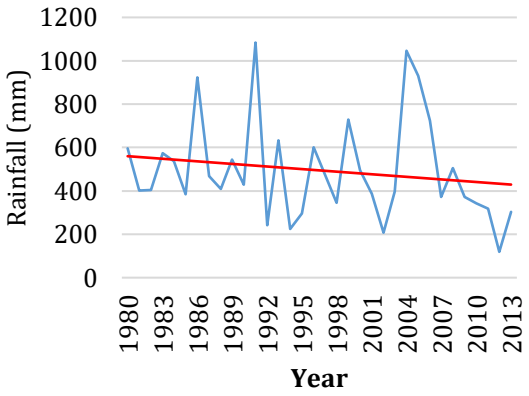


Figure 8: Total Rainfall in Autumn (Sept-Oct)

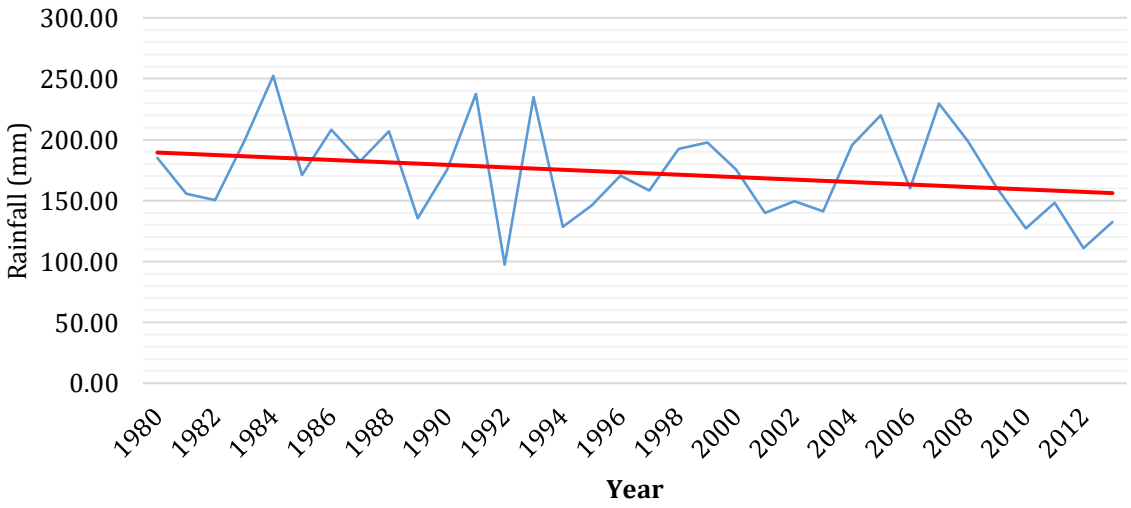


Figure 10: Annual Average Rainfall (mm) in Narayanganj

5. CLIMATE CHANGE PROJECTION AND CLIMATE SCENARIO STATEMENT

Although there is no dedicated literature available detailing climatic projections for various regions in Bangladesh, the National Plan for Disaster Management (2010-2015) published by the Government of Bangladesh and the Vulnerability, Risk Reduction and Adaptation to Climate Change, Climate Risk and Adaptation Country Profile (2011), published by World Bank is referred in this section. The National Plan for Disaster Management used a regional climate model PRECIS for Bangladesh.

Table 4: Climate Scenario Statement

Changing Climate Conditions	Assessment	Climate Scenario Summary Statement
Precipitation Change	National Assessment[19]	Pre-monsoon rainfall will decrease while monsoon and post-monsoon rainfall will increase. From 2051 onwards, annual average rainfall and monsoon rainfall will follow a higher increasing trend.
	National Assessment[20]	There will be an increase in the amount of run-off, and rainfall intensity.
Temperature Change	National Assessment[19]	The monthly average maximum temperature will increase during the monsoon period and will decrease in other periods. The monthly average minimum temperature will increase in all periods and the annual maximum and minimum temperature will follow an increasing trend.
	National Assessment[20]	Mean temperatures across Bangladesh are projected to increase between 1.4°C and 2.4°C by 2050 and 2100, respectively.

During the stakeholder consultation, these projections were discussed in detail. The stakeholders observed that although temperature seems to be increasing over the years, the rainfall seems to be decreasing. This is also evident from the analysis of rainfall trends of previous years. The main climate risks are therefore taken as:

Climate risk 1: Increased temperature;

Climate risk 2: Decreased rainfall

5.1. Climate Impact Assessment

Climate impact assessment of urban systems helps to evaluate their fragility with respect to the identified climate impacts. These urban systems include **'Core Systems'** such as water, energy, transportation which are essential for the running of the city and **'Secondary Systems'** such as

[19] Government of Bangladesh. 2010. National Plan for Disaster Management, 2010 – 2015, Disaster Management Bureau, Disaster Management & Relief Division, Government of Bangladesh.
[20] The World Bank Group. 2011. Vulnerability, Risk Reduction and Adaptation to Climate Change. Climate Risk and Adaptation Country Profile, Bangladesh. The World Bank Group, Global Facility for Disaster Reduction and Recovery, Climate Investment Funds.

health, education, sanitation which rely on the core systems. The urban system analysis identified five fragile urban systems for Narayanganj through rigorous discussion in the SLDs:

i) Air Quality
ii) Water Quality
iii) Sanitation and Waste Water
iv) Solid Waste
v) Transportation

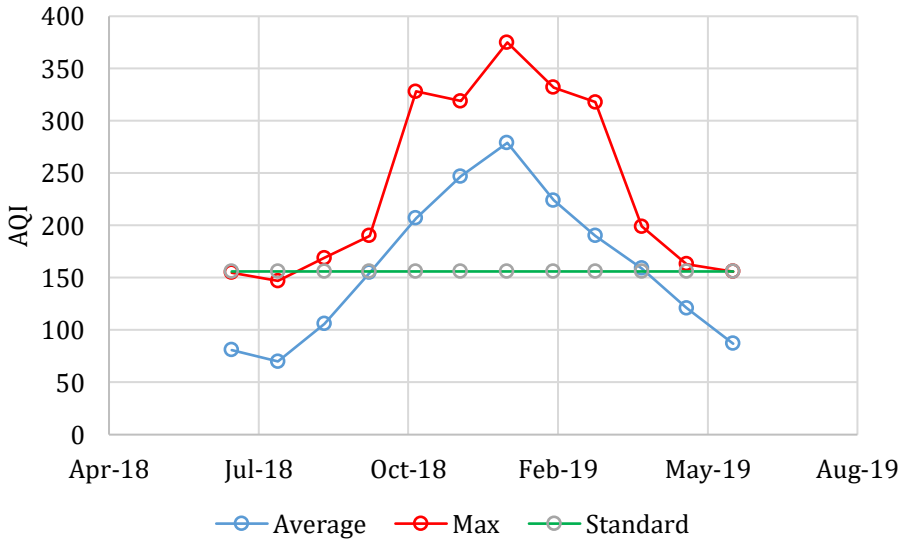
5.2. Urban Systems Analysis

5.2.1. Air Quality

Situation Analysis

Air quality is one of the most vulnerable urban system in Narayanganj City Corporation. Department of Environment (DoE) under the Ministry of Environment, Forest and Climate Change (MoEFCC) has installed one Continuous Air Monitoring Station (CAMS) in Narayanganj under Clean Air & Sustainable Environment (CASE) project supported by World Bank to monitor city air quality. The CAMS assesses harmful substances in the air like SO_2, NO_2, CO, PM10, and PM2.5 along with other meteorological parameters. The CASE project publishes monthly air quality report based on the monthly average readings of each substance and Air Quality Index (AQI) based on PM2.5 concentration in the air.

