

**PEOPLE'S REPUBLIC OF BANGLADESH
DEPARTMENT OF ENVIRONMENT (DoE)**

**ADVISOR ON ENVIRONMENTAL
MANAGEMENT IN BANGLADESH**

PROJECT COMPLETION REPORT

NOVEMBER 2023

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

NIPPON KOEICO., LTD.

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Source : "Surface and Ground Water Quality Report 2016", "New Clean Dhaka Master Plan (2018-2032)"
 Source: JET

Location Map for the Target Area

Advisor on Environmental Management in Bangladesh

Project Completion Report

Table of Contents

	Page
1. Introduction	1
1.1 Background	1
1.2 Project Purpose.....	1
1.3 Outline of the Project	2
1.4 Status of Wate Pollution Control and SWM.....	5
1.4.1 Status of Water Pollution Control.....	5
1.4.2 Overview of Solid Waste Management (SWM)	7
2. Project Activities	9
2.1 Activities for Identifying Issues on Environmental Management (Output 1).....	9
2.1.1 Basic Environmental Management Law	9
2.1.2 DoE Organization	11
2.1.3 DoE's Mandate	17
2.1.4 Current Status and Issues on Water Pollution Control.....	18
2.1.5 Current Status and Issues on SWM.....	24
2.2 Capacity Development Activities (Output 2)	31
2.2.1 Activities on Examination of Capacity Development for DoE.....	31
2.2.2 Activities in Water Pollution Control	34
2.2.3 Activities in SWM	40
2.2.4 Final seminar.....	53
3. Issues, Measures, and Lessons Learned in Project Implementation and Management	57
3.1 Overall Issues, Measures, and Lessons	57
3.1.1 Necessity of Fostering Comprehension on JICA Technical Cooperation at Begging of Project	57
3.1.2 Implementation of Project Activities in Epidemic of COVID-19.....	57
3.1.3 Hiring Local Experts	57
3.2 Water Pollution Control Component	58
3.3 SWM Component.....	58
3.3.1 Developing Relations with DoE's Waste and Chemical Management Wing.....	58
3.3.2 Execution of Technical Cooperation Involving Relevant Organizations.....	59
4. Achievements of Outputs	60
4.1 Output 1: Legal and institutional issues in water pollution countermeasures and solid waste management related to administrative mandate of DoE are identified.	60
4.2 Output 2: Analysis and examination on the required CD are conducted for comprehensive environmental management by DoE	60
5. Recommendations	66
5.1 Recommendations for Achieving Overall Goals	66
5.1.2 Water Quality Management	66
5.1.3 Waste Management Field.....	67

Appendices: Technical Cooperation Products

List of Tables

	Page
Table 1-1	Outline of Main Activities of the Project..... 2
Table 1-2	Summary of Workshops and Assistance on Laboratory (Water Pollution Control) 3
Table 1-3	Summary of Workshops (SWM) 4
Table 1-4	Expected Activities in Future by DoE 4
Table 2-1	Outlines of Basic Environmental Management Law and Regulation 9
Table 2-2	Summary of Revisions in ECR in 2023 10
Table 2-3	Major DoE Managers Collaborated for the Project 12
Table 2-4	Outline of Main Wings of DoE Headquarters..... 12
Table 2-5	Environmental Standards for Surface Water (ECR2023) 20
Table 2-6	Other Donors' Support for Water Pollution Control..... 22
Table 2-7	Summary of BEST Project 22
Table 2-8	Law and Rules Related to Solid Waste Management 24
Table 2-9	Relevant Other Donor's Projects 30
Table 2-10	Outline of 1st Workshop on Water Pollution Control..... 35
Table 2-11	Outline of 2nd Workshop on Water Pollution Control 35
Table 2-12	Overview of Activities to Support Obtaining Lab Certification 38
Table 2-13	Summary on Main Tasks to be Conducted for Obtaining ISO for Chattogram Environmental Analysis Laboratory 39
Table 2-14	Outline of the First Workshop on Waste Management..... 50
Table 2-15	Outline of 2 nd Workshop on SWM..... 50
Table 2-16	Overview of Final Seminar 54
Table 2-17	Expected Activities in Future by DoE 54
Table 4-1	Current Status, Issues and Expected Future Activities in Water Pollution Control Sector 62
Table 4-2	Current Status, Issues and Expected Future Activities in SWM Sector..... 64

List of Figures

		Page
Figure 1-1	Water Quality of Buriganga River (2018).....	6
Figure 1-2	Water Quality Trends of Buriganga River (2010-2018).....	7
Figure 2-1	DoE Organization	15
Figure 2-2	Divisional Office of DoE.....	16
Figure 2-3	Revision of EIA Procedures by the Revised ECR (2023)	19
Figure 2-4	Historical Record regarding the Formulation of Waste-related laws and Strategies	24
Figure 2-5	Major Ministries and Agencies and Local Governments under SWM Rule	28
Figure 2-6	Flow of SWM by Local Governments.....	29
Figure 2-7	Budget Allocation Plan for Training Planned by DoE in 2023-24.....	32
Figure 2-8	Responses to Questionnaire regarding Training Needs	33
Figure 2-9	Example of Slides used in Workshop on Water Pollution Control (Comparing the contents between Bangladesh ECR and Water Pollution Control Act in Japan).....	36
Figure 2-10	Example of Slides used in Workshop on Water Pollution Control (Wastewater treatment mechanism)	37
Figure 2-11	Example of Slides used in Workshop on Water Pollution Control (Basic information of wastewater treatment with exercises).....	38
Figure 2-12	Image of Cooperation between DoE and Local Governments (LGI).....	41
Figure 2-13	Establishment of a Working Group within the National Coordination Committee	42
Figure 2-14	History of Legal and Policy Systems Development related to SWM and Necessary Actions for Its Improvement	43
Figure 2-15	Development and Capacity Building of Municipal Waste Management Systems with Expected Coordination with Relevant Stakeholders	44
Figure 2-16	Example of Monitoring Sheet Summarizing SWM Data for Local Governments in Japan.....	45
Figure 2-17	Example of Waste Flow in Japan Summarizing SWM data for Local Governments.....	45
Figure 2-18	Necessary Activities for Development and Capacity Building of Industrial Waste Management Systems with Expected Coordination with Relevant Stakeholders	46
Figure 2-19	Relevant Laws concerning recycling-oriented Society and Waste Management in Japan	47
Figure 2-20	Monitoring System for Industrial Waste including Hazardous Waste	47
Figure 2-21	Development and Capacity Building of Medical Waste Management Systems with Expected Coordination with Relevant Stakeholders	48
Figure 2-22	Proposal for a Future DoE Waste and Chemical Wing Organizational Structure..	49
Figure 2-23	Targets of New Clean Dhaka Master Plan 2018-2032	52

List of Photos

		Page
Photo 1-1	Status of a Waterway (Tonga Khal) in Dhaka City	6
Photo 1-2	Open Damping of Existing Final Disposal Sites in the Surrounding Cities of Dhaka City (Gazipur City).....	8

