



**Internship Report on**  
**“Implementing Automation by Digitization of Information Systems**  
**At Dhaka WASA”**

**Submitted To:**

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# **Letter of Transmittal**

Date: 25/04/2022

Dr. Dhiman Kumar Chowdhury

Professor and Chairman

Department of Accounting & Information Systems

Faculty of Business Studies

University of Dhaka.

**Subject: Submission of Internship Report.**

I am here by submitting my Internship Report, which is a part of the MBA Program curriculum. It is great achievement to work under your active supervision. This report is titled- “Implementing Automation by Digitization of Information Systems at Dhaka WASA”.

I have got the opportunity to work as an Engineer at Dhaka WASA both in projects and in operation and maintenance divisions. While preparing this report, I have tried my level best to include all the relevant information, explanations, things I learned from the organization, my contribution to the organization to make the report informative and comprehensive. It would not have been possible to complete this report without your assistance, of which I am very thankful. This job gave me both academic and practical exposures. I learned about the organizational culture, working procedure of a prominent public water supply utility of the country, this also gave me the opportunity to develop a network in the public sector. It would be my immense pleasure if you find this report useful and informative to have an apparent perspective on the issue.

Therefore, I pray and hope that you would be kind enough to accept my Internship Report and oblige thereby.

Sincerely Yours

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Shyed Shahriar Housaini

ID: 10916046

University of Dhaka.

# **Acknowledgment**

I would start by thanking my honorable internship supervisor Dr. Dhiman Kumar Chowdhury who has provided me with the necessary guidance needed to complete this internship report. Without his help it would not be possible for me to compile necessary information, make necessary adjustments to finish the report in time. I am also deeply grateful to him for allowed me to choose an organization for internship according to my job.

I would like to thank Dhaka WASA colleagues for all their support, necessary tips and guidelines during the internship period and the entire divisional team for being helpful and supportive in every little help I needed and for creating the opportunity for me to bring out my best performance.

I would like to express my sincerest gratitude to my family members and friends who always encouraged me for my higher studies and successful result.

# **Executive Summary**

This internship report is an overview of my job experience at Dhaka WASA. During my job I have worked with various employees & stakeholders at various different roles and in water & waste-water utility service division, digitization of information systems divisions, digitalization of work process and its different applications at DWASA. The objectives of the study are to analyze the automation implementation process, to identify the problems of digitization works & to recommend policies to overcome the problems of digitization & modernization at DWASA.

I was a member of operation & maintenance staff and technical staff. I worked in projects along with the functions of budgeting, technical & procurement management, vendor payment. My contribution was appreciated by my supervisor and other members of the department at DWASA. I had a great opportunity to practically see how mechanization, automation and digitization sector is working and evolving in Dhaka WASA.

This report has been presented based on my observation and experience gathered from DWASA. The organization has many projects, divisions and departments but the focus in this report is given more on the technical, engineering, automation and digitization works including financial investments. This report mentions about the budget and works for automation at Dhaka WASA, financial information and activities of SCADA based water management, MIS, GIS, AIS departments.

After working in those fields at Dhaka WASA, I came up with some important deductions. The main findings are: modernizations is helping to give satisfactory services, financial investment for automation is satisfactory, opportunity cost or product lifecycle - cost benefit analysis is not used, no established rules, regulations or formula used for Operation or maintenance investment, lack of coordination among various working divisions, staffs were not being properly trained, technology management and financial management of engineering divisions are not following any set rules.

The report also consists recommendations and conclusion according to my point of view, which I think would improve the organization in the automation aspects. Some recommendations are: staffs at all levels should be trained adequately to know the benefits and their relative duties and responsibilities, cooperation between various wings should be increased latest international standards & best practices should be followed, automation experts should be involved, investment should be for adding value & maximizing profit only, sustainable green technology should be used, technical audit teams should be employed.

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## ***CHAPTER 01 – INTRODUCTION***



Water resource management, clean drinking – water production, Potable Water Distribution and Sewage or Waste-water management, Customer services, Billing, Revenue Collection, Audit and Accounting are the main activities of Water Supply and Sewerage Authority.

Currently I have the opportunity to work as an engineer at Dhaka WASA at Planning & Design (Electrical & Mechanical) division. Engineers at Dhaka WASA are related to procurement of goods and services for - operation, maintenance, planning development / project works, quality assurance and also providing services to the customers.

### **1.1 Background of the report:**

This report is a partial requirement of the Internship program of MBA program of – Department of Accounting & Information Systems, Faculty of Business Studies, and University of Dhaka. The main purpose of internship is to get the student exposed to the job world of the business managers. Being an employee & intern, the main challenge was to translate the real life experience into theoretical concept and write a report. The internship program and the report have following purposes:

- To get and organize detail knowledge on business processes of the organization.
- To experience the real-world business & service activities.
- To fulfill the requirement of MBA program.

This report is the result of three months long internship study program conducted in Dhaka WASA and is prepared as a requirement for the completion of the MBA program of university. As a result, I need to submit this report based on the “**Implementing Automation by Digitization of Information Systems at Dhaka WASA**”. This report also includes writing on the overview of the organization, automated products and services of Dhaka WASA, and also what factors they should consider while selecting automation for different purposes.

### **1.2 Objective of the report:**

The objective of the report can be viewed in two forms: i) General objective, ii) Specific objective

**General Objective:** The internship report is prepared primarily to fulfill the Masters of Business Administration (M.B.A) degree requirement under the Faculty of Business Studies, University of Dhaka.

**Specific Objective:** More specifically, this study entails the following aspects:

- a) To give an overview of Dhaka WASA,
- b) Look at various works related to automation of various divisions and financial information,
- c) To identify the policies and cost for implementing automation into management



- process, d) To find out problems in automation process with effective solutions to overcome the limitations.  
e) To make some recommendations regarding automation works.

### **1.3 Significance of the report:**

Other than pointing out the key factors for Automation of to the management, it will also be useful to employees, management practitioners, automation industry and the society as a whole. Employees can find out in which direction the management is going and based on the organizational environment what should be their future preparations. Management practitioners can gain important insights regarding the areas for improvement in similar sectors. Automation industry and Technology-vendors/bidders can also benefit from the outcomes of this study by getting an indication of where to focus resources and efforts for business opportunities. Finally, the society at large will benefit from improved customer services, if the findings help improve overall atmosphere of the organization.

### **1.4 Methodology of the report:**

**Framework of the report:** The whole report has been arranged in seven specific parts. Part one named as Introduction, which includes the origin, objectives, significance, limitations and methodology of the report. Part two named as Organization Overview, which includes the description of the overall organization of Dhaka WASA. Part three named as Services & Job Responsibilities which includes my job responsibility and activities in the organization as employee for past ten years. Part four points out key areas of automation at DWASA. Part five discusses about MIS, AIS, GIS. Part six mentions about Smart Water Management by SCADA. Part seven includes DWASA SWOT matrix, Conclusion, Recommendation & References.

**Target population:** The target populations for the study are –1. Internal employees. 2. Vendors of the organization. 3. Consumers 4. Key executives of Dhaka WASA. 5. Government Regulators 6. International Agencies

**Study Area:** The study will be conducted within the organization to study the automation process of Dhaka WASA.

**Data Sources:** For the information of the report mainly both type of internal and external - primary, secondary and tertiary sources of data have been collected. For accurate study we have to follow some rules & regulations. The study materials were collected from these sources:

**Primary sources:** Data which is considered as first-hand information collected by a surveyor, investigator, etc. is defined as Primary Data. The sources from which such data is collected is termed

as the primary source of data collection for the concerned information. Primary sources of data consist various data collected by-

- a) Analysis of Practical work, Job responsibilities. Face to face conversation with the co-workers and informal interview with the employees of Dhaka WASA.
- b) Direct observations of DWASA activities- Zonal office & Project works, Services.
- c) Interview with Customers, Vendors & Consultants.

**Secondary sources:** Data that has already been collected, analyzed, published and has undergone statistical treatment can be defined as Secondary data. Such type of data is tailored from primary data sources. Secondary sources including

- a) Files & folders in work computers have been used for this purpose. Digital copies of file notes, survey reports, estimates, drawings, contracts etc.
- b) Old project files, letters, papers and old work documents, design and drawing papers.
- c) Official letters, notices, circulars, organization reports and publications collected & maintained by office or record section.
- d) Dhaka WASA information from the official websites.
- e) Internal Study report, Masterplan on DWASA automation- Central SCADA committee.
- f) Presentation materials and training manuals from DWASA training center and trainers.

**External sources:** Some external sources (Some are also known tertiary source) were also used various report and documents published by government units or development partners. – a) Newspapers & news websites, various Water Utility related Websites. b) Automation guidelines and user manuals of international companies. c) Textbooks and External Research or Study reports on WASA and SCADA and Automation.

### **1.5 Limitations of the study:**

- To perform employee survey involved in Accounting and Revenue/Billing Departments became very hard because I was not directly involved with the Accounting and Revenue/Billing Departments team; rather I worked with engineering team.
- Some employees were not willing to co-operate with external study.
- All the Information is not easily accessible or not permitted to disclose according to the organization policy, rules and regulations had been followed on the disclosure of confidential information. It was difficult to collect information from different vendors of automation works.
- I also faced problem in communicating with my University Internship supervisor, Employees, Management members and Vendors of Dhaka WASA- face to face, due to COVID-19 situation.



## ***CHAPTER 02 - ORGANIZATION OVERVIEW***



Dhaka Water Supply and Sewerage Authority (WASA) is a service oriented autonomous commercial organization in the Public Sector, entrusted with the responsibility of providing water supply, sewerage disposal (wastewater), and storm water drainage service to the urban dwellers of Dhaka City. It covers more than 360 sq. km service area with more than 20 million people with a production capacity of 2650 million liters water per day (MLD). Dhaka WASA was established in the year 1963 as an independent organization and currently which is running under the WASA ACT 1996. The First Water Treatment Plant in Dhaka City Established in 1874 - Chadnighat –WTP.

