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WATER SUPPLY FOR NEWLY INCLUDED EIGHTEEN WARDS IN DHAKA NORTH CITY CORPORATION: AN INTROSPECTION

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ABSTRACT
Dhaka, the capital of Bangladesh and a city with 20 million inhabitants, faces numerous challenges such as water logging, ground water depletion, inadequate sanitation, polluted river water, unplanned urban development, and the existence of large slums where more than one third of its population lives. Residents of Dhaka enjoy one of the lowest water tariffs in the world, which limits the utility's capacity to invest. The utility in charge of water and sanitation in Dhaka, DWASA, addresses these challenges. By this way, operating costs are more than covered, and a reduction of water losses from 53% in 2003 to 29% in 2010. For these achievements DWASA, got a "Performer of the Year Award" at the Global Water Summit 2011 in Berlin. The award selection was made by participants based on presentations by the managers of seven invited utilities from Algeria, Bangladesh, Brazil, Poland, Romania and the United States. In the future DWASA plans massive investment to replace dwindling groundwater resources with treated surface water from less polluted rivers located up to 160 km from the city. In 2011 Bangladesh's capital development authority, Rajdhani Unnayan Kartripakkha (RAJUK), made rainwater harvesting for new houses mandatory in an effort to address water scarcity and reduce flooding. The inclusion of Eighteen wards in DNCC aims to improve the availability, safe and quality of water in a sustainable way. There are number of studies found, where the water supply in Dhaka City areas are considered as main focus. This study found the gap of water supply in DNCC after Eighteen wards were included in the corporation.

Keywords:DNCC (Dhaka North City Corporation) DWASA (Dhaka Water and Sewerage Authority) Ground Water (GW), Surface Water (SW) Environment Management Plan (EMP).

INTRODUCTION
Bangladesh has made rapid social and economic progress in recent decades, reaching middle-income status by 2021. Gross domestic product (GDP) growth averaged close to 6 percent annually since 2000 and, according to official estimates, accelerated to over 8 percent in FY19. But the overall environmental condition of Dhaka is increasingly reaching a critical situation which is mainly due to a very dense population with high growth rates, and limited water distribution coverage for the city. On the other hand, Bangladesh is already committed to improving the water and sanitation scenario of its urban settlements. This commitment is further reinforced due to its policy of achieving Millennium Development Goals (MDG). This project aims to achieve these goals in the context of water supply in project area. This includes determination of a phased implementation plan identifying the resources required to provide adequate water supply for designated area.

1.1 Project Location and Description
Dhaka
Dhaka, the capital city of Bangladesh, is the center of all development activities. Total area of the city is 306.38 square kilometers and its total population is about 8.9 million increasing at an annual rate of 4.2% per year, one of the highest rates amongst Asian cities. According to World Urbanization Prospects 2014 published by the United Nations, in respect of population of Dhaka is now the 11th largest megacity. It also forecasts that Dhaka will be the 6th largest megacity of the world with a population of 27.37 million in 2030. Dhaka city is mainly divided into two city corporation area, Dhaka North &South City Corporations. And Eastern and Northern Fringe areas, bounded by the rivers Buriganga, Turag, Balu, the Tongi Khal, and Sitalakhay shown in figure 1-1.
Dhaka is the financial, commercial and the entertainment capital of Bangladesh, and accounts for up to 35% of Bangladesh's economy. Since its establishment as a modern capital city the population, area, social and economic diversity of Dhaka have grown tremendously. The literacy rate of the city is 74.6% in 2011.The

city is now one of the most densely industrialized regions in Bangladesh. A large number of Dhaka its work in the household or unorganized labor, while a substantial portion (approximately 800,000) work in the textile industry, as garments. Approximately 23% of the population was unemployed according to data from 2013, with an estimated 34% of households living below the poverty line.1

The urban zone is increasing due to inclusion of fringe area of the Dhaka metropolitan area to city corporation facilities. On 2016, Dhaka North City Corporation included 8 x union (Horirumpur, Uttar Khan, Dakshin Khan, Dumni, Badda, Beraid, Vatara, Satarkul) and extended their service area. Where rural to urban transect, semi urban areas are dominating and rapid increase of urbanization is taking place.