Abbreviations

3R	Reduce, Reuse and Recycle
ADB	Asian Development Bank
ADG	Additional Director of General
BEST	Bangladesh Environmental Sustainability and Transformation
BOD	Biochemical Oxygen Demand
BWDB	Bangladesh Water Development Board
CAMS	Continuous Air Monitoring System
CBP	Cox Bazar Paurashava
CC	City Corporation
CCC	Chattogram City Corporation
CDM	Clean Development Mechanism
CETP	Common Effluent Treatment Plant
CFU	Colony Forming Unit
CGP	City Governance Project
COD	Chemical Oxygen Demand
CRDP-II	Second City Region Development Project
CRM	Certified Reference Material
CTEIP	Coastal Towns Environmental Infrastructure Project
DD	Deputy Director
DG	Director General
DNCC	Dhaka North City Corporation
DO	Dissolved Oxygen
DoE	Department of Environment
DPHE	Department of Public Health and Engineering
DSCC	Dhaka South City Corporation
ECA	Environmental Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environmental Conservation Rule
EIA	Environmental Impact Assessment
EPR	Extended Producer Responsibility
EQS	Environmental Quality Standard
ETP	Effluent Treatment Plant
FBCCI	Federation of Bangladesh Chambers of Commerce and Industry
FCDO	Foreign, Commonwealth and Development Office
GCC	Gazipur City Corporation
GCGS	Green Credit Guarantee Schemes
GDP	Gross Domestic Product
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HQ	Headquarter
IEE	Initial Environmental Examination
ISO	International Organization for Standardization
IT	Information Technology
JET	JICA Expert Team
JICA	Japan International Cooperation Agency

LGD	Local Government Division
LGED	Local Government Engineering Department
LGI	Local Government Institute
MGSP	Municipal Governance Service Project
MoEFCC	Ministry of Environment and Forest and Climate Change
MoC	Ministry of Commercial
MoF	Ministry of Finance
MoI	Ministry of Industry
NCC	Narayanganji City Corporation
NEAP	National Environmental Action Plan
NRM	Natural Resource Management
PR	Progress Report
RDF	Refuse Derived Fuel
RS	Remote Sensing
SCRDP	Southern Chattogram Regional Development Project
SDGs	Sustainable Development Goals
SIDA	Swedish International Development Cooperation Agency
SOP	Standard Operating Procedures
SRF	Solid Recovered Fuel
SWM	Solid Waste Management
TDS	Total Dissolved Solids
TOT	Training of Trainer
UDCGP	Urban Development and City Governance Project
UGIIP-III	Third Urban Governance and Infrastructure Improvement Project
UNDP	United Nation Development Programme
WASA	Water and Sewerage Authority
WB	World Bank
WBA	Ward Based Approach
WCM	Waste and Chemical Management
WS	Workshop

1. Introduction

1.1 Background

Bangladesh economy has been maintaining steady growth since 2000. On the other hand, Bangladesh is facing various and serious environmental problems such as air pollution, water pollution, increasing of solid waste generation, and noise pollution due to rapid urbanization and industrialization. Due to discharge of domestic and industrial wastewater without proper treatment, heavy water pollutions are observed not only at urban rivers but also in entire river basins. Population increasing causes concern of negative impact on society by solid waste. The Japan International Cooperation Agency (JICA) has been addressing these environmental issues by strengthening solid waste management (SWM) capacity at the North and South Dhaka City and Chattogram City through technical cooperation and grant aid projects. Other donors, such as the World Bank (WB), have been also providing support for environmental management, including air pollution control, under the framework of aid coordination. The Bangladesh government aims to become a developed country with achieving poverty eradication by 2041. Toward achieving sustainable economic growth, environmental policies for improving human livelihoods and reducing social inequalities are planned to be adopted, as well as reducing risks by environmental problems and ecological losses. In addition, the "Eighth Five-Year Plan" (FY2020/21-FY2024/25) raises improvement of urban environmental management as a prioritized policy, and sets following targets: commencement of operation of the polluter-pays principle, improvement of water quality level in urban area, improvement of air quality, and improvement of the global ranking of the Environmental Performance Index from the bottom 5% (2018) to the top 50% by 2025 and top 30% by 2041. The Government of Bangladesh is progressively taking development approaches based on the Sustainable Development Goals (SDGs).

The Ministry of Environment, Forest and Climate Change (MoEFCC), a supervisory authority for environmental policy in Bangladesh, has developed environmental conservation policies and laws with formulating various plans, strategies, and programs for environmental management. The Department of Environment (DoE) has responsibility to formulate regulations, conduct inspections and monitoring and issue permits and licenses in accordance with superior laws and policies. However, due to a lack of human resources of the DoE, the requirements of the enacted laws and the applied policies for environmental management has not been adopted sufficiently.

Considering the situation mentioned above, this project (the Project) was conducted to identify issues to be addressed for comprehensive environmental management and to provide proposals and advices for capacity and institutional development for implementing environmental management in future, with focusing on water pollution control and SWM that have strong needs on enhancement of environmental management capacity.

1.2 Project Purpose

In Bangladesh, the legal and institutional system for environmental management are insufficient to address environmental problems due to rapid urbanization and industrialization. In order to solve these issues, the Project aims to improve the capacity on environmental management for DoE and relevant organizations in accordance with the present situation.

The project purposes, outputs and activities are as follows.

Project purpose

The issues to be addressed for enhancing environmental management administration mainly in water pollution control and SWM are identified, and the direction for capacity development (CD) of the DoE for conducting comprehensive environmental management is proposed.

Outputs and activities

Output 1: Legal and institutional issues in water pollution countermeasures and SWM related to administrative mandate of the DoE are identified.

Activities 1-1: To identify the current issues on policies, legal systems, implementation structure, and countermeasures etc. against environmental pollution and problem

Activities 1-2: To identify the administrative issues on environmental standards and laws, regulations and guidelines related to inspection and monitoring in water pollution control and SWM

Activities 1-3: To identify the administrative issues in the future considering the planned and implemented relevant projects by other donors in water pollution prevention measures and SWM

Output 2: Analysis and examination on the required CD are conducted for comprehensive environmental management by the DoE.

Activities 2-1: To provide support and advice on administrative environmental management for clear demarcation among the DoE, relevant ministries and local government, and CD for coordination and cooperation among the concerned administrative bodies

Activities 2-2: To provide support and advice on policies, regulations, institutional structure, implementation plan, and human resource development of the DoE

Activities 2-3: To hold the trainings, workshops and seminars for the MoEFCC and the DoE officers

1.3 Outline of the Project

The activities of the Project were conducted as follows.

Work Period : December 2021 to November 2023

Counterpart : DoE

Main Activities : The outline of the activities is shown in Table 1-1.

Table 1-1 Outline of Main Activities of the Project

Year and Month	Water Pollution Control	SWM
	• Output 1: Identifying the existing administrative issues on environmental management	
2022.2	• Collecting information on legal systems	
2022.3	• Holding a kick-off meeting	
2022.5-6	• Collecting information on water	• Collecting information on SWM

Year and Month	Water Pollution Control	SWM
	pollution control	
2022.8	<ul style="list-style-type: none"> • Holding a Coordination Meeting 	
2022.9-11	<ul style="list-style-type: none"> • Examining the issues on water pollution control 	<ul style="list-style-type: none"> • Examining the issues on SWM
2022.12-2023.1	<ul style="list-style-type: none"> • Holding a workshop for examining issues related to water pollution control (administrative system for wastewater control and wastewater treatment technique) 	<ul style="list-style-type: none"> • Holding a workshop for examining issues related to SWM (administrative system for SWM)
2023.5	<ul style="list-style-type: none"> • Sharing a finding reports and discussing the identified issues on water pollution control with DoE 	<ul style="list-style-type: none"> • Sharing a finding reports and discussing the identified issues on SWM with the DoE
<ul style="list-style-type: none"> • Output 2: Providing proposals for strengthening future environmental management capacity 		
2023.2-3	<ul style="list-style-type: none"> • Providing supports for Chattogram DoE laboratory accreditation 	/
2023.7	<ul style="list-style-type: none"> • Holding a workshop for clarifying the future activities 	<ul style="list-style-type: none"> • Holding a workshop for clarifying the future activities
2023.8-10	<ul style="list-style-type: none"> • Preparing a Final Seminar by DoE and summarizing proposals 	
2023.11	<ul style="list-style-type: none"> • Holding a Final Seminar • Preparing a Project Completion Report 	

Source: JICA Expert Team (JET)

Holding of workshops were the main activities in the Project. The workshops were held totally 4 times in the Project, of which breakdown is 2 times each for water pollution control and SWM. Through the workshops, priority issues to be addressed and expected activities by the DoE in future for enhancing environmental management were examined with introducing referential information such as Japanese environmental management system and basic wastewater treatment technology. Regarding water pollution control, the Project also provided technical support to Chattogram environmental analysis laboratory for a gap analysis to confirm current issues and proposing required activities, an activities schedule and indicative cost for accreditation of the laboratory in the future.