## **2.1 Organizational Profile:**

**Organizational Structure:** Dhaka WASA is under the supervision of - Ministry of Local Government, Rural Development and Co-operatives, Local Government Division of that ministry of the People's Republic of Bangladesh. The organizational structure of Dhaka WASA was changed according to the WASA Act 1996. Dhaka WASA Board consists of 13 members, headed by the Chairman. The Board is formed by representatives from different professional organizations and Government officials. According to the organizational structure of 2007, total number of approved posts and present employees are as follows:

Class	Approved Posts	Existing Posts	Vacant Posts
First	309	221	88
Second	331	260	71
Third	1917	1079	838
Fourth	2111	1340	771
Total	4668	2900	1768

**Area of Jurisdiction:** Dhaka South City-Corporation and Dhaka North City-Corporation.

### **Dhaka WASA New Demand Areas Forecast**

Year	Population (Million)	Area (Sqkm)
2025	21.6	1000

**Legal Framework:** Under the order No. 19 of the East Pakistan Ordinance No. XIX of 1963 Dhaka WASA was established. Later in 1996, Dhaka WASA Act (Act No. 6 of 1996, 17 August 1996) was promulgated to formulate and implement the rule of corporate management.

**Dhaka WASA Organization Mandate:** To ensure Water Supply, Treatment and Disposal of

Wastewater (sewage) and Storm Water Drainage. As an autonomous body Dhaka WASA started its journey with the mandate to effect (EP Ordinance NO. XIX, 1963) a) Supply of water b) Disposal of sewage c) Storm water drainage and d) Solid waste management

**Water Sources:** Major River System and Water Sources in Dhaka City: Padma, Meghna, Buriganga, Shitolokkha. Ground Water – Water present beneath earth's surface aquifer is pulled up to surface.

## **2.2 Mission & Vision:**

**Vision:** To be the 'Best Water Utility' in the Public Sector of South Asia-Ensuring an environment-friendly, sustainable and pro-people water supply management system.

**Mission:** A) To reduce the dependency on ground water. B) To implement the projects effectively and speedily. C) To practice a corporate culture in its management and operation. D) To ensure a high level of transparency and accountability in all its service and activities. E) To improve the efficiency and reduce operating cost. F) To constantly seek way to serve our customers.

**Activities at DWASA:** Around 78 per cent water comes from underground sources and the rest 22 per cent from surface water. Ground water is abstracted by using a total of 923 deep tube wells. Surface water is supplied by treating water of the river Shitalakshya and Buriganga through 4 Water Treatment Plants. Dhaka WASA supplies water to the mega city of Dhaka city and Narayanganj area. At present over 20 million people live in Dhaka and Narayanganj and this will increase many times by the year 2050. It is notable that ground water level is declining by 2-3 meters per year due to continuous abstraction of water. Several water treatments plants projects have already been taken with a view to increasing dependency on surface water up to 70 percent. Saidabad Water Treatment Plant, Phase-III is under implementation, which will supply a total of 450 million liters water per day in the city. Furthermore, two additional large Water Treatment Plants at Gandharbapur and Padma (Josholdia WTP) Water Treatment Plant, (Phase-I) have been taken. In Gandharbapur, it is planned to treat water from the river Meghna, which will produce 500 million liter of water per day. The Padma Water Treatment Plant is being built at Josholdia near the bank of the great river Padma from where 450-million-liter treated water. Dhaka WASA has 410 (including 42 mobile generators) diesel-driven generators. Dhaka WASA has taken initiatives for purchasing two hundred new generators. Moreover, if there is any water crisis anywhere in the city, Dhaka WASA instantly supplies water by using 43 water carrier trucks and 44 tractor trolleys.

**Sewerage System:** The sewerage system of Dhaka city was initiated in 1923. Sewage Treatment Plant – 2 (Pagla, Dasherbandhi). Proposed Sewage Treatment Plant – 3 (in Uttara, Mirpur,

Rayerbazar). Sewage Lift Station – 26. Sewer Line - 934 km. Number of Sewer Connection - 88,980.

### **2.3 Dhaka WASA at a glance:** Demand and Supply of Water by Dhaka WASA

Year	Population (In million -approximately)	Demand (Million Liter)	Supply Capacity (Million Liter)	Shortage (Million Liter)	No. of Deep Tube wells
1963	0.85	150	130	20	30
1970	1.46	260	180	80	47
1980	3.03	550	300	250	87
1990	5.56	1000	510	490	216
1997	8.0	1350	870	480	225
2000	8.5	1500	1130	370	308
2001	10.0	1600	1220	380	336
2009	14.15	2120	1880	240	518
2011	15.00	2240	2150	90	599
2013	15.00	2250	2420	-	644
2015	15.80	2250-2300	2420	-	702
2017	17.00	2450	2500	-	827
2019	20.10	2500	2600	-	886
2021	20.10	2520	2740		923

#### **Water Supply Infrastructure:**

Item	Unit	2017-2018	2018-2019	2019-2022	2020-2021
Deep Tube Well	Nr	795	827	887	896
Water Treatment Plant	Nr	4	4	4	5
Water Production/Day	MLD	2450	2500	2550	2560
Water Line	Km	3600	3720	2550	2560
Water Connection	Nr	371766	379686	390642	392400
Overhead Tank	Nr	38	38	38	38
Street Hydrant	Nr	1643	1643	1643	1643

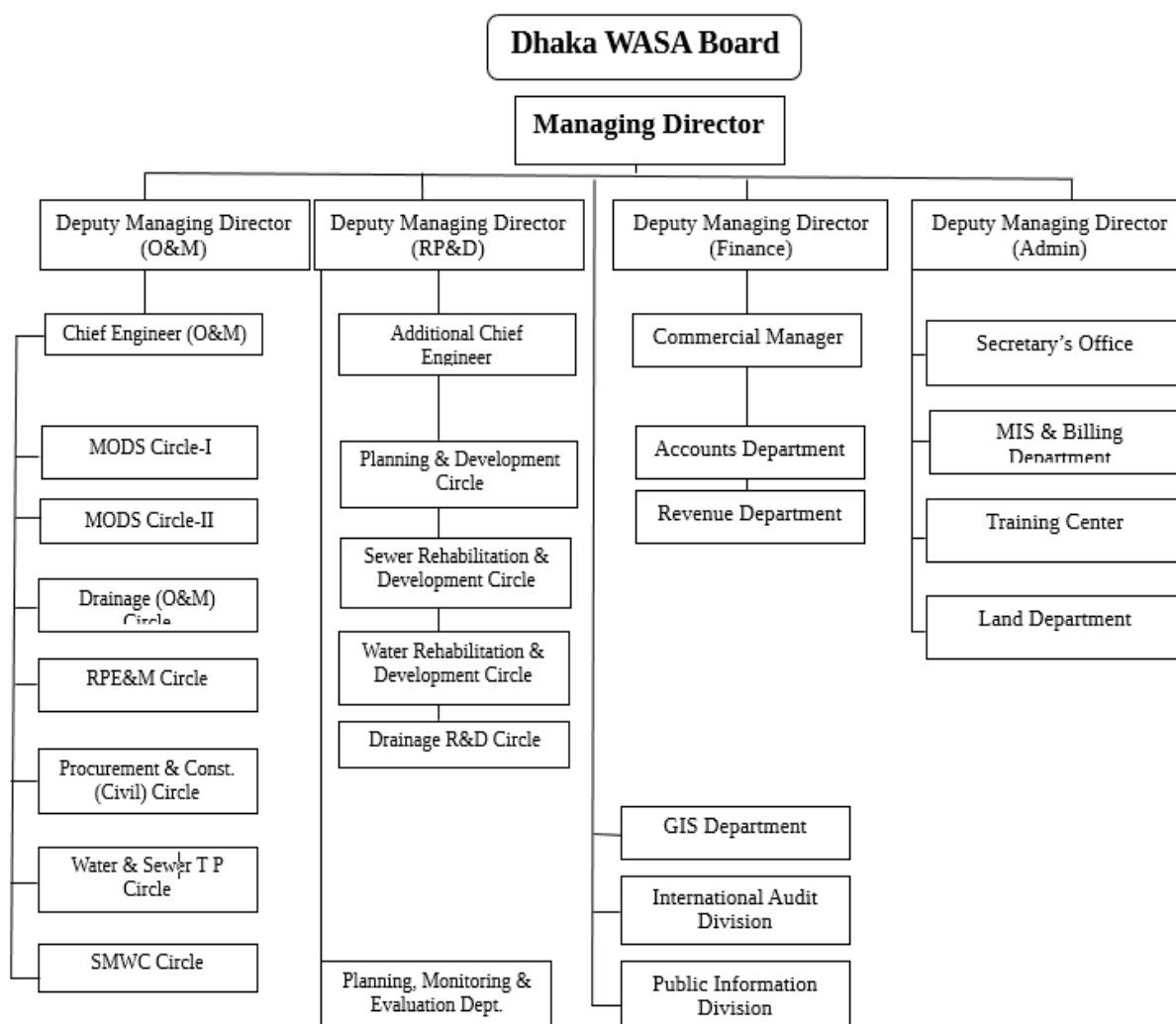
### Water and Sewerage Billing and Collection (In Lack Taka):

	2017-2018	2018-2019	2019-2020	2020-2021
Billing	105285.95	1191110.47	13062	13679.20
Collection	100055.82	117942.50	13067	12813.06
Bill Receivable	44711.09	45881.06	4584	7661.46

### Water Tariff

Category	01/11/2017	01/8/2018	01/7/2019	01/7/2020	01/07/2021
Domestic	10.00	10.50	11.02	14.46	15.18
Commercial	32.00	33.60	35.28	40.00	42.00

### Short Organogram of Dhaka WASA





## ***CHAPTER 03 – SERVICES & JOB RESPONSIBILITIES***





Dhaka WASA is a service oriented public, autonomous authority, which as a part of Local government division provides services of Water supply and Sewer waste water disposal. DWASA appoints staffs after written and viva tests. Managing Director is the appointment authority. I also took part in exams successfully and got my appointment as an Assistant Engineer (9<sup>th</sup> grade salary scale of GoB).