Figure 11: Annual Air Quality Index of NCC



Annual AQI data of NCC indicates that the monthly average reaches and exceeds national standard of AQI 156 in seven consecutive months during September – March. Monthly maximum concentration of PM2.5 exceeds national standard all over the year except for July.[21] The air quality throughout the year is considerably good during the monsoon, yet unhealthy in terms of international standard.

[21] http://case.doe.gov.bd/

Fragility Statement

The urban fragility statement for this system is "Being a primarily industrial city, air quality is poor, with dust and particulate matter as major pollutants from thermal power plants, cement plants, steel rolling mills, and textile mills. Lung diseases are common in slum areas".

Climate Fragility Statement

Dust and particulate matter is major pollutant in the city. Decreased precipitation can increase air pollution and cause lung diseases.

5.2.2. Water Quality

Situation Analysis

Dhaka Water Supply and Sewerage Authority (WASA) and Department of Public Health Engineering (DPHE) are working jointly for water supply and sanitation in Narayanganj. WASA operates in Narayanganj core area and in Kadamrasul (Block-01, 02, 04, 05, 06) except Siddirganj (Block-03) through pipe line. In 2013-14 fiscal year, WASA supplied 55 Million Litter per day with 16 pumping stations. At present, WASA is providing water supply services in Narayanganj City Corporation area with 31 water pumping stations and 2 water treatment plants. With the current capacity, WASA is able to supply 92.2 Million Litter water every day to 27000 out of 54012 residential units within the City Corporation area.

Until 2020, WASA had the treatment capacity of 55 MLD with the help of two local treatment plants – Godnail and Sonakanda water treatment plant. With the growing demand of water, WASA had planned to develop a 50 year master plan for Narayanganj in 2016-17 Fiscal Year. However, the progress has been stalled since NCC wanted to take over the responsibility of water supply service within its' administrative boundary. On 31st October 2019, Dhaka WASA handed over the responsibility to NCC. A total 31 deep tube-wells, 32 street hydrants, eight overhead water tanks and two water treatment plants with 160 employees were handed over to NCC.

Fragility Statement

The urban fragility statement for this system is "Supplied water from WASA plant is mainly used for non-drinking purposes, while residents rely largely on tubewell water for drinking. Indiscriminate withdrawal of water through deep tubewells is lowering the ground water level".

Climate Fragility Statement

Water source used for drinking is polluted from domestic and industrial effluents. High temperature and low rainfall can cause greater demand on water resources, and lead to greater abstraction of ground water and lowering of water table. Lower rainfall can cause greater pollution of surface water.

5.2.3. Sanitation and Waste Water

Situation Analysis

At present, there are no waste water treatment facility in NCC. As a result, household waste water is discharged directly to the river and local waterbodies. Although many houses have septic tanks, but the septage is released to the river and waterbodies when the tank is filled. A study shows that almost 80% industries in Dhaka-Narayanganj-Demra (DND) area has no large

treatment plant for effluent discharge. Due to irregular monitoring, they are releasing untreated or improperly treated waste water into the river and canals. As a result, surface water in Narayanganj is highly polluted. The Biological Oxygen Demand (BOD) values of the effluents varies from 415 to 770 mg/L and the average value is 573.89 mg/L, which is 14 to 18 times higher BOD value than the Department of Environment (DoE) standard. Again, the Chemical Oxygen Demand (COD) values of the effluents varies from 860 to 1560 mg/L and the average value was found 815 mg/L, which is around 4 to 9 times higher than the DoE standard. [22]

Fragility Statement

The urban fragility statement for this system is "Lack of facilities to collect and treat waste water is leading to release of effluents, both domestic and industrial, to the nearby river, polluting the river. Since the river water is also used for water supply in the city, it impacts health of the population".

Climate Fragility Statement

High temperature and lower rainfall can increase concentration of pollutants in water sources and cause health risks to population.

5.2.4. Solid Waste

Situation Analysis

Waste management is one of the major responsibilities of Narayanganj City Corporation. Conservancy Department under NCC is responsible for waste collection, transportation and management. According to 2013 City Corporation data, the city produces 300 tons of solid wastes everyday including 140-150 tons of industrial waste and 150-160 tons of domestic waste containing food, vegetables, fruits, polyethylene, paper and cloths. Another study by NCC states that industrial, commercial and residential wastes contribute respectively 10, 20 and 70 percent of the total amount. According to the city corporation, their efficiency in municipal waste collection is between 80-90%. At present, they are incinerating most of the collected waste. The uncollected waste remains untreated and people dump them into the landfills, ponds, canals and river. City Corporation is now planning to treat their collected waste through waste to energy and recycling interventions.

Fragility Statement

The urban fragility statement for this system is "Lack of treatment and processing facilities of waste, is leading to open dumping of waste. Lack of segregation at source is leading of mixed waste that is difficult to process".

Climate Fragility Statement

Sudden high intensity rainfall may lead to choking of drains with uncollected solid waste. This can cause waterlogging and related health impacts.

5.2.5. Transportation

Situation Analysis

[22] Impact of the Effluents of Textile Dyeing Industries on the Surface Water Quality inside D.N.D Embankment, Narayanganj; Mahfuza S. Sultana et al.

Narayanganj city is well connected with the nearby cities by road, rail and waterway. A total of 609.43 km of road connects each and every corner of Narayanganj. The roads in many part of the cities experience massive traffic load, especially due to overweight freight trucks. Poor quality of road construction materials along with heavy traffic load have resulted in pit holes and bleeding of bitumen in many parts of the road.

Fragility Statement

The urban fragility statement for this system is "Damaged roads and high pollution levels because of lack of regulatory control over vehicles".

Climate Fragility Statement

Water logging can cause major impacts on vehicle movement, cause greater air pollution and emissions, particularly from stalled vehicles. Water freight can cause water pollution in case of lower rainfall, there will be greater water pollution. High temperature is damaging road surface.

5.3. Risk Assessment

The climate risks associated with the fragilities of the systems were calculated through a risk assessment exercise conducted by the stakeholder group during the Shared Learning Dialogues (SLDs). The fragile urban systems with the highest risks as per the assessment were investigated further.

The risk score for each climate fragility statement is defined as a combination of the likelihood of occurring an event and the consequences faced if the event is occurred.

Table 5: Risk Assessment of Fragile Urban Systems

Urban Systems	Climate fragility statement	Risk Score	Risk Status
Air quality	Dust and particulate matter is major pollutant in the city. Decreased precipitation can increase air pollution and cause lung diseases.	16	High
Water quality	Water source used for drinking is polluted from domestic and industrial effluents. High temperature and low rainfall can cause greater demand on water resources, and lead to greater abstraction of ground water and lowering of water table. Lower rainfall can cause greater pollution of surface water.	20	Extreme
Sanitation/ Waste water	High temperature and lower rainfall can increase concentration of pollutants in water sources and cause health risks to population.	16	High
Solid Waste	Sudden high intensity rainfall may lead to choking of drains with uncollected solid waste. This can cause water logging and related health impacts.	9	Medium

Urban Systems	Climate fragility statement	Risk Score	Risk Status
Transport	Water logging can cause major impacts on vehicle movement, cause greater air pollution and emissions, particularly from stalled vehicles. Water freight can cause water pollution in case of lower rainfall, there will be greater water pollution. High temperature is damaging road surface.	20	Extreme

Based on this risk assessment, two fragile urban systems – water quality and transportation show extreme risk scores while air quality and sanitation and waste water show a high risk. All of these urban systems require urgent attention but water quality and transportation and air quality should be put on high priority as per the assessment of the stakeholders.