Table 1-2 Summary of Workshops and Assistance on Laboratory (Water Pollution Control)

Workshop	Date	Participants		Contents
1st Workshop	1st February 2023	35 persons	DoE	<ul style="list-style-type: none"> • Exercise on basic knowledge of treatment technique of effluent treatment plant (ETP) • Introduction of legal system and history of water pollution control in Japan • Discussion of priority issues to be addressed by the DoE
2nd Workshop	9th July 2023	26 persons	DoE	<ul style="list-style-type: none"> • Discussion of priority activities to be conducted by the DoE in future
Assistance on Environmental Analysis for	From 15th to 16 th March 2023	10 persons	Environmental Analysis Laboratory of	<ul style="list-style-type: none"> • Gap analysis on quality control of the laboratory

Workshop	Date	Participants		Contents
Accreditation of Environmental Analysis Laboratory			Chattogram DoE	<ul style="list-style-type: none"> • Examination on required activities, schedule and budget for accreditation of the laboratory

Source: JET

Table 1-3 Summary of Workshops (SWM)

Workshop	Date	Participants		Contents
1st Workshop	21st December 2023	51 persons	DoE, Dhaka North City Cooperation (DNCC), Dhaka South City Cooperation (DSCC), Chattogram City Cooperation (CCC) and other surrounding city corporations	<ul style="list-style-type: none"> • Introduction of SWM system with example of SWM activities at field in Japan • Discussion of priority issues to be addressed by the DoE
2nd Workshop	20th July 2023	38 persons	DoE, DNCC, DSCC, CCC and other surrounding city corporations, and donors such as WB and Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ)	<ul style="list-style-type: none"> • Introduction of requirements regulated by Solid Waste Management Rule (SWM Rule) for monitoring and planning by local governments • Introduction and sharing of SWM plans of the DNCC and the DSCC • Discussion of priority activities to be conducted by the DoE in future

Source: JET

Based on the findings obtained through the Project, the priority activities to be conducted by the DoE in future were finally summarized as shown Table 1-4. These activities were shared with stakeholders by the DoE and JET at the final seminar held in November 2023.

Table 1-4 Expected Activities in Future by DoE

Area	Current Institutional Aspect	Expected Activities in Future by DoE
Water Pollution Control	Environmental Conservation Rule (ECR) was revised in 2023 and the requirement of water quality monitoring and wastewater	<p>(Activities to be conducted in short term)</p> <ul style="list-style-type: none"> • To provide continuous technical training for proper inspections on industrial wastewater sources and issuing and updating Environmental Clearance Certificates (ECC). • To provide trainings for proper operation of laboratory equipment for environmental analysis and ensuring quality of analytical results.

Area	Current Institutional Aspect	Expected Activities in Future by DoE
	monitoring was enhanced.	<ul style="list-style-type: none"> • To conduct required activities for accrediting of DoE's environmental analysis laboratories. (Activities to be conducted in long term) <ul style="list-style-type: none"> • To strengthen collaboration with the related ministries and the agencies to examine pollution loads including impacts of wastewater other than industrial wastewater • To examine systems to realize wastewater management in river basin level by collaboration with the related organizations • To address transboundary pollution issues in international rivers, etc.
SWM	The SWM Rule was enacted in 2021, and it was clarified of the obligation to report waste generation and treatment status and to formulate a management plan.	(Activities to be conducted in short term) <ul style="list-style-type: none"> • To identify issues that prevent local governments from conducting the activities requested by SWM Rule with collecting good practices. • To provide trainings for strengthening the capacity for guiding and encouraging local governments to ensure monitoring and SWM planning with developing assistant tools. • To conduct pilot monitoring activities on industrial waste management with consultation to the relevant stakeholders including concerned private sectors. • To enhance the institutional system of SWM such as expanding of WCM Wing and setting working groups under the National Coordination Committee (Activities to be conducted in long term) <ul style="list-style-type: none"> • To develop a comprehensive monitoring system on industrial waste generation and treatment status

Source: JET

1.4 Status of Wate Pollution Control and SWM

1.4.1 Status of Water Pollution Control

(1) Legal System and Implementation Mechanism of Central Ministries and Agencies

The DoE under the MoEFCC have responsibility to manage water quality in Bangladesh. As basic law and rule, the ECR was enacted in 1997 in accordance with the Environmental Protection Act (ECA) enacted in 1995. The ECR regulates environmental water quality standards and effluent standard, and the installation of ETPs in enterprises was stipulated. However, several hindrances, such as installation and maintenance costs of proper ETP, has disturbed installation of them, and water pollution has become conspicuous around Dhaka City, where leather and textile industries were concentrated. As a result, four rivers (Buriganga river, Shitalakshya river, Turag river, and Balu river)

were designated as ecological critical areas in 2009. Subsequently, the ECR was revised in 2023 with increasing new parameters on environmental water quality standards and effluent standards. However, the revised ECR does not have technical explanation on the newly added parameters, and it is considered that training and capacity building for officers who engage water pollution control.

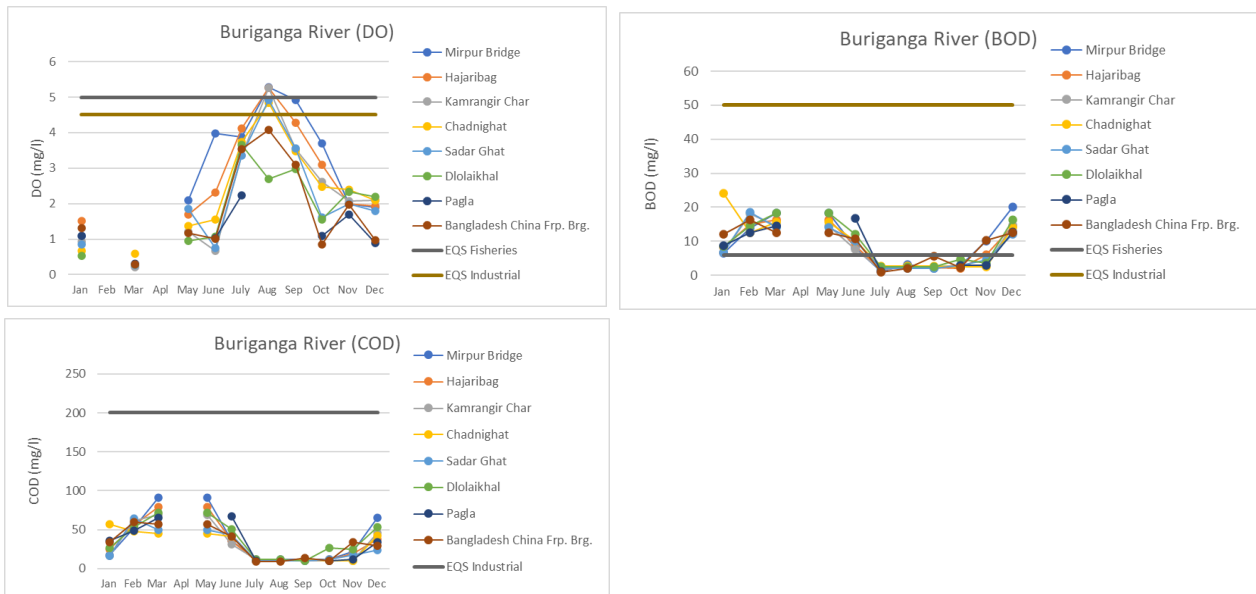
(2) Water Pollution Status and Water Quality Monitoring

The DoE had started environmental water monitoring in 1973. Surface water quality monitoring is carried out at 66 sites in 28 rivers. The number of measured parameters is 12, such as pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), and chemical oxygen demand (COD) every month. The monitoring results show concern on water pollution by domestic wastewater and industrial wastewater in rivers flowing major cities such as Dhaka, Chattogram, and Kluna. In particular, water quality deteriorated seriously during dry season when water volume decreased. At Dhaka City and its surrounding area, a part of the monitoring points showed suboxic condition and heavy organic pollution with almost 0 mg/L of DO, 50 mg/L of BOD and 200 mg/L of COD in 2016. The latest edition of the monitoring report for water bodies is the “2018 Water Quality Report” by the DoE. The water quality of the Buriganga River near Dhaka city in this report is shown in the Figure 1-1 as an example.