### **3.1 Drainage Operation and Maintenance works:**

- At the start of my work at DWASA, on 2010 November - I was posted as Assistant Engineer at Drainage (Electrical & Mechanical) Division. That Drainage (E & M) division was created on 2008 and was responsible to mainly operating and maintenance of 4 permanent and various seasonal or temporary storm water pumping facility at various places of Dhaka City.

#### **Job Responsibilities:**

- (a) Worked at Various Pumping /Lifting Stations of Canals and Many more Temporary/Mobile Pumping Facilities of Dhaka city under Electrical and Mechanical division at Dhaka Drainage Network Operation and Maintenance division.
  - (b) There were permanent pumping stations at Old Dhaka -Mill Barakh Dholaikhal-Burigangah point; Janapath-Titipara- Maniknagar area Pumping station on the Segunbagicha Canal, Rampura Pumping station on east side of Rampura bridge on Begunbari canal, another pumping station at Kallianpur regulating pond area pumping out to Turag River. I mainly looked after Titipara -Maniknagar and Rampura -Begunbari Pumping stations. There were 20 to 25 temporary pumping stations established during rainy seasons, at various points and at the edge of Dhaka City to drain out storm water.
  - (c) Planning, Tendering, Evaluating, Procurement or Purchase for Drainage Electrical-Mechanical Operations and Maintenance Works. Supervise over DWASA staff and contractors at work and quality control.
  - (d) There were Electric motor driven pumps and Diesel Engine driven pumps. But mostly electric ones were used where there was electricity available. Diesel pumps were problematic and operational cost was high. Also, operation and maintenance of a truck mounted crane which helped in various lifting works at DWASA.
- 
- Sub-Divisional Engineer (Operation & Maintenance) Division-1, Drainage System of Dhaka city (March 2013). There were 10 kilometers of Open Canals and Box-culvert and 190 km pipe storm sewer drain line and more than 2000 manholes to maintain under this division, Drainage Operation and Maintenance – 1 (Operation and Maintenance of Pipe Drainage, Box-Culverts and

Canals network of Dhaka to keep the water flowing specially during rainy season).

**Job Responsibilities:**

- (a) Planning, Budgeting, Tendering, Evaluating, Procurement or Purchase for Drainage Operations and Maintenance Works.
  - (b) Supervise over DWASA staff and contractors at work and quality control. Plan and schedule cleaning activities for DWASA cleaners to clean all drainage units- pipe lines, box culvert, canals, manholes, pits etc. Excavation and Re-excavation of canals. Eviction of illegal structures canal land or other property of Dhaka WASA drainage facilities.
  - (c) Manual tendering, evaluation, Notification award, contracting- system was being phased out and paperless, web portal-based time and work saving- tendering system were being introduced. I was the first person in my division to implement e-GP and also, I trained other colleagues to work with that system.
- Sub-Divisional Engineer, UDDP - Urban Dredging Demonstration Project. (Operation and Maintenance of Pipe Drainage and Canals network of Dhaka) With co-operation of Vitens Evides International – Dutch water Operators (Netherlands) and Water operator partnership /WOP, based upon MOU with Dhaka WASA.

**Job Responsibilities:**

- (a) Urban Drainage / cleaning of Pipes, Box Culverts and Canals dredging and Sediment deposition and removal monitoring management with online/web-server base WIT software and mechanized equipment (floating bulldozer, Excavator etc) and drainage inventory/asset management software system. Attempts were taken to modernize, mechanize drainage works.
  - (b) Introduction of digital GIS system and software. Working to gather information previously unknown or not used. Example – Waste water sample collection, water testing to determine content, mobile gas analyzer, sedimentation data collection and digitization for storing etc.
  - (c) This project also tried to popularize mechanization and Automation at various levels of our work by arranging various meetings and seminars which I also attended.
- Executive Engineer (Dec 2018 - Jun 2019). Five Canal Development Project by Land Acquisition of Manda, Baishteki/Journalist colony, Kurmitola, Hazaribagh, Begunbari Canals with Excavation and Re-excavation.

**Job Responsibilities:**

- (a) Preparing various documents maps, drawing, list of land owner related to land acquisition work, contacting with related stakeholders, government authorities, local people.
- (b) Planning, Tendering, Evaluating, Procurement or Purchase for Drainage Electrical-Mechanical Operations and Maintenance Works. Excavation and Re-excavation of canals. Eviction of illegal structures canal land or other property of Dhaka WASA drainage facilities.
- (c) Budgeting, Financial management of project funds. Easy and time saving Automated web portal-based file, note, reporting, letter drafting & distribution system was introduced. I also updated my work and also improved my skills.

**3.2 Sewer Projects Works:**

- Executive Engineer, Sewer (R & D) Project Executive Engineer, Sewer (R & D) Project, (Nov 2017 - Jul 2019) Sewerage System Rehabilitation and Development Project works for Dhaka.

**Job Responsibilities:**

- (a) Planning, Tendering, Evaluating, Procurement or Purchase for Drainage Electrical-Mechanical Operations and Maintenance Works, Managing Construction works of pipe sewer lines and manholes at old Dhaka area.
- (b) Ensuring safety and security of the workers and the people or property nearby the work site, as the sewer lines were being constructed at more than 10- 15 feet deep trenches. I was also responsible as an Executive Engineer (Additional charge) Jan 2021 - Apr 2021 · 4 months, at Dhaka Sanitation Improvement Project. Working on improvement of Sanitation system- Sewer network and Lifting stations and Pagla sewerage treatment plant at Narayanganj. Upgrading the Pagla STP from 120 mld to 600 mld capacity (mld = million liters per day) was the main focus. Almost 15 KM trunk main sewer line construction was also planned. Construction of pipe sewer collection network was also part of the project.

**Job Responsibilities:**

- (a) I was mainly involved in the preparation phase of this project. My main duty was to help the project director with preparation of Tender documents, technical documents of large packages. I also prepared documents for required land acquisition for a sewer lifting station at Golaphbagh, Dholaipar area.

- (b) I also helped the project team to prepare documents, specifications and BOQ for small office restoration and reconstruction civil works, vehicle procurement, office equipment and procurement of Computers and related equipment.

### **3.3 Planning and Design Division Works:**

- Executive Engineer at P & D (E & M) Division. Planning and Design works related to Electrical and Mechanical equipment.

#### **Job Responsibilities:**

- (a) Planning Electrical & Mechanical works as needed by various divisions of Dhaka WASA.
- (b) Drawing, designing, preparing specification, tender evaluation for Electrical & Mechanical works or supplies. Inspection & Testing for Quality assurance of various works and supply.
- (c) Supervision, Inspection and Management of Work-site and Office works, Inspection of various works related to implementation of automation for water production and distribution system. Example – SCADA, VFD, PLC, HMI and Sensors etc were specified and inspected for quality control.

### **3.4 Trainings received from DWASA:**

1. Orientation training course and was informed about overall structure and scope of work and business process, DWASA Act 1996 and DWASA regulations 2010 by DWASA.
2. Public Procurement Act 2006 & Public Procurement Rules 2008 by DWASA training center.
3. Office management, Leadership, Staff management trainings by DWASA and training center.
4. Project planning, management and implementation by training center, Web and Computer based E-GP and digital web-based file/Nothi management by DWASA.
5. Budget planning, budget management and implementation. Planning, Modeling and Designing of Draining system. Asset and Inventory management by software-based systems. Water distribution network - design, operation and maintenance by Water Operators Partnership.
6. Gender role in Water policy making by Water Aid Bangladesh, Water & Gender Alliance.
7. Procurement management, PPR PPA, local and international bidding, vendor management, contract management – 21day training hosted by Engineering Staff College.
8. Office manner, staff development, personal skill development by training center.
9. Time management and Emotional Intelligence Personal and Official financial management by training center, Divisional procedures, non-revenue water management and implementation of SCADA, Organization management and Leadership Training.



## ***CHAPTER 04 - AUTOMATED SYSTEMS & SERVICES AT DWASA***



#### **4.1 Advantages of Automation:**

- 1) Reduced costs. 2) Save time. 3) Better Customer. 4) Enhanced workflow. 5) Satisfied employees. 6) Better situational. 7) Better quality service. 8) Automation also promotes consistency. 9) Improved Insight of organization. 10) Embrace new & better technology. 11) Reduce system loss and unethical practices. 12) Improve Span of control.