[1]https://en.wikipedia.org/wiki/Dhaka

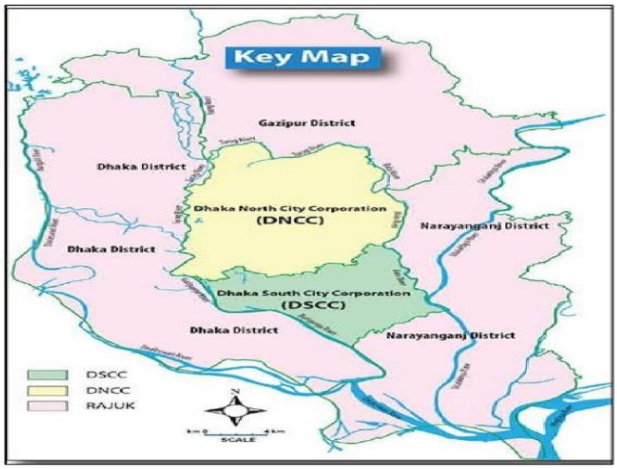

Figure 1-1: Map of Dhaka City

1.1.1 Proposed Project Area

The proposed project area will be part of Dhaka North City Corporation's(DNCC) newly included 18x wards. It is north-eastern side of the Dhaka city. Total area of DNCC is 197.22 square kilometers. Before 2016 the area only 82.64 square kilometers. With the new inclusion of 8x union (Horirumpur, Uttar Khan, Dakshin Khan, Dumni, Badda, Beraid, Vatara, Satarkul) DNCC added new 18 x wards in their administrative boundary (Fig1-2). Total area increase 114.58 square kilometer. DNCC already started developing road networks , drainage system and other city facilities in those sub urban area. Project started 2020 and will be finish by 2022.

On 2014 Dhaka WASA prepared their master plan for Dhaka to supply water aiming the demand up to 2035. DWASA identified 10 (Ten) service zone for Dhaka . Project area falls into MODS zone VIII ,IX and part of zone X (Fig 1-3). Project area is part of limited water distribution coverage area od Dhaka WASA. Water is supplied from deep tube well. Water quality and quantity are also important factors as 75% of GW uses for supply and the groundwater level has dropped about 20m over the last seven years at a rate of 2.81m per year. Project area need early attention due to rapid urbanization and inclusions of new wards which will require basic civic facilities. As DNCC working on road development and drainage system, side by side water supply, operation and management is prime requirement is this area. Here sustainable, reliable and climate-resilient water supply is require to build a sustainable city.

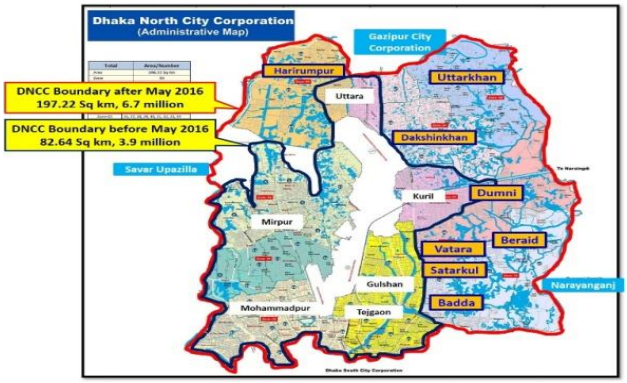

Figure 1-2: DNCC Area Map

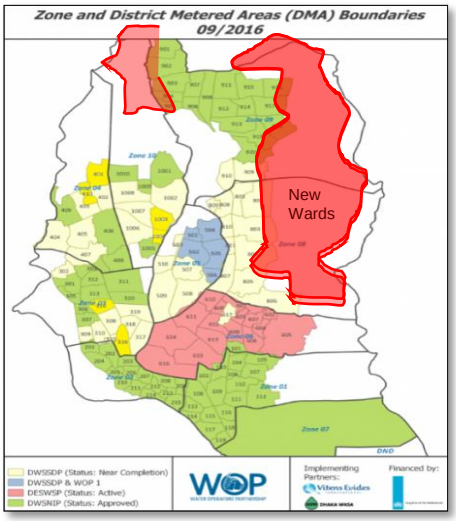

Figure 1-3: DWASA Zone Map

Socio- Economic Setup

Project area consist part of developed, most of the developing and fringe area of Dhaka city. A study shows projected population of union will pass present urban zone. Table 1-1Three sectors, viz. the public, private, and individual household sectors, are responsible for all of the land developments in project area. In recent years, property development has proliferated in both wetlands and agricultural areas without any consideration of the concomitant environmental costs. In addition, individual households have started to develop the peripheral areas. Land speculation influenced the development of suburban areas, increasing land prices and growing demand for housing. Lowlands and agricultural areas in the fringe zone are rapidly becoming built up by the individual and property developers.