Source: JET

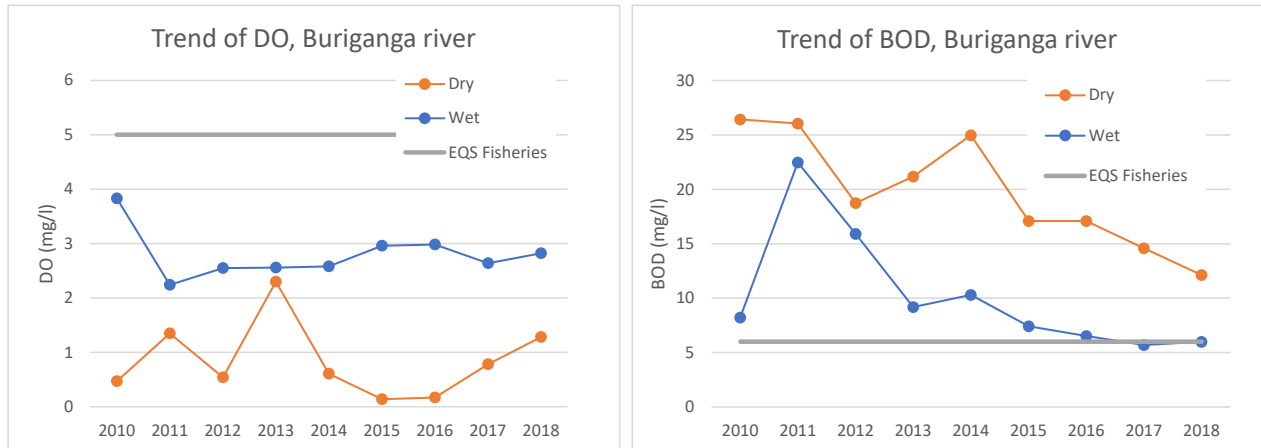
Photo 1-1 Status of a Waterway (Tonga Khal) in Dhaka City



Source: JET created the graph from the data of Surface and Ground Water Quality Report 2018

Figure 1-1 Water Quality of Buriganga River (2018)

The result of the latest survey shows a trend of low concentrations of DO and increasing of BOD and COD during the dry season. These results were measured in the mainstream of the Buriganga River. The water quality of tributaries of Buriganga River shows above 50 mg/L BOD and 200 mg/L COD, respectively, as was the case in 2016. The recent water quality trends in the Buriganga River are shown in Figure 1-2.



Source: JET created the graph from the data of Surface and Ground Water Quality Report 2018

Figure 1-2 Water Quality Trends of Buriganga River (2010-2018)

In recent years, water quality trends have shown that DO has remained as similar concentration level but BOD has been improved. However, all monitored figures still exceeds environmental standards.

With the deterioration of water quality in the dry season, the amount of groundwater intake has been increased. Regarding industrial wastewater, leather and dyeing industry containing heavy metals has occupied a large portion. Although many parameters including heavy metals are regulated as effluent standard, analyzed parameters are currently limited, hence, pollution by the parameters affecting human health such as heavy metals in environmental water have not been grasped.

1.4.2 Overview of Solid Waste Management (SWM)

(1) Legal System and Implementation Mechanism of Central Ministries and Agencies

The DoE is in charge of developing a legal system for SWM and has responsible for the supervising and monitoring of SWM executed by local government and guiding industrial waste management against private sector as a regulatory authority. Meanwhile, Local Government Division (LGD) of the Ministry of Local Government, Regional Development and Cooperation has responsible for supervising SWM by local governments and technical support for the planning and facility implementation. Practical work of SWM (equipment procurement, facility development, operation and maintenance) are implemented by local governments under LGD. In Bangladesh, The hazardous Waste and Ship Breaking Waste Management Rule, the Hazardous Waste (E-waste) Management Rule, and the Medical Waste Management Processing Rule have been enforced and the SWM Rule, the basic regulation for SWM, was established in 2021. On the other hand, laws on hazardous waste other than E-waste and ship breaking waste, basic laws for a recycling-oriented society, reductions in single-use plastics, and legal systems regarding green purchasing have not yet been enacted. It can be said that the waste-related legal system is still under development.

(2) Status of SWM

In the field of SWM in Bangladesh, JICA has been continuously providing the support during about 20 years since the development study was started in 2003. The support were mainly for North and South Dhaka City and Chattogram City in the areas of collection and transportation, final disposal, organizational improvement, environmental education, and 3R (Reduce, Reuse and Recycle), etc. with various programs such as technical cooperation projects, grant aid projects (General Grant Aid, Program Grant Aid for Environment and Climate Change, Grant Assistance for Grassroots Human Security Projects, etc.), and cooperation with the Japan Overseas Cooperation Volunteers. Regarding the collection rate, it was over 80% in North-South Dhaka City and Chattogram City. On the other hand, in rural cities, the rate was from 50% to 60% (Paurashava¹), and waste collection services are not provided in regions (Upazila²). Semi-aerobic landfill sites have been developed in North and South Dhaka City, but open dumping is generally observed in the cities surrounding Dhaka City and the regional cities.



Source: JET

Photo 1-2 Open Damping of Existing Final Disposal Sites in the Surrounding Cities of Dhaka City (Gazipur City)

¹ Paurashava is an administrative unit of local government in Bangladesh, translated as Municipality.

² Upazila is an administrative unit of local government in Bangladesh, translated as Sub District.

2. Project Activities

2.1 Activities for Identifying Issues on Environmental Management (Output 1)

2.1.1 Basic Environmental Management Law

(1) Overview

The basic laws concerning environmental management in Bangladesh are shown in Table 2-1.

The basic law on environmental management is the ECA, and the regulation stipulating the detailed rules for implementing the requirements in ECA is the ECR.