6. VULNERABILITY ASSESSMENT

6.1. Overview

In order to build resilience there is a need to understand the extent of vulnerability of the city to climate change. This vulnerability depends upon the geographical location, demography, infrastructure, socio economic condition, ecological condition of the city. The Intergovernmental Panel on Climate Change (IPCC, 2007)[23] defines vulnerability as a function of three parameters of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

The vulnerability assessment consists of identification of areas vulnerable to the identified climate risks and actors for all the prioritized climate fragility statements of the fragile urban systems and analysis of the adaptive capacities of the actors and the urban systems. Vulnerability assessment of Narayanganj city was carried out in consideration of the following elements:

1. **Identification of Vulnerable Places**: Areas that are highly vulnerable to the identified fragile urban systems of the city were identified and mapped to arrive at vulnerability hotspots affected by maximum number of fragile urban systems.

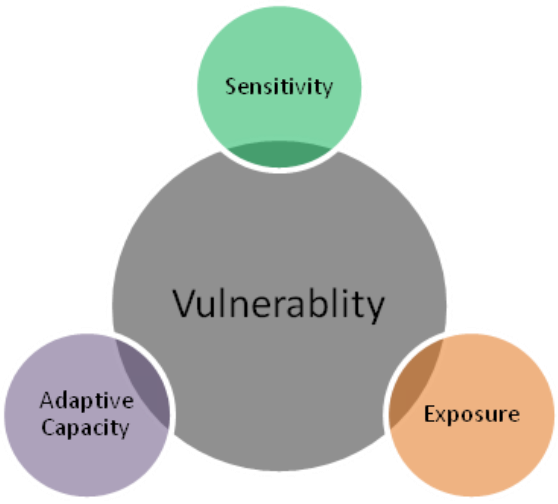


Figure 12: Vulnerability Constituents21

[23]IPCC, 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Annex I., M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK.

2. **Identification of Actors and their Adaptive Capacity:** In each of the vulnerable areas, the actors that play a critical role towards building urban resilience were identified and assessed in terms of their capacity to organize and respond to threat or disruption, access to resources necessary for response (manpower, technology, funds) and access to information necessary to develop effective plans and actions and to improve responses to disruptions. These determine the adaptive capacity/resilience of the identified actors for a particular fragile system.
3. **Assessment of Adaptive Capacities of Fragile Urban Systems**: Adaptive capacity of urban systems is its capacity to absorb and respond to shocks that determines their resilience. The adaptive capacity was determined in the context of economy, technology/infrastructure, governance, social systems and ecosystems.

The sections below identify the vulnerable areas, vulnerable actors and adaptive capacity of the fragile urban systems using the Climate Fragility Statements developed in consultation with the stakeholder group.

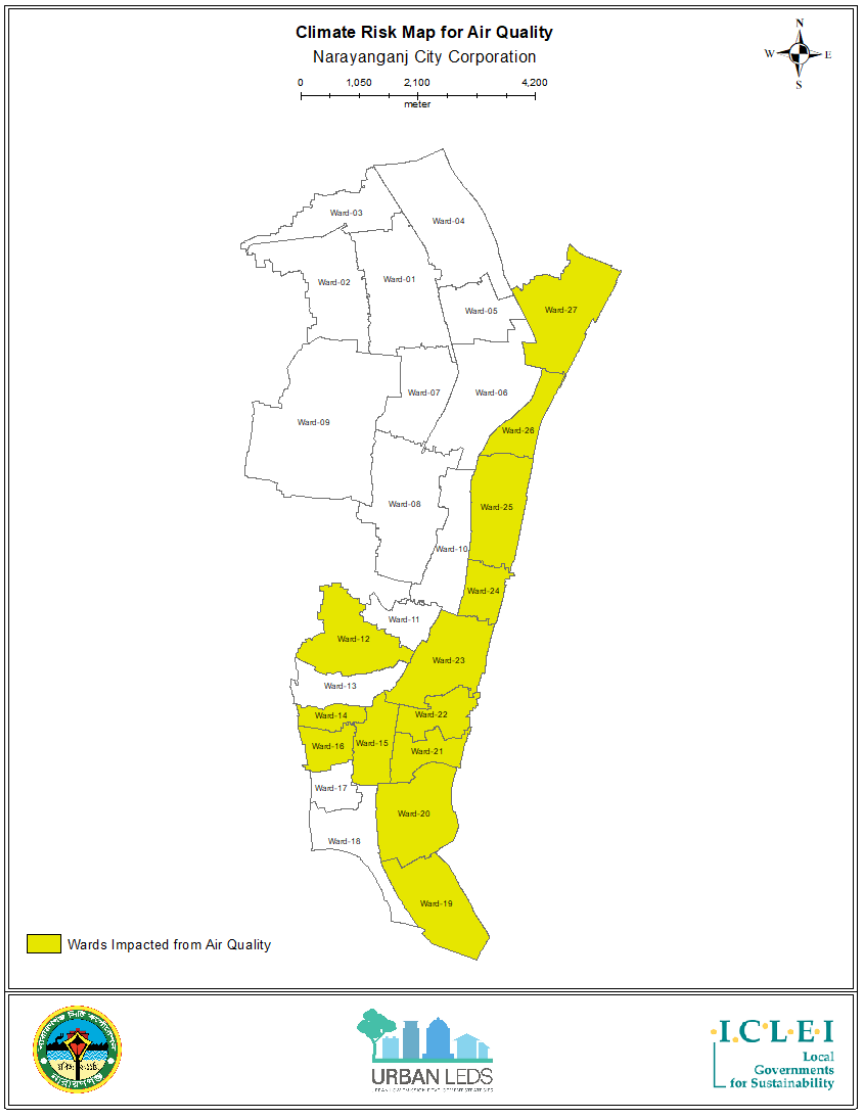
6.2. Identification of Vulnerable Places

6.2.1. Air Quality: Vulnerable Areas

Table 6: Climate Vulnerable Area for Air Quality

Climate Vulnerability Statement	Area/ Ward Most Vulnerable
Dust and particulate matter is major pollutant in the city. Decreased precipitation can increase air pollution and cause lung diseases.	• Chasara Intersection, Ward 12 – Road dust and vehicular smoke • Ward 19, 20, 21, 22, 23, 24, 25, 26, 27 – Cement Factory • Ward 15, 16, 17 – Garments • Ward 25, 26, 27 – Cotton Mills • Ward 06 – EPZ • Nitaiganj, Ward 18 – Grain Dust