Table1-1: Projected population of New Wards by 2030

Bhatara Union			Ward 19: Gulshan		
1 Storey Building	7,767	57%	1 Storey Building	78	2%
2-4 Storey Building	5,010	37%	2-4 Storey Building	1,853	43%
5-6 Storey Building	490	4%	5-6 Storey Building	895	21%
Over 6 Storey Building	412	3%	Over 6 Storey Building	1,440	34%
	13,679			4,266	
Bhatara Union			**Ward 19: Gulshan**		
Population 2010	43,002		Population 2010	187,046	
Population 2030	454,221		Population 2030	325,704	

1.2 Proposed Project Objective

The project aims to improve the availability, quality, safe and affordability of water in a sustainable way. Also ensure 24 hours pressurized water supply to all including low income community (LICs). This will also suggest the augment the ground water sources with surface water and improve parts of the distribution networks.

1.3 Impact, Outcome and Outputs

The project impact will be safe drinking water made available for new 18 wards urban population. The outcome will be sustainable provision of more reliable, improved, and climate- resilient water supply in project area ensured.

1.4 The outputs will be DWASA's (i) distribution network strengthened; (ii) sustainable DMA management capacity enhanced; and (iii) capacity for quality service delivery enhanced.

DESCRIPTION OF THE STUDY

2.1 Need for the Study

The water supply situation is characterized by the significant number of deep tube wells. This area is also regarded as low quality and somewhere inadequately sized water pipes, low workmanship, low operating pressures, inaccurate and inadequate data about location of pipes and service connections, and inaccurate and inadequate data about location of other utility lines. The existing system has a total pipe length about 94.82 km out of total 182.54 km road. The storage and distribution network is insufficient and old to meet even present requirements. To meet future requirement improvement and rehabilitation in the water supply system has been identified asa major priority for new 18 wards of DNCC.

2.2 Sub Project Components

The project includes (i) rehabilitation of about 94.82 km distribution network under zone 8,9 &10 ; (ii) Construction, regeneration of all DTWs;(iii) service connections including installations of meter chamber, domestic meters and floating valve; and (iv) installations of valves, bulk meters and loggers, etc. For efficient and effective execution, the project will be implemented through a design built contract, i.e. the civil works contractors will also prepare the detail designs. The main activities (the works) of the project will comprise the following steps:

a) Survey;
b) Resettlement plan implementation;
c) Design comprising of (a) detailed survey of area (location of water pipes, service connections, valves, tube wells, bulk meters, and other utility lines); (b) detailed network modeling of areas and updating of basic model (outline design) with additional information obtained from survey;
d) Pipe works comprising of (a) Improvement of Distribution Network, establishment of DMAs; (b) installation of bulk meters, valves etc. and construction of DM chambers. (c) rehabilitation or replacement of existing pipes network design; extension of network to areas not adequately served; and (e) pre-commissioning and commissioning of DMAs.
e) Design and installation of SCADA (compatible with the WSD SCADA) Installation of electro- magnetic flow meters and connection to SCADA
f) Operation and Maintenance of the District Metered Areas (DMAs) including flow recording, monitoring and assessment of Water Loss on a regular basis.

2.3 Ecological Resources

The ecological component generally refers to flora and fauna, their present status, description and habitats. The status of the flora and fauna of the study area (both terrestrial and aquatic environments) was determined by:

a. Reconnaissance survey of DNCC and surrounding area.
b. Interviews and discussion with local informants.
c. Through different secondary sources.

2.4 Water Quality

a.Surface Water Quality.

The quality of the surface water surrounding Dhaka is poor. Untreated discharge of industrial and municipal effluents into the rivers, swamps, and natural channels causes water pollution.

b.Ground Water Quality. It has been recorded that Dhaka city's ground water has been depleting in the past decade. The groundwater from the Dupa Tila Aquifer, located in the Madhupur Tract has a chemistry of calcium-bicarbonate to sodium-bicarbonate. It has less than 350 mg/l of total dissolved solids and is oxygenated, making its pH slightly acidic. These baseline conditions of groundwater in the Dupi Tila

aquifer have since then been altered by the influence of recharge modification that increased the concentration of chloride, nitrate and sulphate, which are the principal inorganic indicators of urban contamination.