Table 2-1 Outlines of Basic Environmental Management Law and Regulation

No.	Name	Year	Contents
1	National Environmental Policy	1992, In 2018 (Last update)	<p>The National Environmental Policy provides a set of sectoral action guidelines for the implementation of environmental policies, including the following items:</p> <ul style="list-style-type: none"> • Monitoring and management of environmental pollution activities • Implementation of environmental-friendly development in all fields • Use of natural resources with both sustainable and environmentally friendly manners • Promotion of regional and international mutual cooperation for global environmental conservation • Building capacity and developing public opinion on environmental education and conservation • harmonizing environmental policies and strategies with policies and strategies in other fields • Implementation of environmental impact assessments and strategic environmental impact assessments in all necessary sectors • Active involvement in international environmental initiatives and implementation of necessary actions at the national and local levels
2	Bangladesh Environment Conservation Act (ECA)	1995 (Revised in 2010 and 2023)	<p>This Act stipulates the authority of the Director-General of the DoE to conduct appropriate and necessary activities concerning pollution control, prevention and mitigation for environmental conservation.</p> <p>In addition, the followings are stipulated.</p> <ul style="list-style-type: none"> • Establishment of Ecologically Critical Area • Obligation on acquiring ECC • Policy on regulating vehicle emission • Obligation to promulgate standards for air, water, noise, and soil by regions and purposes • Permissible limits for waste discharge • Establishment of environmental guidelines for the management and reduction of environmental pollution, conservation, and environmental improvement

No.	Name	Year	Contents
3	Environmental Conservation Rules (ECR)	1997 (Revised in 2023)	<p>The ECR in 1997 was promulgated based on the ECA in 1995. The ECR regulates the followings:</p> <ul style="list-style-type: none"> • National environmental quality standards (EQS) for air, surface water, groundwater, drinking water, industrial wastewater, emissions, noise, and vehicle emissions • Environmental Impact Assessment (EIA) implementation process • ECC retrieval process • Procedures for implementing Initial Environmental Examination (IEE) and EIA according to categories of industrial/development projects/activities • Requirements of the environmental management plan • Procedures for claims on damages due to environmental pollution by persons Affected or potentially affected
4	National Environmental Action Plan (NEAP)	1995	NEAP shows the Environmental Management Action Plan from 1995 to 2005. Action plans are presented for the identification of major factors affecting the environment in the country, proposals for measures to prevent and reduce environmental degradation, restoration of the natural environment, and promotion of sustainable development.
5	Environmental Court Act	2000 (Revised in 2002 and 2010)	The Environment Court Act stipulates establishment of the environment court and the matters incidental thereto. It also provides the jurisdiction of the environmental court, penalties for violations of court orders, judicial proceedings in the special magistrates court, investigative proceedings, the supervision of the environmental court, appellate proceedings and the establishment of appellate courts.

Source: JET

(2) Outline of Revision of ECR

The ECR was revised in 2023. Major revisions are shown in Table 2-2. The revised contents are a part of EIA procedures and ECC obtaining procedures, water environmental standards and wastewater standards with adding new parameters and updating some of standard figures. Currently, the DoE analytical laboratories do not have capacity to analyze all of the additional items adequately.

Table 2-2 Summary of Revisions in ECR in 2023

Key Revisions		Content
EIA	Revision of Target Sectors	Revising business classification according to the degree of environmental impact (Note: Business is categorized by colours according to degree of environmental impact in Bangladesh) <ul style="list-style-type: none"> • Add a new category (yellow category)
	Reporting	<ul style="list-style-type: none"> • Providing guidance on the preparation of EIA reports • Describing EIA report assessment/approval process • Updating EIA approval costs
ECC	ECC acquiring process	<ul style="list-style-type: none"> • Updating ECC acquiring process

Key Revisions		Content
	Expiration date	<ul style="list-style-type: none"> • Updating ECC expiration dates for green category and yellow Category
Evaluation and compensation for environmental damage	-	Adopting ECC suspension procedures for business proponents who caused environmental damage due to improper pollution control
Environmental and emission standards	-	<p>Surface water quality:</p> <ol style="list-style-type: none"> 1. Terrestrial surface water quality: <ul style="list-style-type: none"> • Adding new parameters such as total dissolved solid (TDS), COD, NO₃-N, NH₄-N, PO₄-P Cr, and Pb 2. Coastal surface water quality <ul style="list-style-type: none"> • Adding 16 parameters 3. Drinking water quality <ul style="list-style-type: none"> • Deleting BOD • Adding pesticides (aldrin/dieldrin) and surfactants 4. Sewage effluent <ul style="list-style-type: none"> • Revising NO₃-N and PO₄-P standard values more strictly 5. Industrial wastewater <ul style="list-style-type: none"> • Setting new standards of wastewater discharged to coastal area • Adding residual chlorine and bioassay tests (for pesticides manufactures only) 6. Wastewater by each industrial sector <ul style="list-style-type: none"> • Industries on fertilizer, pulp and paper, distillery, sugar, food processing, fish processing and dairy products manufacturing: Water temperature standard value was added. • Textile industry: Colour, water temperature and COD standard values were added. • Dyeing and printing industries: Sulphides, phenolic compounds, Pb, Cd, Co, and Ni were added. • Leather tanning: Chlorine and phenol were added. • Industries on food processing, fish processing, and dairy products: pH standard value was added. • Crude oil refinery: 10 parameters were added. • Agrochemical Industry: 35 parameters were added. • Battery, paint, and ceramic tiles industries: Hygiene-related parameters were added.

Source: JET

2.1.2 DoE Organization

(1) Overview

An environmental management system in Bangladesh was initiated based on discussions at the United Nations Conference on the Human Environment in 1972. In 1977, the Environmental Pollution Control Committee and the Environmental Pollution Control Headquarters were established. After the establishment of the Environmental Pollution Control Department in 1985, the DoE was established in 1989. In addition to the headquarters, the DoE has divisional offices in Dhaka, Chattogram, Khulna, Bogra, Barisal, Sylhet, Rangpur, Mymensingh and has 49 district offices to carry out environmental administration. According to interviews with the DoE Headquarters, although 1,133 officers currently

planned to be assigned, the actual number of officers assigned is 586 in March 2023. Figure 2-1 shows the organizational chart of the DoE, and Figure 2-2 shows distribution of the divisional offices.

While the DoE is suffering from a shortage of personnel, the DoE plans to employ 4,392 personnel in the future. Therefore, it will be important to carry out technical training for newly hired officers with grasping the capacities of each officer in addition to the officers who are already in charge of their duties.

(2) Organizational structure of DoE headquarter

The managers of the main DoE wings in the headquarters co-working for the project are listed in Table 2-3.

Table 2-3 Major DoE Managers Collaborated for the Project

Section	Position and roles
DoE	Director General (DG) : Chief representative of DoE
	Additional Director of General (ADG) : Assistant of DG
Natural Resource Management (NRM) Wing	Director : Wing manager and focal point of the Project Deputy Director (DD) : Assistant of director and main counterpart of water pollution control component for the Project
Waste and Chemical Management (WCM) Wing	Director : Wing manager DD : Assistant of director and main counterpart of SWM component for the Project
Monitoring & enforcement Wing	DD : Assistant of wing director The Project discussed issues and required activities on inspection of wastewater sources.
Planning Wing	DD : Assistant of wing director The Project collect information on progress of Bangladesh Environmental Sustainability and Transformation (BEST) Project by WB.
Environmental Clearance Wing	Director : Wing manager The Project discussed issues and required activities on issuing and updating process of ECC and EIA procedure related to evaluation of effectiveness and appropriateness of ETP equipped at wastewater sources.

Source: JET

The outline of main wings of the DoE Headquarters are summarized in Table 2-4.