#### **4.2 DMA and NRW:**

**District Metered Area (DMA) Approach and Non-Revenue Water (NRW) Reduction:** Almost 144 years ago these pipe lines was constructed and became leaky causing 40-45% of non-revenue water. Due to this leakage the water demand of city dwellers cannot be fulfilled and on the other hand Dhaka water supply & sewerage authority (DWASA) are not getting the revenue also. For example, if the water production is 3.0 crore liter which can fulfill the water demand of 200,000 people) per day but due to leakage -1.35 crore liter (which fulfill the water of 90,000 people) water is unaccounted for and only 1.65 crore liter (which fulfill the demand of 1, 10,000 people) can be supplied to the households. So, producing 3.0 crore liter water for 2, 00,000 people per day only 1 10,000 peoples are served. Due to this unaccounted-for water, it became difficult to supply water to the people causing water crisis. This becomes serious especially in hot season. Also, only 59% of homes had water meters, and those were often inaccurate or inaccessible to meter readers. Surveys showed that 90% of slum dwellers were using DWASA-supplied water through illegal channels. Physical losses topped 50%; with improper metering, in a low-pressure, intermittent supply system, those losses were difficult to quantify accurately. The water that did reach consumers, DWASA was collecting only 62% of revenues. Only one-third of the water entering the system was ever paid for. With course of time Dhaka WASA water supply system was moving towards unsustainable and unmanageable state due to inadequate system water pressure, use of illegal suction pump, plenty of unidentified leakages and illegal connections, poor water quality, high system loss 40% -45%. So, it is clear that water supply system cannot be improved unless and until the Non-Revenue Water (NRW) can be reduced.

**DMA test Project:** For that purpose, a pilot project was initiated in 2007 under a Technology Assistance project by Asian Development Bank (ADB) in Manikdi area of the city where NRW was 45%. Under the project 7 km water line was rehabilitated and 500 nos. of house connection was shifted from old water line to new one. After commissioning it was observed that the NRW became 12%. The consultant found similar circumstances across the system.

### **4.3 DWSSDP, DMA & SCADA Financing:**

Dhaka Water Supply Sector Development Project or DWSSDP was initiated in 2011 to address above mentioned issues. DWASA implemented the DWSSDP with financial assistance full for from ADB & GoB. The project aims to ensure sustainable, more reliable and improved water supply services through strengthening distribution networks and capacity building for better operation & management of the network by introducing of District Metering Areas (DMAs) to ensure 24/7 pressurized water supply in the network at 1-bar or more, to reduce the water loss to 15% or less, and Improve Water Quality. District Metered Area (DMA) is a technical term to define a hydraulically isolated small area from big network system with its own water supply system and distribution network for a community which can be isolated from remaining network without affecting supply system of other areas but with facilitating surplus water to adjacent water deficit areas. Dhaka WASA started establishing DMAs in 7- Zones, with a target of about 145 DMAs. So far established 54 DMAs and remaining 91 DMAs are in progressing. Most of the parameters, data or information needed to monitor DMA will be collected, monitored and controlled by SCADA system by sensors, valves, gates, meters, pressure regulators and pumps etc.

In a 2016 Citizen Report Card Survey after completion of project, in all 11 DWASA zones, nearly 82% of the respondents reported no service failure in the previous 12 months and 12% noted only one service failure. Forty-four percent said that the compatibility between their bills and services received was “good”; 36% found the value for services “acceptable.” As a service provider, DWASA was rated “good” by 47% of those who replied to the survey. Volume, pressure, continuity of supply, and quality of water, the majority said, was “excellent” (2%), “very good” (18%), or “good” (37%).

DWSSDP was funded with at a total project cost of USD 212.7 million including taxes and duties of USD 16.1 million. About 70.5% (USD 150 million) of the total project cost was funded with loan facility from the Special Funds Resources (SFR) of the Asian Development Bank (ADB). The Government of Bangladesh however, counterpart funded the rest 29.5% of the total cost (USD 62.7 million) of the project. The counter fund includes cost elements covering land acquisition, remuneration of counterpart staff, office accommodation, taxes and duties, resettlement cost, part of the civil works and other miscellaneous costs. The repayment period for the loan facility by the government of Bangladesh was fixed within 32 years, a grace period of 8 years, and an interest charge of 1.0% per annum during the grace period and 1.5% per annum thereafter 5 Further,

agreement was reached to relend loan proceeds to DWASA under repayment term period of 20 years which includes a 5-year grace period and an annual interest rate of 5%. Also, the Government of Bangladesh would bear all foreign exchange risks which was costed at USD 35.4 million.

Item		Amount (USD Million)
A	Base Cost	
	Part a: Distribution system and quality improvement	160.4
	Part b: Capacity building and institutional strengthening	8.3
	Part c: Project management and Implementation support	17.1
B	Contingencies	23.2
C	Financing Charges during Implementation	3.7
	<b>Total</b>	<b>212.7</b>

#### **4.4 Water ATM:**

Dhaka WASA has signed and MoU with an international NGO working in water sector to take steps to sell water from deep tube wells in a legal way. Customer has to buy a smart card. When customers want to buy water, they will have to insert the smart card into the water ATM machine and water will start pouring out for them. Taking out the card will stop the water flow. Per liter water is sold - taka 0.40 (Forty paisa). Revenue from RFID card and water sell will go to DWASA. DWASA had invested taka 6, 00, 00,000 in FY 2020-21 and allocated taka 7,00,00,000 in FY 2021-22 for water ATM machine installation and Operation and Maintenance.

#### **Water ATM Financial Mapping:**

Year	Number Of System Installed	Number Of System Online	Total No. Of Card sold	Total No Of card sold amount	Customer Recharge	Total Revenue	O&M Bill	Dhaka WASA Payout
2017	6	6	3,615	1,084,500	1,033,190	2,117,690	760,000	1,357,690
2018	62	62	14,658	4,397,400	12,623,734	17,021,134	9,834,239	7,186,895
2019	127	124	31,629	4,611,650	34,656,067	39,267,717	33,310,247	5,957,470
2020	198	181	41,382	3,817,400	44,506,452	48,323,852	58,589,578	-10,265,726
2/2021	198	173	8,828	459,250	7,394,465	7,853,715	9,703,107	-1,849,392
6/2021	240	211	32,957	2,679,650	26,067,772	28,747,422	20,846,084	7,901,338

**Obligations of DWASA:** To pay all the necessary expenses for operators, devices, provide water, provide space, electricity etc. according to contract documents.



**Obligations of Drink-well vendor:** Design, build & operate water ATM at various deep tube well pump houses to provide purified drinking water to customers and stop illegal water selling. Develop a system so that DWASA can get revenues from selling RFID card and water selling from ATM.

#### **4.5 ‘Shanti’ Bottle Water Plant:**

Project Name : DWBWS Project	Project Cost : BDT 16.93 Crore
Construction Start : 25.11.2004	Construction Complete : 30.06.2006
Capacity : 10000 ltr./hr. (4000 ltr/hr washing)	Product Brand : “Shanti”

**Fixed Asset:** Injection Machine: 6 Set, Blow Machine: 4 Set, Filling machine (Semi-auto): 4 Set, Wrapping Machine: 3 Set, Ozone Generator: 2 Set, Water Treatment Plant: 1 Set, UV disinfection unit: 4 Set, Cooling Tower: 2 Set, Date Coding Machine: 3Set, 20 Liter Jar Washing Machine: 2 Set.

<b>Profit – Loss FY: 2020-2021</b>	
Item Description	Taka (Lakh)
<b>EXPENSE</b>	
Raw material	111.846
Operational Cost (outsourc & Master role Salary)	65.191
VAT & SD	35.49
Electricity, Telephone, Fuel, Water etc	41.849
Office Expense, Conveyance, Honorarium, OT etc	14.393
In FY 2020-21, 5% depreciation of the Fixed Asset (131.995)	6.599
Total Expense	275.013
<b>INCOME</b>	
Sales	
Total Income	217.851
Loss	= 57.162

<b>Profit – Loss FY: 2021-2022 (27th Oct-21)</b>	
Item Description	Taka (Lakh)
<b>EXPENSE</b>	
Raw material	19.317

Operational Cost (outsourse & Master role Salary)	16.470
VAT & SD	9.09
Electricity, Telephone, Fuel, Water etc	10.301
Office Expense, Conveyance, Honorarium, OT etc	5.639
In FY 2020-21, 5% of the Fixed Asset (12.434)	0.621
Total Expense	61.438
INCOME	
Sales	
Total Income	73.88 (Oct-21)
Profit	= 12.442

#### Cost Analysis in Taka:

No.	Cost Items	0.250 L	0.5 L	1.0 L	1.5 L	2.0 L	5.0 L	20.0 L
1	Bottle (PET)	2.37	3.03	4.48	5.656	7.53	18.01	0.00
2	Cap	1.05	1.05	1.05	1.05	1.05	1.02	1.36
3	Hanger	0.00	0.00	0.00	0.00	0.00	1.35	0.00
4	Body Label	0.52	1.02	1.04	1.32	2.77	3.26	0.93
5	Wrapping	0.50	1.00	1.50	1.86	2.70	5.75	0.00
6	Security Seal	0.00	0.00	0.00	0.00	0.00	0.00	1.60
7	Chemical	0.001	0.002	0.004	0.005	0.006	0.007	0.1
8	Power	0.067	0.133	0.26	0.26	0.533	0.533	0.533
9	Gas & Oil	0.011	0.011	0.011	0.011	0.011	0.011	0.00
10	Salary	0.08	0.107	0.107	0.107	0.107	0.107	0.107
11	Consumable Item	0.02	0.02	0.02	0.02	0.02	0.02	0
12	Maintenance	0.01	0.03	0.03	0.03	0.03	0.03	0.03
13	(10%) Capital Investment	0.01	0.01	0.01	0.01	0.01	0.01	0.01
14	Raw Water	0.01	0.02	0.04	0.06	0.08	0.2	0.80
15	Overhead- 1%	0.04649	0.0643	0.0855	0.10389	0.1485	0.30308	0.0547
16	Depreciation (5%)	0.23477	0.3249	0.4319	0.52464	0.7498	1.53055	0.276235

17	Total Cost	4.93026	6.8222	9.0694	11.0175	15.745	32.1416	5.80
18	SD	0.24651	0.3411	0.4535	0.55088	0.7873	1.60708	0.290047
19	VAT	0.77652	1.0745	1.4284	1.73526	2.4799	5.06231	0.913647
	Grand Total Cost	5.9533	8.238	10.95	13.304	19.01	38.811	7.00463
	Plant Rate	6.00	9.00	13.00	16.00	20.00	40.00	30 - 40
	Trader Price	7.00	10.00	15.00	18.00	22.00	45.00	50
	Max Retail Price	10.00	15.00	20.00	25.00	25.00	65.00	70-90

15% VAT & 5% SD Applicable for 250ml -2000ml bottle water, only 15% VAT Applicable for 5000ml -20000ml bottle or water.