ECONOMIC DEVELOPMENT

3.1Land Use. Present land use mixed with urban and semi urban. However the near future development will densify the urban zone and high rise buildings and some industry. Figure 3-1 shows the future land use pattern of Dhaka city.

3.2Industry. Almost half of all Bangladesh's industry is based in Dhaka, where manufacturing is the most important activity, with many factories supplying low cost garments to major companies in Europe. There are several industrial areas in DMAs area, among them Uttarkhan, Dakshinkhan and Vatara are noticeable. it is found that lots of small scale workshops are located along the Dumni and Harirampur also.

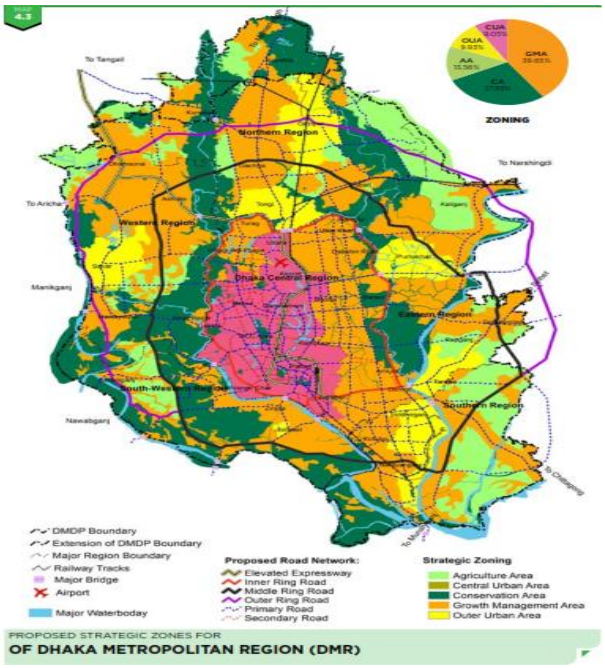

Figure3-1: Source Dhaka Structure Plan Report 2016-2035

[2]Burgess WG, Hasan MH, Rihani E, Ahmed KM, Hoque MA,

Darling WG (2011) Groundwater quality trends in the DupiTila aquifer of Dhaka: Bangladesh sources of contamination evaluated using modeling and environmental isotopes. Int J Urban Sustain Dev 3(1):56- 76

3.3 Road. There are a multitude of smaller cross-linking roads, many of which are narrow and suitable for only one or two vehicle widths, which also become congested as drivers seek alternative routes. In some areas new road construction is going on. DNCC also working on to widen and improve the road network which will further accelerates the business and housing in this area.

3.4 Infrastructure. Infrastructure is a major problem in all towns and cities in Bangladesh, where many facilities are inadequate to serve the needs of such a large population, after decades of underfunding and neglect. Some of the infrastructure is provided and maintained by DWASA, and other elements are the responsibility of other government agencies.

SOCIAL AND CULTURAL RESOURCES

4.1**Demography**. Dhaka City is the capital of the People's Republic of Bangladesh. In 2011, the Dhaka Metropolitan Area (DMA) had a population of 9.3 million. As per census 2011, the following Table 4-1 shows the distribution of union-wise population in the project area.

Table4-1

Ser	Union	Road (km)	Population (Lacs)
1	Horirumpur	40.89	1.573
2	Uttar Khan	36.92	1.400
3	Dakshin Khan	70.95	5.295
4	Dumni	8.63	0.300
5	Badda	12.32	1.806
6	Beraid	2.677	0.149
7	Vatara	9.212	4.500
8	Satarkul	0.94	0.650
Total:		182.54	15.673

Source: Study of options for Road and Drainage Networks Improvement in Extended DNCC area

4.2 Income and Expenditure. Income and expenditure pattern of population reflect their socioeconomic status and the status of the area as well. The income-expenditure pattern also refers to the savings status of the selected population. The income and expenditure here presents the monthly income from different sources and expenditure for different items of household and their other common needs. Monthly income level is presented in the Table 4-2 below.

Table 4-2

Level of Income	**Percentage**
Below 2500	0.90
2501-4500	10.33
4501-8000	33.09
8001-12000	22.21
12001-15000	10.22
15000+	23.25
Total	**100.00**

Source: Detailed Area Plan of DMDP Area, RAJUK, 2010

ANTICIPATED IMPACTS AND MITIGATION MEASURES

5.1 Potential environmental impacts of the proposed network improvement components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts and mitigation is devised for any negative impacts.

a. a.Location Impacts include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
b. Design Impacts include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.

c. Construction Impacts include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
d. O&M Impacts include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational wastes teams, and occupational health and safety issues.