Figure 13: Climate Risk Map for Air Quality

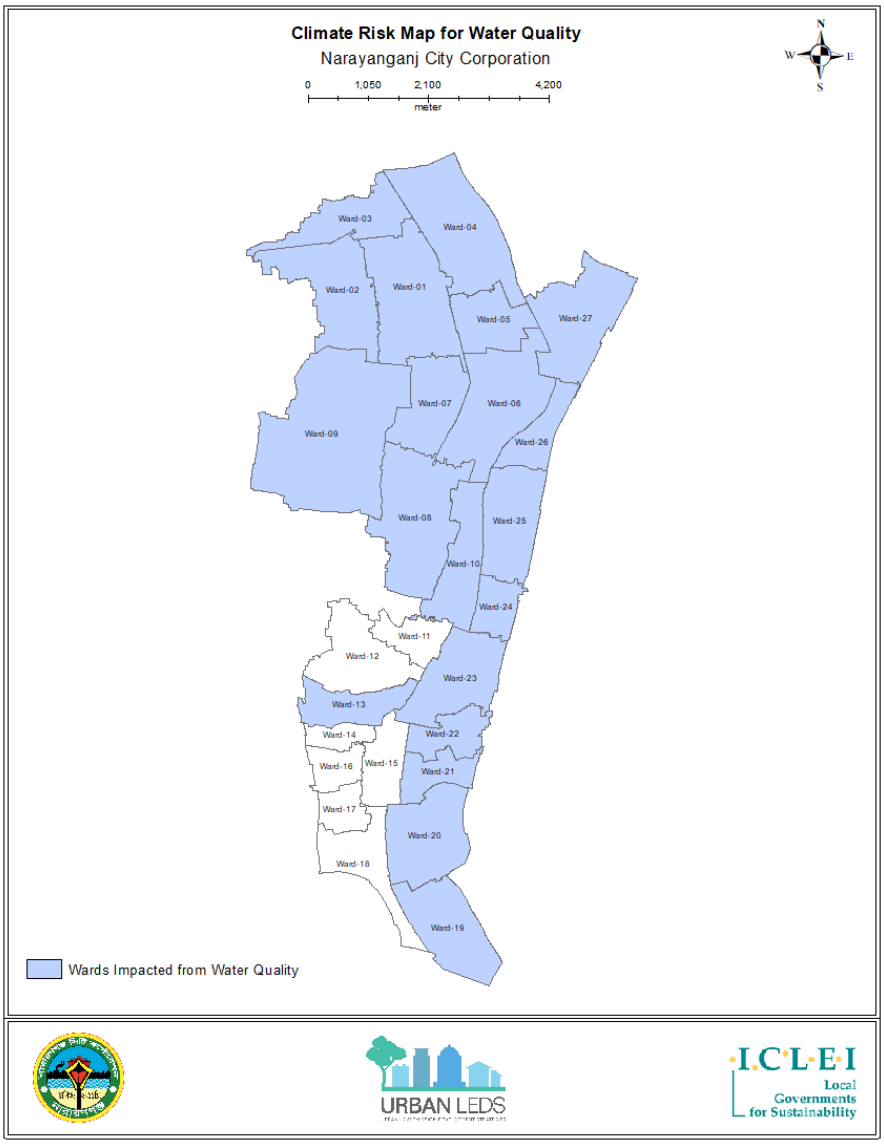


6.2.2. Water Quality: Vulnerable Areas

Table 7: Climate Vulnerable Area for Water Quality

Climate Vulnerability Statement	Area/ Ward Most Vulnerable
Water source used for drinking is polluted from domestic and industrial effluents. High temperature and low rainfall can cause greater demand on water resources, and lead to greater abstraction of ground water and lowering of water table. Lower rainfall can cause greater pollution of surface water.	• Bandar Area, Ward 19, 20, 21, 22, 23, 24, 25, 26, 27 • Siddirganj • DND Area • Ward 06, 13 – EPZ and BISIC area • Ward 08, 10 – Industrial Area

Figure 14: Climate Risk Map for Water Quality

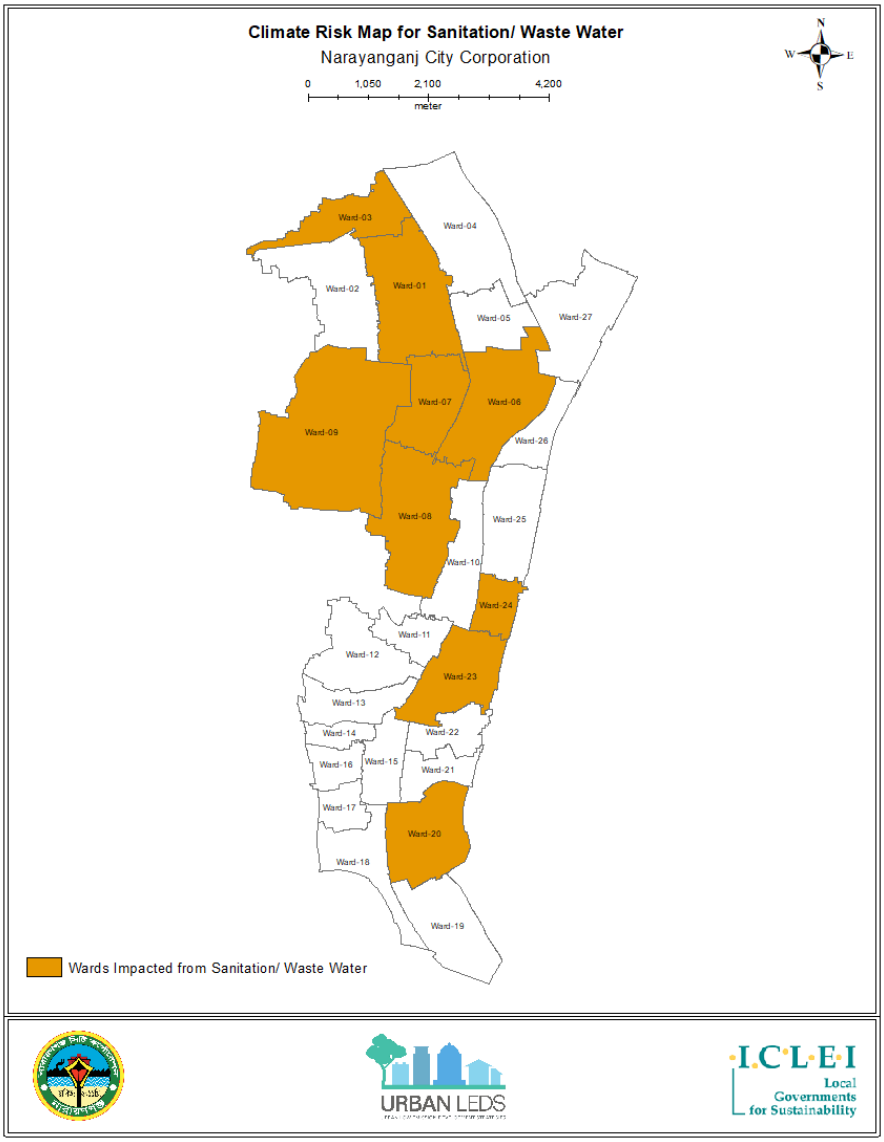


6.2.3. Sanitation and Waste Water: Vulnerable Areas

Table 8: Climate Vulnerable Area for Sanitation and Waste Water

Climate Vulnerability Statement	Area/ Ward Most Vulnerable
High temperature and lower rainfall can increase concentration of pollutants in water sources and cause health risks to population.	• Bihari Colony, Ward 06; Shantinagar, Ward 23; Ward 20 • DND Area, Ward 01, 02, 03, 07, 08, 09 – Most Severe Area • Nurbagh, Ward 18; Rasulbagh, Ward 27 – No Soak well