**Automated Services:** 100% Online Sale (POS), Payment, Store Inventory. Plant under CCTV Coverage. 100% Procurement by e-GP, e-nothi introduced, Biometric Attendance. A LIMS or laboratory information management system software is on and production software is in progress.

#### **4.6 Steps for Modernization at ‘Shanti’ bottle plant:**

Most of the bottled water production machines at Shanti plant are semi-automated. Steps to be taken-  
a) Introducing cost effective bottle (Less weight & short neck) and Short Cap to reduce cost. b) Advertisement & awareness campaign in Electronic & Print Media led by -Professional marketing wing or resources. c) Change old Chinese Machineries (Injection, Blowing, Filling etc semi-automatic, more than 15 years old), which requires too much troubleshooting & high maintenance & operating cost, labor cost & partial operation hour. d) Build up professional & skilled manpower / technicians. e) Invest into automated production machines. This will increase production 300 % and reduce labor, material, operation & maintenance cost by 50%. In 2020 it was estimated that 5 production lines will cost 7,50,00,000 takas with new automated Chinese machines and will cost 10,00,00,000 taka to be fully automated with modern European machines – with longer, reliable and better performances.

At present each semi-automated production line machine based on its type and rate of production requires 3 to 7 operators & helpers. But for automated production line machines the operator & helper requirement will come down to 1 or 2 per machine line.



## ***CHAPTER 05 – AUTOMATION AT MIS, AIS & GIS DEPARTMENTS***



### **5.1 Management Information System (MIS):**

MIS department at Dhaka WASA pays as the main actor in the field of Automation, Digitation and Computerization. MIS and Billing department performs almost all the works, procurement of goods and services for Networking, Hardware and Software purchase, Operation and Maintenance is done by MIS department at DWASA.

Most of the DWASA communication and IT structure and computers, servers, internet, database, software, data center, digitized records are created and maintained by MIS. DWASA Geographical Information System (GIS), Accounting Information System (AIS), Internal Audit, Planning, Revenue Divisions, Billing Division, Administration department also uses services of MIS.

MIS and billing department is allocated average yearly budget or around 6 to 7 Crore taka.

### **5.2 Works & Budget of MIS Department, FY 2020-21:**

Procuring Entity	Senior Systems Analyst (MIS & Billing Dept)
Method of procurement	Most of the works will be done by Direct Procurement Method (DPM)
Approver	Work will be approved by Head of Procuring Entity or Managing Director.
Budget Source	Own Fund / Revenue
Budget Heads	Allocation (Lakh Taka)
A) Computer Repair & Maintenance	3.06
B) Repair & Maintenance	151.00
C) Computer Purchas	491.96
Total Allocation (amount in Lakh Taka)	646.02

### **ANNUAL PROCUREMENT AND WORK PLAN, FINANCIAL YEAR 2020-21**

S/N	Description of Procurement package	Cost in TK.
	Software:	
1	Online PIMS Software Development	3,35,000
2	Pension Software Development and Online Bank Payment Service update of Billing System	1,65,000
3	Land and e-Lab Software Development	5,00,000

4	Accounting Software purchase and Development for Accounts Division of Dhaka WASA.	37,50,000
5	Online Electricity, Gas and Others Billing Information Preservation and Management software of Dhaka WASA.	1,76,400
6	Mobile application Development of Dhaka WASA.	5,46,525
7	Real-time Online Billing Software Upgradation.	19,50,000
8	Private DTW and Water New Connection Security System.	4,39,500
	1 – 8 Carried over from previous year	
9	Audit Software Upgradation	4,50,000
10	Digital Archiving of Employee Information of Dhaka WASA	8,00,000
11	Residence Management software	8,00,000
12	Private DTW, Store Inventory and Water New Connection software	1,50,000
13	PIMS, Pension, Payroll System Upgradation.	5,00,000
14	Loan Approval Process, Loan and Payroll Data Migration Tools	9,00,000
15	Enhancement work of Private Deep Tube well	3,00,000
16	Complaint Management Software for FM Division	10,00,000
	Software Sub total	<b>12,762,425</b>
	Hardware:	
17	Computer, Printer, Scanner, UPS & Laptop for Revenue Department	91,00,000
18	Line Printer for Billing Print	1,96,00,000
19	Purchase of a Multifunction color printer, scanner and copier.	3,98,640
20	Purchase of Desktop computer offline UPS, Power Strip for Accounts Department and a mini Projector (Portable).	5,17,525
21	Online UPS Servicing of Computer Center Server Room	1,57,550
22	Photo copier Printer Servicing for Revenue Zone-5	19,200
23	Computer, Printer, Scanner, UPS & Laptop	60,00,000
24	Hardware Accessories for Regular Maintenance.	2,95,000
	Hardware sub-total	<b>3,60,87,915</b>
	Networking:	

28	Online Billing (Internet VPN-Central Internet 530mbps) Connection	26,71,200
29	200 MBPS Backup Internet Connection for WASA Bhaban	10,08,000
30	5 mbps Internet Connection	60,000
31	Grameenphone Data Connectivity bill for backup billing connection.	1,44,000
32	2 no Network and Hardware Technician	8,20,115
33	5mbps Data Connectivity for Revenue Zone-11, Narayanjonj.	61,800
34	Security Devices Collection for Revenue Zones of Dhaka WASA	7,95,000
	28 – 34 Carried over from previous year on Network	
35	Update and New Billing Network Establishment for Zone-2 and 4	5,74,625
36	Update/New Billing/Internet Network Establishment for Accounts, Central Laboratory Dasherbandi and Land Dept. of Dhaka WASA.	3,95,650
37	Update and New Billing Network Establishment for Revenue Zone 6 and Devices for regular maintenance of Dhaka WASA.	4,95,350
38	Update and New Billing Network establishment for MODS Zone 8.	4,93,050
39	50 mbps internet establishment in Savar-Keranigonj Wellfield plant.	5,33,500
40	Network Accessories for Regular Maintenance	14,00,000
41	Billing & Internet Network Upgradation for Revenue, MODS zone.	20,00,000
	Networking Sub total	<b>1,14,52,290</b>
42	Emergency Allocation	42,99,500
	<b>Grand Total=</b>	<b>6,46,02,130</b>

### **5.3 Works & Budget of MIS Department, FY 2021-22:**

Budget Source	Own Fund / Revenue
Allocation for MIS & Billing Department	
Budget Heads	Allocation (Lakh Taka)
A) Computer Purchase	526.44
B) Computer Maintenance	100
C) Call Center Cost	73.15
D) Rest of the amount of Budget of 2021-2022 of MIS &	10.58

Billing Dept. (Serial No 3 to 10)			
Total Allocation (amount in Lakh Taka)			710.17
Estimated Summary			
Budget Head	Allotment	Estimated for purchasing	Emergency fund
Computer Purchase	526.44	512.11	14.33
Computer Maintenance	100.00	100.00	0
Call Center Cost	73.15	0.00	73.15
Sub Total	-	612.11	87.48
Grand Total	699.59		

#### **ANNUAL PROCUREMENT AND WORK PLAN, FINANCIAL YEAR 2021-22:**

S/N	Description of Procurement package (Works/Goods)	Estimated Cost
	Networking:	(In Lakh TK.)
1	Online Billing (Internet VPN-Central Internet 530mbps) Connection Among Own Fundenue, MODS and Other Dept. of Dhaka WASA.	11.00
2	200 Mbps Backup Internet Connection for WASA Bhaban (Mango)	5.40
3	5 mbps Internet Connection for AMR	0.60
4	50 mbps Internet connection in Savar-Keranigonj Wellfield plant.	1.80
5	Integrated Water Operative Center (IWOC) at WASA Bhaban	1.38
6	Purchase of required network accessories for managing director sir.	5.76
7	Purchase of Internet bandwidth centrally for online billing and internet related service among Own Funded Zones, MODS Zones and All other departments of Dhaka WASA.	30
8	Purchase of required network accessories for MODS Zone-3, Magistrate Court-2 and DESWSP of DWASA.	5
9	Network equipment for regular maintenance and various dept.	80
10	Network Switch and Router purchase for DWASA Bhaban	37



	For Network Total Goods	208
	Software:	
11	Central WiFi at DWASA Bhabon	30
12	Carried Over Goods and works:	100.36
13	Audit Software Up gradation	10.00
14	Payroll Software Development	5.00
15	New Connection, DTW and Inventory Software	1.50
16	Software for Supply Chain Management.	35.00
17	Web based inventory, POS & Production Management Software.	5.50
18	Software for Land Record & Tax Payment for Land Division	2.00
19	API for BIDA	5.50
20	Software for Welfare Department	5.00
21	Software for DA Section	8.00
22	Software for Employee personal information update process	10.00
23	Software for MIS online report	5.00
	Subtotal of goods to be done	92.50
	For Software Total Goods	<b>192.86</b>
	Hardware:	
24	Procurement of Server, WM ware and related services for keep running of software's used in digitization of Dhaka WASA	54.50
25	Urgent purchase of Display for Dhaka WASA Board Room.	6.81
26	PC, UPS, Printer and Scanner for Dhaka WASA	130.00
27	Hardware Accessories for PC and Printer	20.00
	For Hardware total Goods	211.31
28	Urgent and Unforeseen works/goods/services to be done under sudden emergency requirement.	87.48
	<b>Grand Total</b>	<b>699.59</b>
	Goods to be done subject to the Availability of Budget:	
	Computer Purchase/Computer Maintenance/Call Center Cost.	