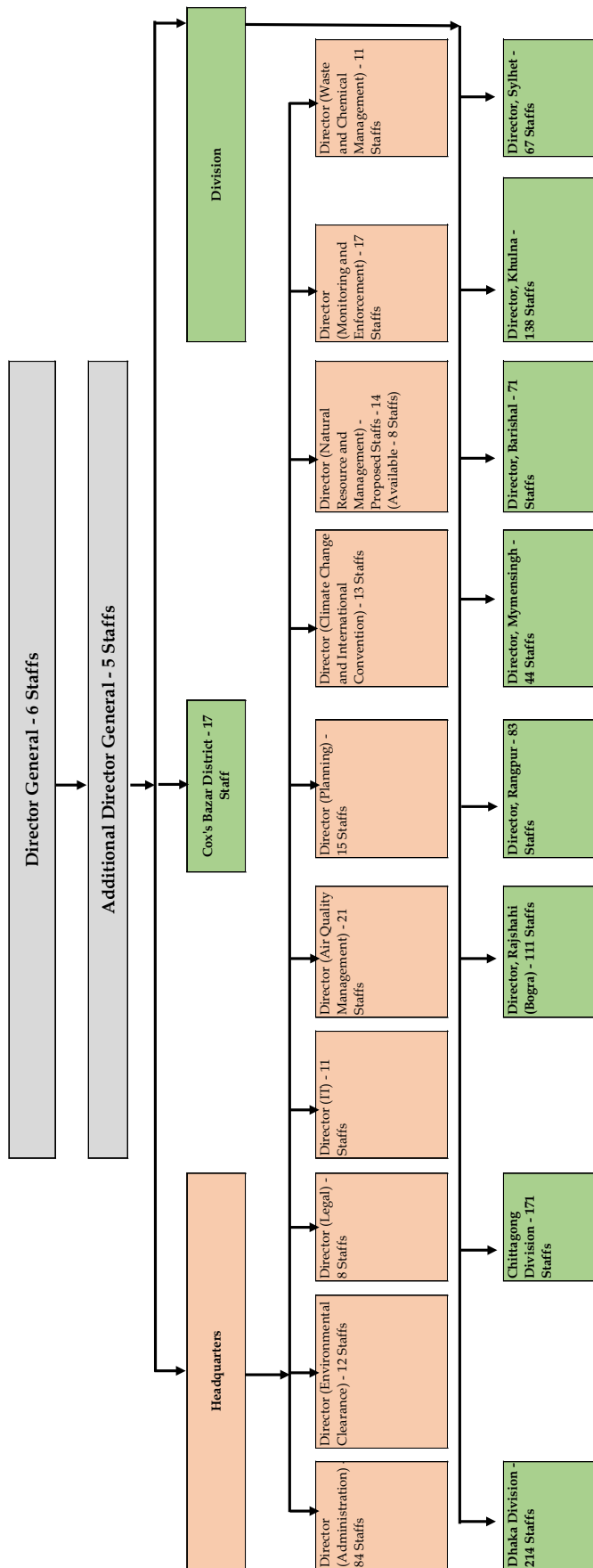
Table 2-4 Outline of Main Wings of DoE Headquarters

Department Name	Overview
Natural Resource Management Wing (NRM Wing)	<ul style="list-style-type: none"> • The main duties are as follows. <ul style="list-style-type: none"> - Environmental water quality monitoring - Educational activities - River environmental management and Natural Ecosystem Management • Activities in collaboration with other departments are also implemented. <ul style="list-style-type: none"> - EIA reviews (cooperating with Environmental Clearance Wing)

Department Name	Overview
	<ul style="list-style-type: none"> - Pollution Source Control (cooperating with Monitoring and Enforcement Wing) • Water management is implemented, coordinating with relevant organizations. <ul style="list-style-type: none"> - River water management: Ministry of Shipping - Water resource management: Ministry of Water Resource - Utilization of agricultural water: Ministry of Agriculture
Waste and Chemical Management Wing (WCM Wing)	<ul style="list-style-type: none"> • The WCM Wing was newly established wing in 2020. Organizational capacity building is required. • Although cooperation with local governments has not been carried out sufficiently so far, it is regulated as a result of enforcement of SWM Rule. The SWM Rule emphasizes the capacity development of the DoE and local officers. • The main duties of this wing are as follows. <ul style="list-style-type: none"> - Providing import license for hazardous chemicals - Monitoring hazardous waste - Developing legal system for waste management - Monitoring waste management by local governments • Activities in collaboration with other departments are also implemented. <ul style="list-style-type: none"> - EIA reviews (cooperating with Environmental Clearance Wing) • Management activities are also conducted in collaboration with other government agencies and local governments. <ul style="list-style-type: none"> - Based on the SWM Rule enforced in 2021, DoE's mandate on monitoring of the waste management carried out by each local authority was clarified. - Cooperation with the LGD, the Local Government Engineering Department (LGED) and the Department of Public Health and Engineering (DPHE) is not sufficient in existing condition. - Based on the SWM Rule, SWM plan and annual report prepared by local governments will be reviewed by the DoE.
Monitoring and Enforcement Wing	<ul style="list-style-type: none"> • Monitoring and Enforcement Wing carries out inspection to enterprises as daily work. The inspection would be undertaken upon request from the relevant authorities. • A fine is imposed on cases that the inspection finds failure to comply with emission/effluent standards. The amount of the fine to be bore by enterprises is calculated with the default penalty unit fee depending on type of discharged substance discharged, and duration of non-compliance. • If any enterprise do not pay a fine noted, penalty measures will be taken such as revoke of business license, and outage of electricity and water

Department Name	Overview
	supply.
Environmental Clearance Wing	<ul style="list-style-type: none"> • Environmental Clearance Wing examines and evaluates documents submitted by project proponents, such as EIA in accordance with the ECR. In case that the application satisfies the contents of the ECR, an ECC is issued. • The ECC needs to be updated periodically, and the Environmental Clearance Wing has responsible for this renewal work.
Planning Wing	<ul style="list-style-type: none"> • Planning Wing prepares future action plan for the DoE and functions as the contact point for the respective donor projects. • According to the Planning Wing, organizational strengthening of the DoE is required. The DoE has already defined the gap between the organizations needed to achieve the goals and the existing organizations, and has proposed a new organizational structure to implement comprehensive environmental controls consisting of around 4,392 staffs. • The DoE's comprehensive capacity-building program has been submitted to the Planning Commission and has been initiated.
Human Resource Development Wing	<ul style="list-style-type: none"> • The Human Resource Development Wing works for identifying the training needs of DoE, and plans and conducts the training. • The trainings consists of 3 groups; basic training for obtaining knowledge as administrative officer, training for obtaining fundamental knowledge on environment, and technical training based on the training needs analysis.

Source: JET



Note : The wings in headquarter are shown by vermilion boxes and the divisional offices are shown by greenish brown text boxes.
Source: JET

Figure 2-1 DoE Organization



Source: JET

Figure 2-2 Divisional Office of DoE

2.1.3 DoE's Mandate

DoE's primary task is to implement regulatory activities related to environmental management. According to DoE's web website, the main duties of DoE are as follows.

General environmental management

- To provide suggestions and recommendations on environmental management based on reviews and evaluations of various projects by governmental and private sectors
- To promote active environmental management in collaboration with domestic ministries and agencies, subordinate organizations, and local governments, as the member of Upazilla-level committees in the district

Actions related to EIA and ECC

- To conduct review and approve on environmental impact assessment (EIA) reports with providing advices
- To evaluate the content of environmental considerations by enterprises based on requirements of ECA and ECR, and issue ECC
- To conduct inspection and reissue ECC based on the applications submitted by enterprises

Monitoring, Inspection and Response to Complaints

- To monitor air and water quality, and analyze emission and wastewater by periodical sampling and to store environmental monitoring data, and prepare monitoring reports for rivers, ponds, wells, and drinking-water in various areas of the country
- To conduct inspections for new or existing plants/projects
- To receive complaints on environmental pollution, and conduct surveys, to prevent indiscriminate logging and to investigate vehicles discharging non-compliance emission
- To issue environmental clearance documents for applicants based on the inspection results

Providing of Penal Provisions

- To raise a lawsuit to the Environmental Court for examining necessity of providing penal provisions to a person or organization that has violated ECA and ECR regulations and to identify the enterprises generating pollution, and to provide legal measures to the violator
- To collect compensation fee from polluters

Waste Management

- To prepare comprehensive SWM plan based on the national strategy regarding SWM
- To supervise and coordinate with local governments concerning SWM

Measures on Climate Change

- To take actions at the national and international levels to address the impacts of climate change

Natural Environment Conservation

- To designate and manage ecological critical areas
- To conserve valuable species

- To lead initiatives for biodiversity conservation

Actions related to International Initiatives

- To implement measures to fulfil national and regional obligations under various international environmental conventions, agreements and protocols

Management of Chemical Substances

- To control import, transportation, usage of hazardous chemical substances
- To control ozone-depleting substances