Figure 15: Climate Risk Map for Sanitation and Waste Water

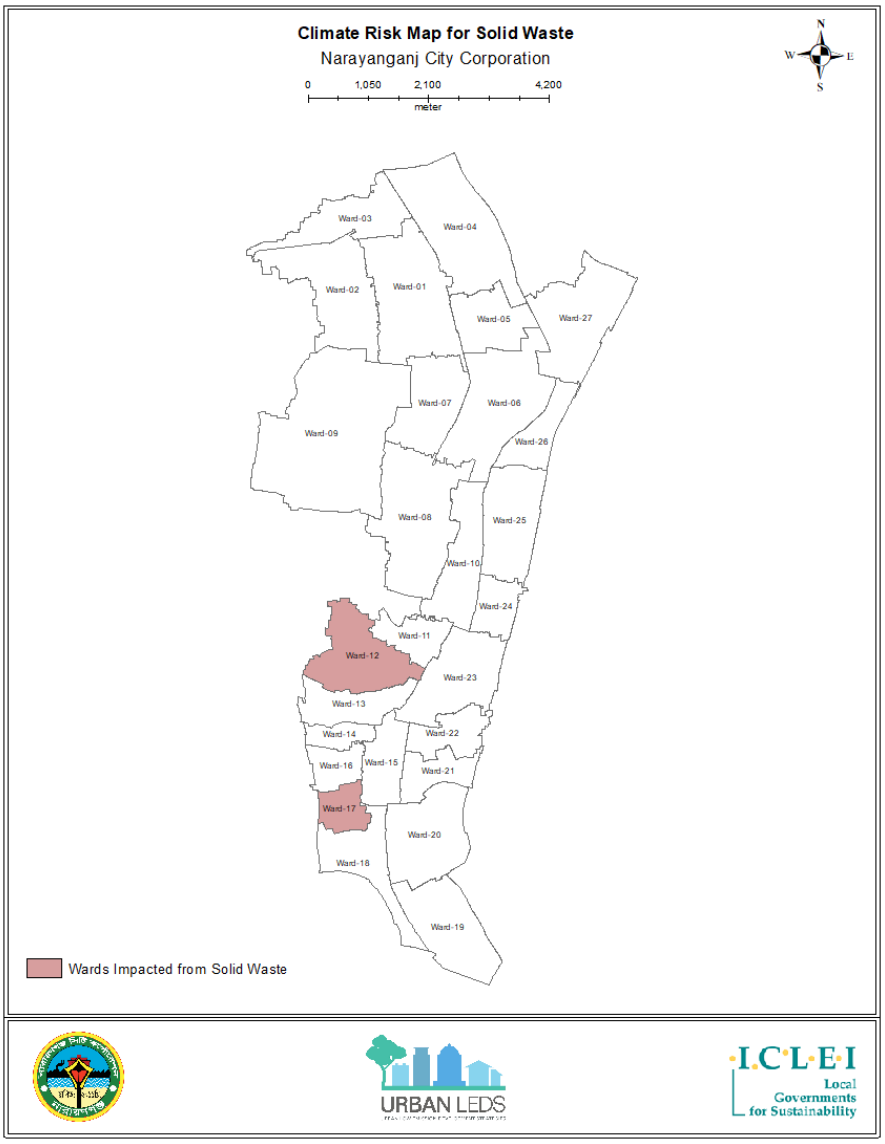


6.2.4. Solid Waste: Vulnerable Areas

Table 9: Climate Vulnerable Area for Solid Waste

Climate Vulnerability Statement	Area/ Ward Most Vulnerable
Sudden high intensity rainfall may lead to choking of drains with uncollected solid waste. This can cause water logging and related health impacts.	• Mission Para, Ward 12 – Construction Materials clogs the drain • Paikpara, Ward 17