29	PC, UPS, Printer and Scanner for Dhaka WASA.	130.00
30	Line Printer for Own Funded Zones of Dhaka WASA	185.00
31	Storage for Server of Dhaka WASA.	180.00

## **5.4 Accounting / AIS:**

An accounting information system gathers data describing the organization's activities, maintains a detailed financial records of the organizations operations, transforms the data into information and makes the information available to users both inside and outside of the organization.

**Use of Accounting Information System:** AIS system is used to maintain – 1. Complete record of customers and service providers, 2. Complete record of suppliers and supplies, 3. Control of physical stock, 4. Maintain employee salaries benefits records, 5. Complete records related to all sales, 6. Processing data to distribute information.

**AIS for Managers:** AIS provides managers with data, information and various reports for –

1. Planning, 2. Monitoring, 3. Directing, 4. Analyzing, 5. Reporting.

Accounting division is one of the most important divisions of Dhaka WASA. Accounting division uses a custom-made software by the vendor Flora Limited do most of the recording and reporting. Annual expenditure for this software is 15, 00,000 taka.

## **Software Automated Processes of Accounting System:**

**User Login Page and Logout Page:** Any authorized user can log in to the accounting system by giving his/her ID and password, also can be logged out. Activity option pages are -

- i) **Account Setup Pages:** Insert, Add, Edit or Update- Financial Year Setup Page, Group Head, Sub Group Head Page, Ledger Head Page, Cost Centre Name Page, Budget Head page, Yearly Budget Entry, APP Setup, Supplier List, Work Orders, Income Tax Slab Setup, User Setup.
- ii) **Accounts Payable:** Insert, Add, Edit or Update - General Bill Register, Unapproved Payment Vouchers, 3. Checks to be issued list, Payment Archived, Supplier ledger, Employee advance register, Employee bill register, View Voucher, Adjustment, Vat Deduction List, AIT Deduction List, Update VAT Challan, Update AIT Challan, Vat Certificates.
- iii) **Daily Transaction:** Adding, Listing, Viewing & Printing of - Payment Voucher, Receipt Contra Journal Purchase Vouchers, Sales Vouchers, Debit note, Credit.
- iv) **Monthly Transaction:** Bank Reconciliation, Charge Depreciation for this month.
- v) **Fixed Asset Management:** Fixed Asset Listings, Fixed Asset Acquisition, Fixed Asset

disposal, Depreciation Schedule, Fixed Asset Transfer Relocation, Fixed Asset revaluation.

- vi) **Reports:** Account Head wise budget, Cost center wise budget, Day Book, Bank Book, General Ledger, Trial Balance Report, Income Statement, Balance Sheet, Cash Flow, Chart of accounts.

### **5.5 Planned AIS Automation development works:**

Package Name	Sl no	Item Required	Implemented by	Estimated cost in million US dollars
Package-1	1	Central IT Infrastructure (Active & Passive)	DWSNIP	5
	2	Central Control Room with Bazel Less Video Wall	DWSNIP	2
	3	10 Zonal IT Infrastructure (Active & Passive)	DWSNIP	2
	4	10 Zonal Control Room with Bazel Less Video Wall	DWSNIP	3
Package-2	1	Central Server and Virtualization, Storage and Backup, 10 Zonal Server (2) and Virtualization	DWSNIP	3
Package-3	1	Network and Firewall (HQ & Zonal)	DWSNIP	1
	2	Core Structured Cabling (HQ)	DWSNIP	0.5
Package-4		Data and Internet Bandwidth (5 Yrs)	DWSNIP	0.5
Package-5	1	Central Unified Distributed SCADA System and Implementation	DWSNIP	4
	2	Web GIS Software, Customization & Reporting with data modeling.	DWSNIP	1.5
Package-6	1	Billing software and interfacing with Financial management system (5Yrs)	DSIP	5.1
	2	Financial Management software (5Yrs) (Modules: Accounts, General Ledger, Intercompany Transaction, Fixed Asset, Warehouse, Procurement, Payroll with facility management & HR)	DSIP	5.1
Package-7	1	SCADS RTU/PLC, Field Devices (Smart flow Meter, Smart Pressure Sensors Sensor, Leveling	EWSP, DWSNIP	4.6

		switch and Sensor, Water Quality Sensor & Energy Meter) & Electrical Components.		
Package-8	1	Smart Digital Water Meter (4G) for Household	DWSNIP	1
	2	MDM & Central Firmware Update Platform	DWSNIP	1.2

DSIP – Dhaka Sanitation Improvement Project, DWSNIP – Dhaka Water Supply Network Improvement Project, EWSP – Emergency Water Supply Project; Source of fund is – Asian Development Bank, Government of Bangladesh and Dhaka WASA.

**AIS Budget Allocation for IT and Automation in Lakh Taka:**

Serial No	Particulars	Allocated Budget FY 2021-22	Allocated Budget FY 2020-21
1	Internet Connection	100	80
2	Computer maintenance	120	100
3	Automation & Digitalization	2000	1500
4	Computer & Accessories	1000	800

## **5.6 Digital/Online Billing and Bill Payment:**

The WASA Authority has created a website where we can get all the information and payment system.

**Dhaka WASA bill statement:** The bill statement is a part and parcel for the people of Dhaka. The bill statement will show - current water bill, bill payment last date. As a result, it is customer's duty to collect the Bill statement. Customers can easily check their water bill from online.

**How to calculate WASA bill:** Firstly visit - [http://app.dwas.org.bd/\\_website](http://app.dwas.org.bd/_website). Then, put your Account Number (The number is mentioned on your Bill Card), Put Your Password (Your Account Number is your Password), finally- you can get your Bill Card. Put your Date Format which you want to check your Bill. Search it and you can check your Bill now.

**Dhaka WASA bill payment system:** After checking the bill, you need to complete your payment. In this modern era, it is really easy to make the payment. You can pay your bill through bKash, Nagad and Rocket. The full procedure -

- Open the Mobile App bKash, Nagad or Rocket. Go to Payment section. Go to Bill Payment. Go to Dhaka WASA Bill. Enter your Meter Number. Put your amount of Bill. Enter your Pin Number. Complete your payment. Digital billing and online bill payment has made it easy for consumers to pay bill and bill collection of DWASA has increased.

## **5.7 Financial Report from Various Projects:**

In 2020-21 Financial Year, on the basis of the Master Water and Sewer Plans and Turn around DWASA Program, it has implemented 10 development projects. Those projects were included in the Annual Development Program (ADP) in the said year. Among the said projects: 5 were investment projects for water supply and 3 projects for sewerage & Other 2 were Drainage Projects. Planning, Monitoring and Evaluation Division has been engaged exclusively to monitor and to evaluate those projects' performance which are as follows:

### **A. Development Projects of Dhaka WASA**

#### **1. Investment Projects in Water Supply Modernization**

Name	Duration	Estimated cost & Financing Source
Dhaka Environmentally Sustainable Water Supply Project	October' 2013 to June' 2022	Estimated Cost 815107.00 Lakh Taka. Financing Source -\$250 million from ADB, \$64 million from Agence Française de Développement and \$136 million from the European Investment Bank, GoB & DWASA.
Saidabad Water Treatment Plan Project Phase-III	July'2015 to June' 2021. Revised - June 2025(Proposed)	Estimate Cost - 459736.05 Lakh Taka. Financing Source - ADB, Agence Française de Développement and European Investment Banks or agencies etc , Gob & DWASA.
Dhaka Water Supply Network Improvement Project	April 2016 to December 2021 Revised - June 2025(Proposed)	Estimate Cost- 318230.00 Lakh Taka Financing- \$275 million from ADB, \$200 million from ATF - Danida Loan, \$128 million from Agence Française de Développement, and • \$44 million from the European Investment Bank etc, Gob & DWASA.
Emergency Water Supply Project	January 2020 to December 2023	Estimate Cost- 73232.00 Lakh Taka Financing- Gob & DWASA.

#### **2. Investment Projects on expansion & modernization Sewerage System**

Name	Duration	Estimated cost & Financing Source
Dasherkandi Sewage Treatment Plant Project.	July 2015 to June 2022	Estimated Cost 371254.00 Lakh Financing Source – China Exim Bank, GoB & DWASA.
Land Acquisition for Construction of Sewage Treatment Plant at Uttara.	July/2019-June /2021, Revised - June 2022	Estimate Cost - 139800.00 Lakh Taka Financing Source - Gob & DWASA.
Dhaka Sanitation Improvement Project	January 2020 to December 2024	Estimate Cost- 385560.00 Lakh Taka Financing- \$275 million from ADB, \$200 million from ATF - Danida Loan, \$128 million from Agence Française de Développement, and • \$44 million from the European Investment Bank etc, Gob & DWASA.

B. Financial Progress of those Projects: In FY 2020 -21, total taka 2171.94 crore was allocated against those projects in the Revised Annual Development Program (RADP). Taka 1033.32 crore was allocated from the own fund of Government of Bangladesh and tk. 1138.62 crore was sanctioned from the Development Partners (DP) fund as the Project Aid. In this said year, tk. 2060.15 crore has been released and tk. 1810.03 crore was incurred as expenditure as a whole, the financial progress was 90% in that time. In this time, the physical progression was 97% as a whole.