Educational Activities

- To foster public awareness on environmental management and to provide environmental information, and conduct public relations activities
- To conduct partnership activities with various social, cultural and economic organizations to promote public participation in environmental conservation and management
- To implement various training programs, workshops, exchange meetings that aim at capacity building for public and private sectors related to environmental conservation and management

Surveys and Research

- To conduct various projects and research on important environmental issues

2.1.4 Current Status and Issues on Water Pollution Control

(1) Identification of Administrative Issues on Environmental Standards, Laws, Regulations and Guidelines related to Inspection and Monitoring on Water Pollution Control

1) Standards for Water Pollution Control and DoE's Environmental Administration Activity

In the field of water pollution control, DoE conducts administrative measures based on the ECA and the ECR. The ECA is the basic law on the whole environmental protection activity, and the policy on the whole environmental protection activity is prescribed. On the other hand, the ECR stipulates the actual environmental protection procedures for governmental and private sectors concerning administrative procedures on issuing the ECC. In addition, the ECR also regulates water quality standards, and stipulates the practical procedures for water pollution control in Bangladesh. Activities for preventing water pollution by the DoE are conducted under the ECC issuing and updating system. Industrial and newly developed projects categorized in the ECR need to obtain the ECC prior to their operation. Environmental Clearance Wing of DoE reviews and evaluates the application documents submitted by project proponents in accordance with the ECR. Consequently, if the application satisfies the content of the ECA and the ECR, Environmental Clearance Wing issues an the ECC. The ECC contains additional environmental conservation requirements, often describing measures for water pollution control. The examples on the conditions added to the ECC for water pollution control are; request on observation of wastewater standards specified in the ECR, request to equip proper wastewater treatment facilities, request to operate wastewater treatment facilities properly, and so on. Monitoring and Enforcement Wing checks the environmental parameters of the wastewater discharged from the project or industrial plant for which the ECC has been acquired, and imposes penalties and penalties on the project owner or the plant owner. The Monitoring and Enforcement

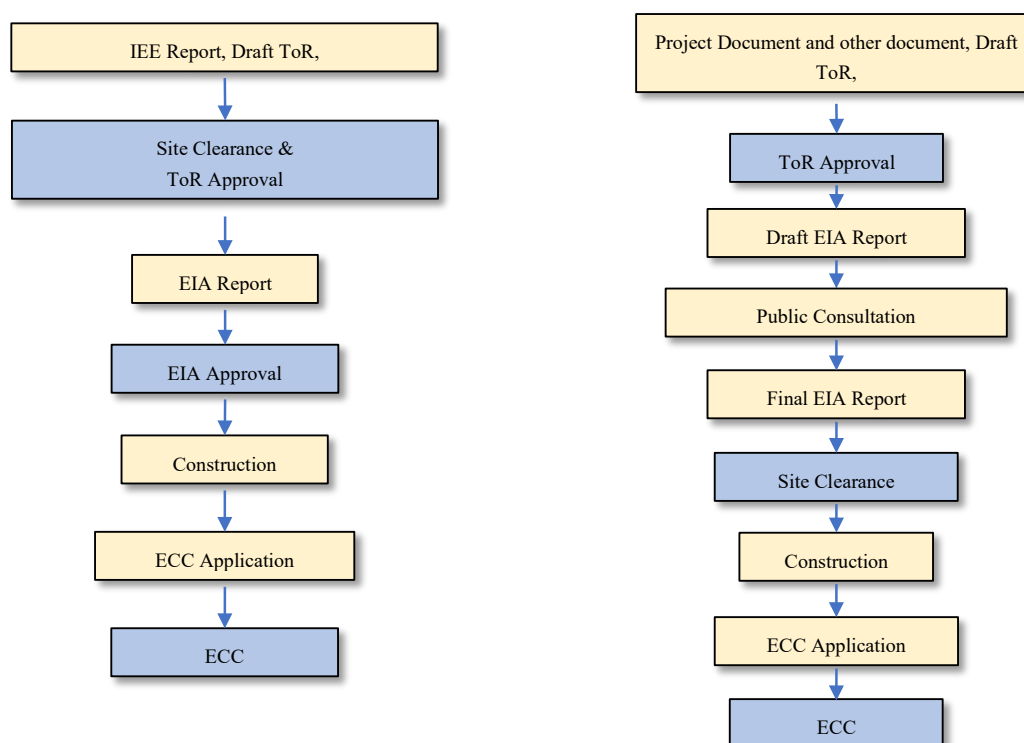
Wing staff shall hold a Mobile Court to determine the amount of fines to the site owner if there is a violation, such as a violation of the wastewater standard. Based on the instructions of the Monitoring and Enforcement Wing, the DoE region office staff inspects the plant where the local ECC was obtained and sends the sampled samples to the DoE laboratory. The Monitoring and Enforcement Wing shall determine a non-penal fine based on the findings of the analyses.

The above is the outline of the administrative activities related to water pollution control of the DoE based on the ECA and the ECR.

2) Administrative Issues related to Water Pollution Control

a) Legal and institutional issues

As an important administrative procedure for water pollution control, the issuing process of the ECC by evaluating appropriateness of ETP needs to be remarked. The process is conducted as a part of EIA procedure. In the revised ECR in 2023, the issuing process of the ECC was revised. In the ECR, category of applied project is classified according to the supposed environmental impact. The categories are classified into 4 levels from low to high environmental impact shown with different colors, green, yellow, orange, and red. The required procedures for acquiring the ECC differ by each category. For example, a project categorized as red category that the largest environmental impact is assumed, an EIA report is required to be submitted. In the revised ECR in 2023, the category classification way was revised. In addition, EIA procedures required for red category project was revised. The following figure compares the revised EIA procedures.



The EIA procedure regulated by ECR (1997)

The EIA procedure regulated by ECR (2023)

Source: JET

Figure 2-3 Revision of EIA Procedures by the Revised ECR (2023)

In DoE, currently, EIA Guidelines based on the ECR in 1997 is being revised. In ECR, the number of parameters regulated environmental and effluent standards for water quality was increased. However, there are no technical explanations of the newly added parameters, and training and capacity building of the officers who execute environmental administration based on these new standards are required. The environmental standards for surface water quality established by the revised ECR are shown in in Table 2-5.

Table 2-5 Environmental Standards for Surface Water (ECR2023)

No.	Type of Water Use	Standard											
		pH	DO Mg/l	BOD Mg/l	NO ₃ ⁻ N Mg/l	NH ₄ ⁺ N Mg/l	PO ₄ ³⁻ -P Mg/l	Total Cr mg/l	Pb mg/l	Hg Mg/l	Total Coliform (CFU*/ 100ml)	TDS** Mg/l	COD mg/l
1	Source of drinking water for supply only after disinfecting:	6.5 – 8.5	≤6	2	7.0	0.1	0.1	0.02	0.03	0.001	100	1000	10
2	Water usable for Recreational activity:	6.5 – 8.5	≤5	3	7.0	0.3	0.5	0.2	0.05	0.001	50	1,000	10
3	Source of drinking water (after Conventional treatment)	6-9	≤5	3	7.0	0.3	0.5	0.02	0.03	0.001	5,000	1,000	25
4	Water usable by fisheries:	6-9	≤5	6	7.0	0.3	0.5	0.05	0.1	0.004	5000	1,000	50
5	Water usable by various process and cooling industries:	6.5 – 8.5	≤1	12	-	2.7	-	0.1	0.1	0.05	-	1,000	100
6	Water usable for irrigation:	6.5 – 8.5	-	12	5.0	1.5	2.0	0.1	0.1	0.002	50,000	1,000	100

*CFU: Colony Forming Unit

** TDS: Total Dissolved Solids

Note) Parameters shown in red color are newly added or revised parameters in ECR (2023).