Figure 16: Climate Risk Map for Solid Waste

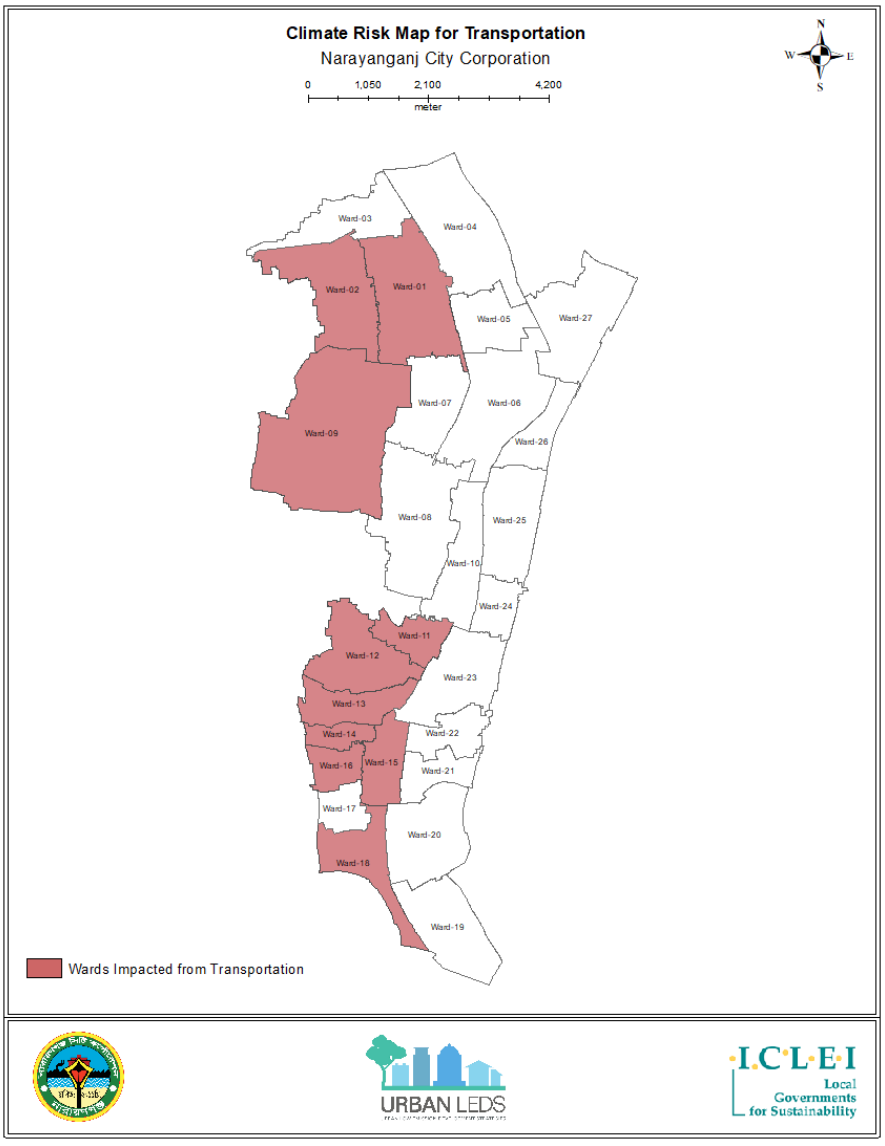


6.2.5. Transportation: Vulnerable Areas

Table 10: Climate Vulnerable Area for Transportation

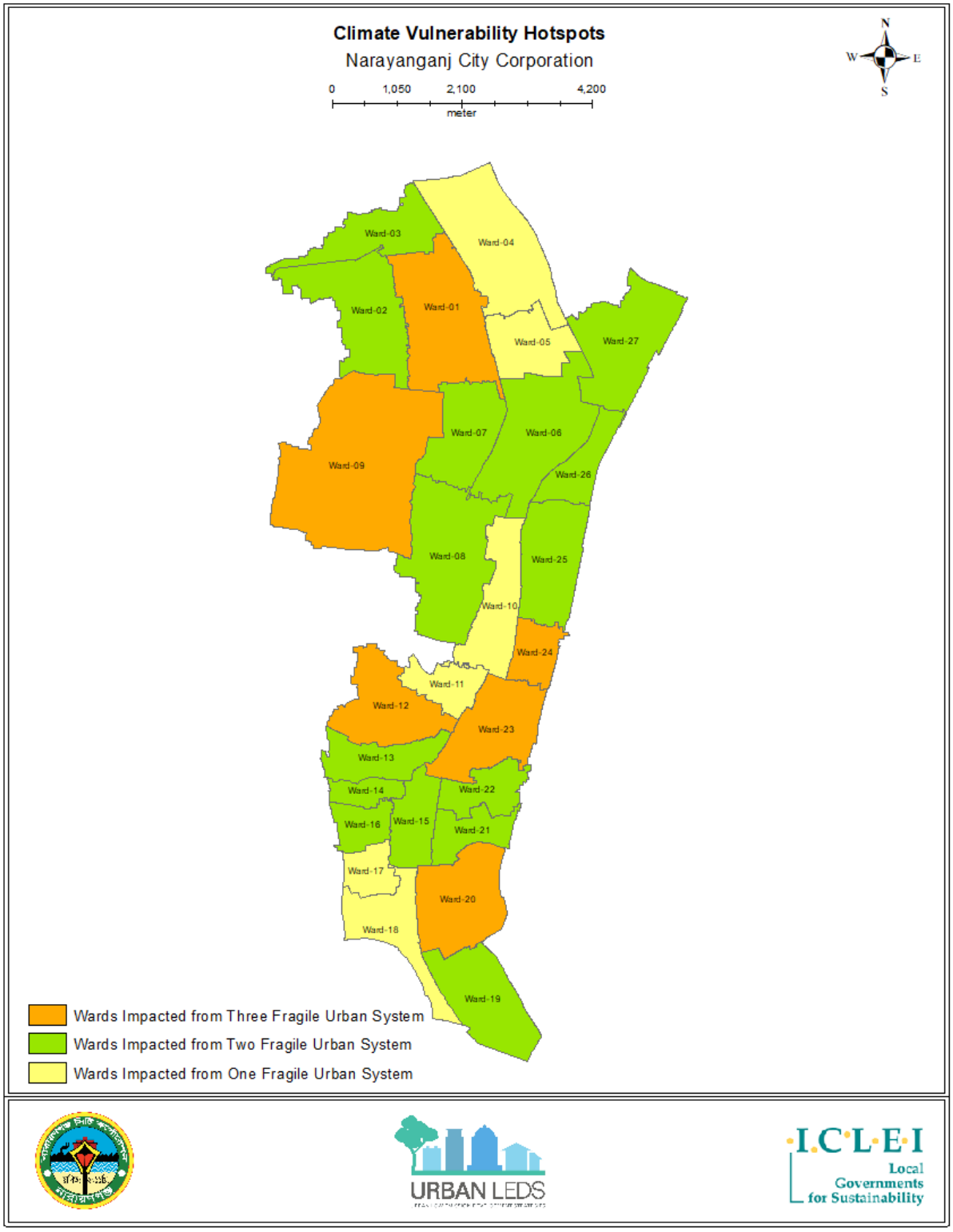
Climate Vulnerability Statement	Area/ Ward Most Vulnerable
Water logging can cause major impacts on vehicle movement, cause greater air pollution and emissions, particularly from stalled vehicles. Water freight can cause water pollution in case of lower rainfall, there will be greater water pollution. High temperature is damaging road surface.	• Signboard to Chasara, Ward 01, 02, 09, 11, 12, 13 • Ward 08, 09, 10, 14, 15, 16, 18 – Heavy Vehicular Movement • BB Road, Ward 14, 15 – Rail Crossing causes 3-4 hrs of congestion every day • 1 No Rail Gate, Ward 15; 2 No Rail Gate, Ward 14, 15; Chasara Intersection, Ward 12, 13

Figure 17: Climate Risk Map for Transportation



Through these assessment, ward 01, 09, 12, 20, 23, and 24 are found to be vulnerable from three out of five fragile urban systems. Ward 02, 03, 06, 07, 08, 13, 14, 15, 16, 19, 21, 22, 25, 26, and 27 are vulnerable from two fragile urban systems and rest of the wards are vulnerable from one fragile urban system, making them least vulnerable compared to other wards.

Figure 18: Climate Vulnerability Hotspots for NCC



6.3. Identification of Actors and their Adaptive Capacity

An analysis of the actors within the wards identified as vulnerable revealed that they had very poor levels of adaptive capacities. The NCC has high adaptive capacity since they have access to resources, information and ability to respond to stress. This is also true for government agencies like RAJUK, DoE or the non-government organisations. However, common citizens including daily labourers, women, children, elderly, and others due to either a lack of information and education, or a lack of financial resources lack the capacity to adequately respond to stress and therefore have low adaptive capacity. Table 11 shows the adaptive capacities of the actors for each fragile urban system.

Table 11: Analysis of the adaptive capacities of local actors identified

Fragile Urban System	Climate Fragility Statements	Most Vulnerable Area/ward	Actors	Level of Adaptive Capacity
Air quality	Dust and particulate matter is major pollutant in the city. Decreased precipitation can increase air pollution and cause lung diseases.	• 15 - Kitchen market; • 12 - Chashara more; • Bandar 19-24, 14, 15, 16 – • Garments; 25, 26, 27 - • Cotton factory; 18- Nitaiganj	Residents	Medium
			Children	Low
			Elderly	Low
			Women	Low
			Slum dwellers	Medium
			Daily labors	Low
			Factory workers	Medium
			Industry owners	High
			NCC	High
			City Development Coordination Committee (CDCC)	High
			CSCC	High
			Policy makers	High
			DoE	High
			NGOs/CBOs	High
			School/College	Medium
			RAJUK	High
			Religious leaders	Medium
			Community leaders	Medium
			Media	High
			Garment industry	High
			Cotton industry	Medium
Water quality	Water source used for drinking is polluted from domestic and industrial effluents. High temperature and low rainfall can cause	• Bandar - 19-27, Siddirganj; • DND area • Ward 13;	Residents	Medium
			Children	Low
			Elderly	Low
			Women	Low
			Slum dwellers	Medium

Fragile Urban System	Climate Fragility Statements	Most Vulnerable Area/ward	Actors	Level of Adaptive Capacity
	greater demand on water resources, and lead to greater abstraction of ground water and lowering of water table. Lower rainfall can cause greater pollution of surface water.	• Ward 6 – EPZ; • Ward 10,8 - Garments industry abstracts water	Industry owners	High
			Water Development Board	High
			NCC	High
			City Development Coordination Committee (CDCC)	High
			CSCC	High
			Policy makers	High
			DoE	High
			NGOs/CBOs	
			RAJUK	High
			School/College	Medium
			Religious leaders	Medium
			Community leaders	Medium
			Media	High
			WASA	High
			Garment industry	High
Sanitation and waste water	High temperature and lower rainfall can increase concentration of pollutants in water sources and cause health risks to population.	• 1, 3, 7, 8, 9 - DND area; • 6 - Bihari Colony; • 20, 23, 24- Selapara, Master para; • 20 - Hazipur, Bagbari; • 23 - Rasulbag, Shantinagar, Noorbag, Charshomil para	Residents	Medium
			Children	Low
			Elderly	Low
			Women	Low
			Slum dwellers	Medium
			Daily labors	Low
			Factory workers	Medium
			Water Development Board	High
			NCC	High
			City Development Coordination Committee (CDCC)	High
			CSCC	High
			Policy makers	High
			DoE	High
			NGOs	High
			CBOs	High