C. Major Physical Progression of the Said Projects:

SI No	Name of the Component	Progress
1	Construction & rehabilitation of deep tube wells	97 No
2	Construction & Rehabilitation of water lines	388.1 km

## **5.8 Automated Biometric Time Attendance System:**

July 2018, Dhaka WASA started its journey with biometric digital time attendance. Started with only 5 devices at Dhaka WASA head office. WASA authority took decision to replace biometric fingerprint attendance system with new technology 3D face detection attendance devices to avoid contagious contamination from finger touch, system started on 2nd June 2020.

Semi-Outdoor Multi-Biometric Time Attendance & Access Control Terminal which supports 3,000 face templates, 4,000 fingerprint templates and 10,000 cards. Price: 28000-30000 Taka per unit.

**Features of present systems:** Dashboard for Management, Scheduled Reporting to Management by E-Mail, Online access of Staff & user, Android & iOS Application, SMS alert, reporting etc.

**Expenses for hardware:** There are 50 different offices, division, projects - at DWASA and almost 800 different deep tube well pump houses. DWASA has concluded that they will need around 30 devices for offices and 200 devices to cover all the different pump houses.

### **Estimated Capital Investment:**

Sl no	Place of Installation	Number of Installations	Number of Devices	Unit cost in BTd	Total cost	Remarks
1.	Head Office, Zonal Office, Project Offices, SCADA room, Server room, Lab room etc.	50	40	30000	12,00,000	Completed
2.	Pump House	800	200	30000	60,00,000	Ongoing
	Total estimated Hardware investment				72,00,000	Taka

## **5.9 Geographical Information System (GIS):**

Following functions were implemented by DWASA GIS division-

**Water, Sewer and DMA Networking Mapping:** All water, sewer and drain lines will be mapped and recorded in digital format.

**Deep tube well mapping:** Deep tube well is the only source of underground water which distributed to city dwellers. The Deep tube well position with information has been built in GIS.

**Land Mapping:** Old Land maps has been converted to digital maps using GIS tools.

**Surface Water Transmission Line Mapping:** Dhaka WASA has four water treatment plant. Under those surface water treatment plants, all transmission line has been converted in digital format.

**Base line Mapping:** Land, road, water body, house position, bridge, culvert and also other utilities network mapping.

**House Connection mapping:** DWASA has taken initiative to make Smart Metering. GIS mapping for House Connection can be the first step to turn smart metering

**Valve & Bulk Meter mapping:** Mapping of Valve position has been built in GIS including information to provide better operation and maintenance. Bulk meter are used to estimate inflow/import and outflow/export into adjacent DMA areas for calculation of water loss.

**Digital elevation modelling (DEM):** Ground elevation is the important component for water, sewer and drainage network design and operation.

**LIC Mapping:** As a part of the plan to bring all slum and Low-Income Community areas in Dhaka city under water distribution service, prepare GIS database for LICs – more than 25000 household.

**Zonal Billing Mapping:** Billing information is being joined with these maps; as a result of which, it is possible to find out connection status, non-metered household and connection type etc. for better understanding of physical features of service areas.

**Other works:** Scan and digitize of about 1200 system maps on Water, Sewer and Drainage line. Upload of all types of maps to DWASA website. GPS survey Based mobile apps for water, sewer.

**DWASA GIS Annual Budget:** DWASA Computer-GIS mainly operates, maintains and modify existing software, servers, web portals / Apps supplied by vendors or MIS division.

Head	FY 2020-21	FY 2021-22	Remarks
Capital Expenditure	141.80	154.59	Lakh Taka
Operating Expenditure	100.84	99.20	Lakh Taka
Computer-GIS Total Budget	<b>242.64</b>	<b>253.79</b>	Lakh Taka



## ***CHAPTER 06 - SMART WATER MANAGEMENT WITH “SCADA” SYSTEM***





## **6.1 Introduction to SCADA:**

Dhaka Water Supply and Sewerage Authority (DWASA) pumping stations are equipped with deep tube wells, they are the main network nodes of the system. DWASA management wants to implement a SCADA (Supervisory Control and Acquisition) system in the network, complete with remote monitoring and control. For that reason, DWASA management had formed a committee to produce a conceptual overview to WASA for a unified, fully integrated Central SCADA Platform with Interactive IoT and HMI Dashboard. The report meant to provide a brief overview of the architecture and framework that has been envisioned by the SCADA Committee for deploying the ideal solution at Dhaka WASA. This automation guideline was meant to guide water production and distribution monitoring and control processes mainly.

### **SCADA stands for: Supervisory Control & Data Acquisition**

- It is a technology to collect data and monitor the performance of production and distribution processes.
- It is an application that can help to increase efficiency, lower costs and increase the profitability of operations by turning data into information.
- Reduce manpower needed for operation and monitoring activities thus reducing costs.

### **Activities of a SCADA System:**

- a. Data acquisition through sensors from various field devices.
- b. Data transfer using communication network to various RTU, Local SCADA or Central SCADA.
- c. Data processing and data or information presentation
- d. User authentication and user access control into the SCADA monitoring and control system based upon various levels of user roles.
- e. Instruments Control – **Control** various pumps motors, valves and chlorination systems remotely.

**SCADA system outputs:** Digital signal Output & Analog signal output for Data Presentation, Alarm, Data analysis, Messages, Trend analysis. Periodic reports, Semi auto or Automatic Control signals, Emergency procedures.

### **Existing Status of SCADA:**

In 2017, Dhaka WASA started the piloting project work for DTW (Deep Tube Well) SCADA, and has covered 200 out of 913 DTW under SCADA systems. Around 8 (eight) company was done this

work. Above them 77 DTW has done by one vendor and he had sold the License software to Dhaka WASA and also found that the software is not perfect to fulfil WASA requirements. All SCADA are running under the vendor-controlled demo software. Vendors used several different field devices as well as different demo software which is running at vendor end. On the other hand, total 23 used such communication device which are infeasible to integrate into central SCADA.

#### **Equipment needed in a SCADA system:**

SCADA systems historically have been broken down into two basic types: Proprietary SCADA System 2) Mix & Match SCADA System. Proprietary SCADA is produced and distributed by big companies as a whole system. Mix and Match SCADA is for experienced users and provide flexibility and cheaper.

#### **6.2 Various equipment and tasks of SCADA system:**

Description and Estimated Price in	Lakh tk.
<b>Deep Tube well</b> - Submersible pump house. Pump is places 400 feet deep underground to bring up water. Deep tube well pump house and secured surrounding facilities are part of smart water network.	10-15
<b>Submersible pump</b> – Used for bringing up water from deep underground via tube well.	10 - 16
<b>Substation</b> - There is also electrical power distribution transformer of 150 kva to 250 kva	15 - 20
<b>Chlorination system</b> - Injects chlorine to kill germs into the water in the water line.	10
<b>VFD</b> - Variable Frequency Drive (VFD) is a field device that frequently interfaces with SCADA systems to control power input & outputs. VFD's are used to power motors driving pumps and fans. VFD's generate analog and discrete signals. 90 kw - 110 kw VFD are used.	5
<b>Bulk water flow meter</b> - Price of turbine type 200 mm.	1.5
<b>Turbidity meter</b> - This is a turbidity meter used to measure solids in water.	1 - 2
<b>Valves</b> - A gate valve, also known as a sluice valve, is a valve that opens by lifting a barrier (gate) out of the path of the fluid. Gate valves can be manually operated or automated.	0.35-1.5
<b>Pressure Sensor</b> with cable and transmitters.	0.5

<b>Water Level Sensor</b> - Borehole Water Level Sensor for Deep Well	0.5-0.65
<b>Chlorination Sensor and Monitoring</b> - Chlorination Sensor used in DWASA SCADA System shows if the chlorination unit is active or inactive. These can monitor chlorine in the water at the time of injection and residual chlorine in the water network pipelines.	0.25 - 0.50
<b>Limit switches</b> - Limit switches are used to automatically detect the presence of an object or to monitor movement limits of that object have been exceeded or not.	0.15 - 0.65
Float switch - A float switch detects the level of a liquid in a tank or container.	0.75
<b>Relays</b> – Relay Contact switches are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals.	0.05- 0.35
<b>RTU (Remote Terminal Unit)</b> - Sensors and process controller devices are attached to remote terminal units (RTU). Multiple remote terminal units at different sites transmit the data collected to a single master station which displays the information in a browser.	1 - 2
<b>PLC (Programmable Logic Controller)</b> - Data from sensors on individual assets is transmitted to the PLC. The PLC translates that data into a format that can be used by the software. If the data crosses certain thresholds, a maintenance work order is created. The Programmable Logic Controller (PLC) was invented in 1968 to support the automobile industry by Bedford Associates' engineer Dick Morley.	0.50 – 2.5
<b>OIT (Operator interface terminal)</b> - OIT's provide a local interface, typically in a remote location or into an isolated system like skid mounted equipment. Screens to display information have a simple layout since displays are not large, anywhere from 4 inches to 14 inches.	0.5-0.75
<b>HMI (Human-Machine Interface)</b> - An HMI or SCADA Master, can provide several helpful extensions for network alarm management of monitoring equipment. HMI software is used at the Central Control location.	0.50 - 2
<b>Server and Memory Storage-</b> Rack server and external memory chips and RAM. SD memory cards, RAM, Rack Servers costs 2000, 5000, 600000 takas.	