ENVIRONMENTAL MANAGEMENT PLAN

This updated EMP based on model design aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (iii) to describe the monitoring measures and reporting procedures to ensure early detection of conditions that require particular mitigation measures; and (iv) identify responsibility for carrying out the mitigation and monitoring measures.

PROJECT BENEFITS

The citizens of the city will be the major beneficiaries of the improved water supply, as they will be provided with a constant supply of better quality water, piped into their homes. This should produce major improvements in the social capital of the city, and significant improvements in individual and community health and well-being. To augment these benefits, DWASA will conduct a public education and information campaign to raise awareness of the health risks of contaminated water and the continuing need to boil municipal water before consumption. Then diseases of poor sanitation, such as diarrhea and dysentery, will be greatly reduced.

People will then spend less on healthcare and lose fewer working days due to illness, so the economic conditions of individuals and the community as a whole should improve. There should be fewer deaths in infancy and at other stages of life, so the structure and well-being of families should also improve. The cultural resources of the city may also benefit, because if people are healthier and have more income, they should also have more time and money to spend on cultural pursuits.

CONCLUSION

Water supply project in newly included wards of DNCC aims to improve provision of sustainable, reliable, and climate-resilient water supply to households. It will enhance the distribution network efficiency and also strengthen the water supply network in new city area. No significant impacts are anticipated whether due to the location or design of the subproject as the sites are selected and fixed with the consideration that components are not located in environmentally-sensitive areas. All pipelines will be laid along the public roads within the right-of-way (ROW). The subproject utilizes the existing water source, and the abstraction will remain within its existing design capacity, therefore, no source related impacts is envisaged. The citizens within the project area will be the major beneficiaries of this subproject. In addition to improved environmental conditions, the project will improve the over-all health condition of the town. With the improved water supply, they will be provided with a constant supply of better-quality water, piped into their homes. The replacement of old distribution lines shall avoid cross contamination and have positive benefit on health by avoiding diseases such as diarrhea and dysentery, resulting in less expenses on healthcare, improve working days and their economic status should also improve, as well as their overall health. New wards of DNCC will be connected a well-planned water supply system and the community will have better civic facilities. DWASA will also enable sustainable and efficient distribution network.

REFERENCES:

1) Water Supply Master Plan for Dhaka City-2014
2) Dhaka Structure Plan 2016-2035
3) M. Mafuzur Rahman, Shahriar Quayyum (2008), Sustainable water supply in Dhaka city: Present: Present and Future.
4) Dhaka North, South now in charge of of city canals (1 January 2021), the independent report, UNB, Dhaka.

5) Dhaka City Corporation to take charge of drainage system, 20 November The Daily Star Report.
6) WASA hands over charge of canals to Dhaka City Corporation, 31 December 2020, The New Age Report.
7) Dhaka WASA, Annual Report 2018-2021.
8) Burgess WG, Hasan MH, Rihani E, Ahmed KM, Hoque MA, (Darling WG (2011) Groundwater quality trends in the Dupi Tila aquifer of Dhaka: Bangladesh sources of contamination evaluated using modeling and environmental isotopes. Int J Urban Sustain Dev 3(1):56- 76)
9) Dhaka Water Supply Network Improvement Project (DWSNIP)
10) Study of options for Road and Drainage Networks Improvement in Extended DNCC area.
11) http://dwasa.portal.gov.bd/sites/default/files/files/dwasa.portal.gov.bd/annual_reports/ 743e1a3c_ 035c _4f66_a5a76827f39f4c68/2020-11-08-13-12-fe46dfae2ee91e0cb90b9ec2fa149f5b.pdf
12) http://www.newagebd.net/article/125852/wasa-hands-over-charge-of-canals-to-dhaka-city-corporations.
13) http://www.thedailystar.net/country/news/dhaka-city-corporations-take-charge-drainage-system-2001509.
14) http://www.thedailystar.net/frontpage/news/give-drainage-dhaka-city-corporations-936757.
15) http://m.theindependentbd.com//post/257809.
16) http://www.dhakatribune.com/bangladesh/dhaka/2020/12/31/dncc-dscc-get-esponsibility-of-26-canals-from-dhaka-wasa.
17) http://en.m.wikipedia.org/wiki/Water_management_in_Dhaka.