Fragile Urban System	Climate Fragility Statements	Most Vulnerable Area/ward	Actors	Level of Adaptive Capacity
			School/College	Medium
			Religious leaders	Medium
			Community leaders	Medium
			Media	High
			Industry owners	High
Solid waste	Sudden high intensity rainfall may lead to choking of drains with uncollected solid waste. This can cause water logging and related health impacts	• Mission Para, Ward 12 – Constructio n Materials clogs the drain • Paikpara, Ward 17	Residents	Medium
			Children	Low
			Elderly	Low
			Women	Low
			Slum dwellers	Medium
			NCC	High
			City Development Coordination Committee (CDCC)	High
			CSCC	High
			Policy makers	High
			DoE	High
			NGOs	High
			CBOs	High
			School/College	Medium
			Religious leaders	Medium
			Community leaders	Medium
			Media	High
Transport	Water logging can cause major impacts on vehicle movement, cause greater air pollution and emissions, particularly from stalled vehicles. Water freight can cause water pollution in case of lower rainfall, there will be greater water pollution. High temperature is damaging road surface.	• Signboard to Chasara, Ward 01, 02, 09, 11, 12, 13 • Ward 08, 09, 10, 14, 15, 16, 18 – Heavy Vehicular Movement • BB Road, Ward 14, 15 – Rail Crossing	Residents	Medium
			Children	Low
			Elderly	Low
			Women	Low
			Roads and Highway Department	High
			Daily labors	Low
			Traffic police	High
			Rickshaw pullers	Low
			NCC	High
			City Development Coordination	High

Fragile Urban System	Climate Fragility Statements	Most Vulnerable Area/ward	Actors	Level of Adaptive Capacity
		causes 3-4 hrs of congestion every day • 1 No Rail Gate, Ward 15; 2 No Rail Gate, Ward 14, 15; Chasara Intersection, Ward 12, 13	Committee (CDCC)	
			CSCC	High
			Policy makers	High
			RAJUK	High
			NGOs	High
			CBOs	High
			BRTA	High
			Media	High

6.4. Adaptive Capacity of Fragile Urban Systems

The adaptive capacities of the five fragile urban systems were assessed during the SLDs against the five parameters of economy, technology, governance, societal and ecosystem services (Table 12).

Several of the systems have medium economic adaptive capacity, since there is funding available for action, however, technological limitations in a majority of the systems indicate a need to look for and identify suitable means of climate action in these systems. Governance and societal adaptive capacity is also low in all fragile urban systems and need supportive policy measures.

Table 12: Consolidated vulnerability analysis of Fragile Urban Systems identified for Narayanganj city

Fragile Urban System	Climate Fragility Statements	Vulnerable Areas	Urban Actors		Adaptive Capacity of the System		
			Vulnerable	Potential Supporting	Low	Medium	High
Air quality	Dust and particulate matter is major pollutant in the city. Decreased precipitation can increase air pollution and cause lung diseases.	• 15 - Kitchen market; • 12 - Chashara more; • Bandar 19-24, 14, 15, 16 – • Garments; 25, 26, 27 - • Cotton factory; 18- Nitaiganj	- Residents - Children - Elderly - Women - Slum dwellers - Daily labors - Factory workers	- Industry owners - NCC - CDCC - CSCC - Policy makers - DoE - NGOs/CBOs - School/College - RAJUK - Religious leaders - Community leaders - Media - Garment industry - Cotton industry	- Technology - Governance - Societal - Ecosystem Services	- Economic	

Fragile Urban System	Climate Fragility Statements	Vulnerable Areas	Urban Actors		Adaptive Capacity of the System		
			Vulnerable	Potential Supporting	Low	Medium	High
Water quality	Water source used for drinking is polluted from domestic and industrial effluents. High temperature and low rainfall can cause greater demand on water resources, and lead to greater abstraction of ground water and lowering of water table. Lower rainfall can cause greater pollution of surface water.	• Bandar - 19-27, Siddirganj; • DND area • Ward 13; • Ward 6 – EPZ; • Ward 10,8 - Garments industry abstracts water	- Residents - Children - Elderly - Women - Slum dwellers	- Industry owners - Water Development Board - NCC - CDCC - CSCC - Policy makers - DoE - NGOs/CBOs - RAJUK - Scholl/College - Religious leaders - Community leaders - Media - WASA - Garment industry	- Governance - Societal - Ecosystem Services	- Economic - Technology	

Fragile Urban System	Climate Fragility Statements	Vulnerable Areas	Urban Actors		Adaptive Capacity of the System		
			Vulnerable	Potential Supporting	Low	Medium	High
Sanitation and waste water	High temperature and lower rainfall can cause greater pollution of water sources and health risks to population.	• 1, 3, 7, 8, 9 - DND area; • 6 - Bihari Colony; • 20, 23, 24- Selapara, Master para; • 20 - Hazipur, Bagbari; • 23 - Rasulbag, Shantinagar, Noorbag, Charshomil para	- Residents - Children - Elderly - Women - Slum dwellers - Daily labors - Factory workers	- Water Development Board - NCC - CDCC - CSCC - Policy makers - DoE - NGOs/CBOs - School/College - Religious leaders - Community leaders - Media - Police - Industry owner	- Technology - Governance - Societal - Ecosystem Services	- Economic	

Fragile Urban System	Climate Fragility Statements	Vulnerable Areas	Urban Actors		Adaptive Capacity of the System		
			Vulnerable	Potential Supporting	Low	Medium	High
Solid waste	Sudden high intensity rainfall may lead to choking of drains due to uncollected solid waste. This can cause water logging and related health impacts.	• Mission Para, Ward 12 – Construction Materials clogs the drain • Paikpara, Ward 17	- Residents - Children - Elderly - Women - Slum dweller	- NCC - CDCC - CSCC - Policy makers - DoE - NGOs/CBOs - School/College - Religious leaders - Community leaders - Media	- Societal - Ecosystem Services	- Economic - Technological - Governance	
Transport	Water logging can cause major impacts on vehicle movement, cause greater air pollution and emissions, particularly from stalled vehicles. Water freight can cause water pollution in case of lower rainfall, there will be greater water pollution. High temperature is damaging road surface.	• Signboard to Chasara, Ward 01, 02, 09, 11, 12, 13 • Ward 08, 09, 10, 14, 15, 16, 18 – Heavy Vehicular Movement • BB Road, Ward 14, 15 – Rail	- Residents - Children - Elderly - Women - Rickshaw pullers - Daily labors	- Roads and Highways Department - Traffic police - NCC - CDCC - CSCC - Policy makers - RAJUK - NGOs/CBOs - BRTA - Media	- Economic - Technological - Governance - Societal - Ecosystem Services		

Fragile Urban System	Climate Fragility Statements	Vulnerable Areas	Urban Actors		Adaptive Capacity of the System		
			Vulnerable	Potential Supporting	Low	Medium	High
		Crossing causes 3-4 hrs of congestion every day • 1 No Rail Gate, Ward 15; • 2 No Rail Gate, Ward 14, 15; • Chasara Intersection, Ward 12, 13					

Annex I

List of Climate Core Committee in NCC

Annexure I: Climate Core Committee for Narayanganj City Corporation

Project: Accelerating Climate Action Through the Promotion of Urban Low Emission Development Strategies (Urban LEDS II)