<b>Database server, cloud storage, backup server</b> - To store the data and operated the equipment. They are billed at - per month per Terabyte of data - in cloud or external Dedicated backup server respectively.	1 - 2
<b>Physical and mobile monitoring facility</b> - Reading and analyzing on Desktop Computer, Laptop Computer, mobile, tablet, staff panel - To see the SCADA data and use it accordingly.	0.5-2
<b>Internet/radio frequency/GPRS</b> - Wireless SCADA systems are the ones in which the communication between the Remote Terminal Unit (RTUs) and Human Machine Interface (HMI) is wireless in nature. General Packet Radio Service (GPRS) is the commonly used wireless technique used in wireless SCADA systems.	0.25-3
<b>System Monitoring and Controlling Console</b> - Control room equipment and furniture (system console) including but not limited to control console for dual redundant workstations, desk for engineering workstations. Servers, manager workstations and printer compartment along with chairs.	1000

**Training and Support services:** Training, 1 year Warranty and 3 years after sales services may cost up-to 20% of total contract value.

### **6.3 Investment into SCADA and related equipment:**

Dhaka WASA is planning to invest in stages - 18,00,00,000 takas to completely modernize and implement smart management with SCADA at Saidabad water treatment plant, supply 225 million liters of water daily.

#### **DWASA Budget Allocation for VFD and SCADA in Lakh Taka:**

Serial No	Particulars	FY 2021-22	FY 2020-21
1	SCADA Installation	845	528
2	SCADA maintenance	200	200
3	VFD/Inverter purchase	450	850
4	VFD/Inverter maintenance	116	110

From DWASA budget it can be seen, DWASA is heavily investing in SCADA automation & maintenance. Various Operation & Maintenance related - Zonal or Local offices are using those funds for piloting projects, tests, maintenance. Vendors are mainly local vendors. Work quality of those vendor may not be up to international standards.

#### **6.4 Cost reduction by SCADA System:**

SCADA system allows various equipment at different places to be monitored, controlled or operated remotely. Operator don't need to be present on the equipment rooms. Dhaka WASA may have about 1000 pumps running at pump houses all the time, to supply nonstop running water to supply line to city dwellers. With SCADA single operator can monitor, supervise or control multiple pump houses -2 or 3 within 1 KM of distance. In case of SCADA operated machines, operators do not have to stay beside the machines all the time. Any authorized person can monitor, operate & control SCADA operated machines from office computer, control room or mobile sets.

Operator salary expense without Automation, SCADA or Smart water management				
Number of pump houses to be monitored	Number of shifts	Number of operators	Monthly average salary	Total monthly salary expense
1000	(24 hour / 8 hour =) 3	(3 shifts x 1000=) 3000	25000 takas	(3000 x 25000 =) 7,50,00,000 takas
Operator salary expense with Automation, SCADA or Smart water management:				
$1000 / 3 \approx 334$	(24 hour /8 hour per shift =) 3	(3 shifts x 334 =) 1002	30000 takas (skilled staff)	(1002 x 25000 =) 3,00,60,000 taka

So, we can see that SCADA or smart water management can save us almost 50% of operator-staff expense. SCADA can also minimize repair and maintenance cost by providing warning to carry-out preventative measures. The more modernization is used, the more effective and efficient the service will become. But currently there is no analysis or official future predictions about the benefits of SCADA automation. Work Packages related to upgrading to modern technology and choice of technology types are undertaken based upon work opportunity, assumptions, vendor influence, random requirement decisions and based upon avidity of funds. Actual long-term effects of these expensive technological & financial investments are not being measured systematically. DWASA - GIS, MIS, Finance, AIS & Engineering divisions should work together to formulate a method to measure the true value & impact of these investments to maximize acquired value against money spent in this process. Top Quality vendors with



## ***CHAPTER 07 – SWOT MATRIX, CONCLUSION & RECOMMENDATIONS***



SWOT matrix is a vital strategic planning tool that can be used by managers to present a situational analysis of the organization. It is a simple technique to map out the present Strengths (S), Weaknesses (W), Opportunities (O) & Threats (T) Dhaka WASA is facing in its current business environment.

### **7.1 SWOT Matrix of Dhaka WASA:**

<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>•Stable, experienced &amp; dynamic staff &amp; Senior Management Team.</li> <li>•Capable &amp; experienced employees supported by a Training Centre established in 1980.</li> <li>•50+ years successful record in providing water &amp; wastewater disposal services for Dhaka.</li> <li>•Progress of “Turnaround Program” is continuing &amp; trust &amp; support of GoB &amp; Development Partners.</li> <li>•Customer-oriented corporate culture and using technology for efficiency &amp; cost saving.</li> <li>•Long-term master plans for development of water &amp; sewerage are in place &amp; current major projects to substitute groundwater by surface water, rehabilitate water networks, reduce Non-Revenue Water &amp; expand sewerage service- are ongoing or in advanced planning stage.</li> <li>•A monopoly position in piped water supply &amp; wastewater service for Dhaka City with assured revenue with very satisfactory Operating Ratio.</li> <li>•Water production capacity is more than water demand due to modernization.</li> <li>•Financial and Policy and Administrative help from Government of Bangladesh (GoB) on various issues and project works.</li> </ul>	<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>•Customer complaints about the quality of supplied water are too frequent.</li> <li>•There are many weaknesses in current water quality monitoring, including: <ul style="list-style-type: none"> <li>1) Frequency of water quality monitoring in the networks vis-à-vis international norms; 2) Equipment, protocols &amp; Water Quality Management equipment at water treatment plants; 3) Control of Drinking Water Treatment Chemicals;</li> </ul> </li> <li>•Monitoring of quality of surface water sources.</li> <li>•Terms of employment for contract-based employees is leading to high employee turnover and loss of skills (e.g. DMA Management Staff).</li> <li>•Sewerage coverage, 20% of Dhaka WASA Service Area, lags far behind water supply coverage.</li> <li>•Although Dhaka WASA is striving to provide Quality service to the public, little is being done to publicize this.</li> <li>•Water tariff is slightly lower than the actual production cost.</li> <li>• Less Coordination between different wings about financial or technical information.</li> <li>• Cost benefit financial lifecycle analysis is not being used.</li> </ul>
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<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>•Exploring potential for increasing efficiency and cost saving through outsourcing &amp; PPP (Public Private Partnership).</li> <li>•Expanding Dhaka WASA's service area into surrounding urban, or urbanizing, areas to bring in new customers &amp; revenue.</li> <li>•Increasing sewerage coverage from the present 20%, will result in large increase in revenue.</li> <li>•Delegation of responsibilities to local Zone Offices for closer ties to local communities.</li> <li>•Taking advantage of Dhaka WASA's internal expertise and facilities to supply services to other parties on a commercial basis.</li> <li>•Automation, Digitization &amp; Computerization is ongoing with satisfactory financial investment.</li> <li>•Investment into big &amp; modern water/sewer projects with international best practices &amp; modernizations by DWASA &amp; GoB.</li> <li>• Push for increased training for staffs by DWASA &amp; GoB.</li> <li>•Highly qualified national and international consultants are being employed by DWASA.</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>•Population migration to Dhaka, rapid economic development &amp; increasing water demands outstrip ability to increase &amp; distribute water.</li> <li>•Project delays, due to external factors (road cutting, land acquisition, public &amp; legal protests, etc.), lead to increased costs and protracted Government approval process for budget increases. Lack of coordination between the organizations disrupts project success.</li> <li>•Delay of surface water supply projects and network rehabilitation projects, extends reliance on a diminishing groundwater resource &amp; may result in deteriorating groundwater quality &amp; water shortages and declining ground water .</li> <li>•Surface water pollution of Dhaka's surrounding rivers &amp; increase in the cost of water supply, climate change &amp; increased possibility for droughts, dropping of water layer and flooding.</li> <li>•Technical, financial and engineering management divisions are not following any set business rules.</li> </ul>
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## **8.2 Recommendations:**

1. To build a staff awareness and Consensus about automation, digitization and its use to bring benefit and ease of work to the employees. All staff, from senior management to the field crew, should understand the basics of Computerization, SCADA and MIS, GIS, AIS - Automation systems at various levels as required by their works.
2. Building the understanding at top-level management on Automation at every possible place to maximize profit cut down unnecessary expenses. Middle management must understand their roles



and responsibilities on implementing automation technology, since it requires hard effort by them to create awareness about new technology.

3. Field level SCADA, MIS, GIS, AIS and related work should follow the international standards guideline and supervised by Internal and/or External Automation Expert team.

4. Automation experts, MIS, GIS, AIS and SCADA working teams should supervise, advice and update the technology as required. Team should be checking technological change regularly and after 5 years should upgrade the DWASA Automation masterplan.

5. All project, working divisions, DWASAS Administration, Revenue division, Accounts divisions, Field offices and all stockholder should try to follow international guidelines, guidelines from Government and DWASA Automation Masterplan for smart water management and MIS, AIS, GIS best practices for administrative purposes. Technical audit experts may be employed by top management.

6. Different and relevant training should be organized on Automation for various levels of staffs.

7. Cost benefit analysis of capital investment and maintenance cost should be formulated and used before taking any large investment decisions. Investment adding values to products or services or saves expenditure- should be considered.

8. Sustainable, green & modern technology based managerial capacity, also technical & financial capacity- should be strengthened and better coordinated to keep Smart-Water systems profitable.

### **8.3 Conclusion:**

DWASA is working very hard for providing water supply, sewerage service to almost 20 million people of the Dhaka. Dhaka WASA also achieved success in required water production and supply by using various digital or other modern technology. However, its activities are not faultless because of challenges like - regular increase of Dhaka WASA geographical area, increase of water supply network size, weak sewer network and other related activities. Various initiatives including strong monitoring by use of automation have been taken to ensure rapid improvement of its functions. Automation and SCADA is not only a brand-new concept using ICT but also is a tool for technology-based management concept in Bangladesh public sector. Integrated Water operation control and command platform is a future oriented water management strategy. So, it is managing the entire process of the water production source as well as water cycle scientifically and systematically. The outcome will be sustainable provision of a more reliable, improved and climate-resilient sustainable water supply in Dhaka city.

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