Sl. No	Name	Organization	Designation	Contact Details
01.	A. F. M. Ehteshamul Hoque (Chairperson)	Narayanganj City Corporation	Chief Executive Officer	ceo@ncc.gov.bd +880 1924 782900
02.	Md. Moinul Islam (Focal Person)	Narayanganj City Corporation	Urban Planner	townplanning@ncc.gov.bd +880 1913 910393
03.	Md. Asgor Hossain (Member)	Narayanganj City Corporation	Executive Engineer	asgor_babul@yahoo.com +880 1816 016924
04.	Dr. Sheikh Mostofa Ali (Member)	Narayanganj City Corporation	Medical Officer	dr.mostofaali81@gmail.com +880 1673 986947
05.	Md. Alamgir Heron (Member)	Narayanganj City Corporation	Conservancy Officer	conservancy@ncc.gov.bd +880 1924 460520
06.	Md. Rashed Mollah (Member)	Narayanganj City Corporation	Sub-Assistant Engineer (Mechanical)	rashedmollah21@gmail.com +880 1717174488
07.	Md. Rezaul Islam (Member)	Narayanganj City Corporation	Assistant Engineer (Electrical)	engr.raju_elec@yahoo.com +880 1675 289750
08.	Mr. Asit Baran Biswas (Member)	Narayanganj City Corporation	Ward 15 Councilor	councillorasit@gmail.com +88-01818458789

পরিকল্পনাবিদ মোঃ মঈনুল ইসলাম
নগর পরিকল্পনাবিদ
নারায়ণগঞ্জ সিটি কর্পোরেশন

A.F.M. Ehteshamul Hoque
Chief Executive Officer
Narayanganj City Corporation

Annex II

Attendance sheet for 1st SLD

UN HABITAT FOR A BETTER URBAN FUTURE — URBAN LEDS — ICLEI Local Governments for Sustainability

Urban LEDS II – Shared Learning Dialogue (SLD)

07th August 2019 (10:00 am – 05:00 pm)
Conference Hall, Narayanganj City Corporation, Narayanganj

Sl. No.	Name	Designation and Name of Organization	Contact	Signature
1.	Md. Mazharul Islam	Station officer, Fire service & civil defence, Narayanganj	01912-620041	
2.	Md. Badrul Alam.	Assistan Engineer Education Engineering Department Narayanganj Zone.	01711463171	
3.	Syed Aynul Huda Chowdhury	Assistant Director(Engg.) BRTA, Narayanganj Circle	01911938335	
4.	Dr. Shaikh Mostofa Ali	Medical officer Narayangonj city Corp.	01673985947 dr.mostofaali51@gmail.com	
5.	MD. ASADUZZAMAN	Consultant, Upazila Integrated Capacity Development Project, LGD/JICA.	01716440440. m.a@outlook.ie	MD. Asaduzzaman.
6.	Asit Baran Biswas	Councillor	01918358589 councillorasit@gmail.com	

UN HABITAT FOR A BETTER URBAN FUTURE — URBAN LEDS — ICLEI Local Governments for Sustainability

Sl. No.	Name	Designation and Name of Organization	Contact	Signature
7.	K M Abul Bashar	GM Expert, UNDP	01796583456	
8.	ASMAUL HUSNA	Gender Consultant, NCC	01916 186601	
9.	Md. Khaled Hossain	JUPP-CGP-NCC	01819461692	Khaled.
10.	Md. Rashed Molla	SAE(M). NCC	01717-174488	07/08/19
11.	MD. JUBAER RASHID	MANAGER ICLE SA	01819866766	
12.	Syed Aynul Huda Chowdhury	Assistant Director(Engg.)	01911938335	
13.	planner Md. Moinul Islam	Urban Planner Narayanganj City Corporation	01913-910393	
14.	Md. Mizanur Rahman	Managing Director, Megha Organic operator- Jaiba Gas Factory	0172-4740113	
15.	MD REZAUL ISLAM (RAZU)	Assistant Engineer (Elec) Narayanganj city Corporation	01675289450	

UN HABITAT FOR A BETTER URBAN FUTURE

URBAN LEDS

ICLEI Local Governments for Sustainability

Sl. No.	Name	Designation and Name of Organization	Contact	Signature
16.	SALEK MAHMOD	Superintending Engineer DPDC	01730335165	Salek
17.	Mohammad Nuruzzaman	Architect Nirman Upadeshta	01819284467	
18.				
19.				
20.				
21.				
22.				
23.				
24.				

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Photographs of 1st SLD

Attendance Sheet for 2nd SLD

UN-HABITAT FOR A BETTER URBAN FUTURE

URBAN LEDS

ICLEI Local Governments for Sustainability

Urban LEDS II – Shared Learning Dialogue (SLD)

26th February 2020 (10:00 am – 03:00 pm)
Conference Hall, Narayanganj City Corporation, Narayanganj

Sl. No.	Name	Designation and Name of Organization	Contact (Cell & Email)	Signature
1.	Md. Mizanur Rahman	Managing Director Megha Organic Bangladesh	01996-175566 meghagroupbd@gmail.com	26/02/2020
2.	Md. Sayeed Anwar	Deputy Director (DD), DOE Dept. of Environment	01712-562164 sayeed_315@yahoo.com	26/02/2020
3.	Hedaet Ullah	Assistant GIS Analyst Rajdhani Unnayan Kartripakkha (RAJUK)	01914-731420 niloy.jugeo@gmail.com	26/02/2020
4.	Md. Rezaul Islam (Raju)	Assistant Engineer (Elec) Narayanganj City Corporation.	01675289750 engr.raju_elec@yahoo.com	26.2.20
5.	MD. ABUL AMIN	CEO, N. Gonj city corp.	abul.amin77@gmail.com	26.02.2020
6.	পরিকল্পনাবিদ মোঃ মইনুল ইসলাম	নগর পরিকল্পনাবিদ, নারায়ণগঞ্জ সিটি কর্পোরেশন	moin-planning@yahoo.com	
7.	[illegible]	CHDF-[illegible], LIUPC/NCC	01677042874	
8.	K M Abul Bashar	GME, UNDP	01796583456	
9.	Md. Shahadat Hossain	SI, NCC	01994742564	
10.	Md. Rashed Molla	SAE (M); NCC	01717174488	26.02.2020
11.	MD. JUBAER RASHID	MANAGER – ICLEI Bangladesh operations	01819866766	
12.	Nikhil Kolsepatil	Manager, Energy & Climate ICLEI South Asia	8585973062	
13.	K H MILON	JUGER CHINTA	01711 355 330	
14.	Md. Alamgir Haron	Conservancy officer	01924460520 haronheathner@gmail.com	
15.	Shyamal Paul	Conservancy Inspector	01685772977	25.02.20

UN HABITAT FOR A BETTER URBAN FUTURE

URBAN LEDS

ICLEI Local Governments for Sustainability

Sl. No.	Name	Designation and Name of Organization	Contact (Cell & Email)	Signature
16.	Md. Junaed Hassan Nazmul.	Assistant Engineer, DPDC Narayanganj (East)	01521215716	
17.	Asmaul Husna	Gender Consultant (NCC)	01916186601	
18.	Tapas Saha	Photo Journalist	01711164065	
19.			01711159108	
20.	MD. MOKTER HOSSAIN	Asstt Revenue officers BRTA	01711640980	26.02.20
21.	Asit Baran Biswas	Councillor, D.C.C	01818458787	26.02.2020
22.	Mohammad Nuruzzaman	Architect, Nirman Upodeshta	01819284467	
23.	Shamima Akter	Journalist, Dhaka Tribune	01777226019	
24.	Mostahidul Alam	Project Officer ICLEI-SA		

Photographs of 2nd SLD