Source: ECR (2023)

Through water quality monitoring and enforcement conducted by the Monitoring and Enforcement Wing of the DoE, depending on the findings by on-site inspections, the Wing can impose the fines on illegal cases by Environmental Court Act. However, currently no regulations concerning administrative guidance for installing wastewater treatment facilities and improving their operation conditions is existed. Therefore, it is difficult for the DoE to urge enterprises installing appropriate wastewater treatment facilities and guiding proper operation due to lack of legislation.

although fines can be imposed, there is a lack of legislation to encourage the establishment and correct operation of wastewater treatment facilities.

Another legislative issue is lack of legal system for water quality management in river basin level. Though the legal system for water quality conservation on surface water bodies such as rivers is being strengthened, a concept of water quality management in river basin level has not been introduced in Bangladesh. Although protected areas such as Ecological Critical Area are stipulated, no legal system for water quality control at upstream area of the Ecological Critical Area is existed.

b) Issues on Administrative Capacity for Executing Environmental Management

Only the DoE officers have licenses to conduct monitoring and enforcement for water quality management, and Monitoring and Enforcement Wing conducts these activities. However, existing system for implementation of monitoring and enforcement is weak. In general, a large number of factories are located in an industrialized area, but the DoE local offices at such area have just only a small number of inspectors. Guidelines on monitoring and enforcement are currently being developed.

The DoE officers in Environmental Clearance Wing examines applications of industrial enterprises for issuing the ECC, but junior officers need to enhance basic knowledge on wastewater treatment. For review of the submitted EIA documents of Red category projects, the DoE officers require a capacity on detailed design calculation of wastewater treatment facilities, but such knowledge is insufficient.

Currently, the ECA and the ECR mainly target industrial wastewater management, and other types of wastewaters such as domestic and agricultural wastewater are not covered by those law and regulation. As a result, although sewage treatment plant needs the ECC for its construction and operation, the DoE officers have a little knowledge on wastewater other than industrial sector.

c) Issues on Cooperation with Other Ministries and Agencies

Occasional meetings are held with relevant ministries and agencies such as the Bangladesh Water Development Board (BWDB), the Department of Public Health and Engineering (DPHE), and Water and Sewerage Authority (WASA), but those are less frequently and insufficient. No joint activities is implemented with other organizations regarding inspections conducted by subordinate officers of local offices. In addition, cooperation with local governments is not requested. Especially in rural cities with industrial zones, the number of inspections is quite insufficient, comparing with the number of enterprises. The ECR regulates that only DoE officers have authority on issuing the ECC and conducting wastewater monitoring, and DoE exclusively carried out industrial wastewater monitoring and management based on the ECC. This causes shortage of inspectors for industrial wastewater management. As explained, DoE is an exclusive authority to check wastewater quality, but the number of inspectors is insufficient to check enterprises throughout Bangladesh. In the future, it is essential to strengthen relationships with other ministries, agencies and local authorities to share information in water quality management in river basins.

(2) Activities of Other Donors on Water Pollution and Issues to be addressed

Two projects supporting the DoE under the MoEFCC are on-going as other donor initiatives for water pollution control. Meanwhile, several sewage treatment projects are going on by WASA under the Ministry of Local Government, Rural Development and Cooperatives. Table 2-6 shows other donors' support for water pollution control.

Table 2-6 Other Donors’ Support for Water Pollution Control

Agency	Donor	Project	Outline
DoE	WB	BEST Project	The project mainly aims to control the pollutants discharged from industrial sources by launching financial assistance mechanism for installation and operation of ETP. The project also has a component to improve DoE's water quality analytical capacity. The project was commenced from August 2023.
	GIZ	Sustainability in the Textile and Leather Sector (STILE)	The project aims capacity building of the DoE for enforcing environmental standards and legislation in the textile and leather sector with support for wastewater treatment. The project has been commenced from 2020, and ongoing.
WASA	Government of China	Dasherbandi Sewage Treatment Plant (STP)	Construction of Dhaka WASA Dasherbandi Sewage Treatment Plant (Project period: 2015 - 2022)
	Asian Development Bank (ADB)	Rayerbazar STP	Construction of Dhaka WASA Rayerbazar Sewage Treatment Plant (Project period: 2021 - 2026)
	WB	Chittagong Water Supply Improvement and Sanitation Project (CWSISP)	The project prepared a Storm Drainage Master Plan and conduct septic sludge treatment pilot project. (Project period: 2020 - 2022)
	South Korea Environmental Defense Fund	STP Feasibility Study on Catchment 3	Feasibility study of Chattogram WASA Catchment 3 Sewage Treatment Plant
	AFD (French Development Agency)	STP Feasibility Study on Catchment 5	Feasibility study of Chattogram WASA Catchment 5 Sewage Treatment Plant

Source: JET

1) The BEST project

The BEST project is implemented by WB to strengthen capacity of the DoE. The project plans to strengthen the capacity of DoE’s environmental analytical laboratory with procuring environmental monitoring-related equipment as various components. The outline of the project is shown in Table 2-7.

Table 2-7 Summary of BEST Project

Item	Content
Purpose	<ul style="list-style-type: none"> Strengthen the government's environmental management capacity in Bangladesh Trial introduction of new financing mechanisms to promote green investment in targeted sectors
Results	Capacity building for the Government of Bangladesh achieves revolutionary developments in environmental management.
Period	August 2023 to July 2028
Content	<p><u>Component 1: Environmental Governance and Infrastructure (Components for DoE)</u></p> <ul style="list-style-type: none"> Building new offices for DoE (5 locations: Mymensingh, Rangpur, Rajshahi, Khulna and Sylhet)

Item	Content
	<ul style="list-style-type: none"> • Build district offices for DoE (31 locations) • Building a training and research center for DoE (1 site) • Procuring environmental monitoring vehicles (63 vehicles) • Procuring monitoring vehicles equipped with an automatic sampling system and particulate matter analyzers using X-ray fluorescence spectrophotometers (4 vehicles) • Procuring environmental monitoring vessels (15 vessels) • Developing environmental analytical laboratories in 6 divisions and 32 districts • Developing heavy metal monitoring systems integrated with Continuous Air Monitoring System (CAMS) • Establishing geographic information systems (GIS) and remote sensing (RS) • Procuring drones for environmental monitoring (75 units) • Developing a centralized air quality monitoring system with web-site system • Establishing an air quality forecasting system • Developing automatic monitoring systems for CETP (central effluent treatment plants) and ETP (effluent treatment plants) (20 sites) • Establishing web based portal sites for information-sharing <p><u>Component 2: Introduction of green finance to prevent air pollution</u></p> <ul style="list-style-type: none"> • Establishing the Green Credit Guarantee System (GCGS) <p><u>Component 3: Vehicle exhaust control</u></p> <ul style="list-style-type: none"> • Developing vehicle inspection centers (4 locations) <p><u>Component 4: E-waste Management Infrastructure</u></p> <ul style="list-style-type: none"> • Development of E-waste recycling-pilot facilities

Source: DoE

The BEST project plans to develop new laboratories and procure instruments for existing and new laboratories. It is necessary to address expected issues such as shortage of the DoE's staff and strengthening the capacity of the DoE's staff to use these instruments properly.

2) The STILE Project

The STILE is being implemented by GIZ. The project addresses possible solutions in energy, chemicals, and wastewater management to promote environmentally friendly and resource efficient production. Regarding the support to the DoE, the following items are provided;

- Capacity building to monitor and guide factories to comply with effluent standards, and
- Providing effective monitoring and inspection tools to strengthen compliance with environmental standards.

The STILE project targets the textile and leather sectors. It does not cover wastewater management in other industrial sectors. Although the textile and leather sectors are currently major industries in Bangladesh, it is necessary to examine how to apply this project's outcomes for other industrial sectors, that would increase depending on future economical growth.

3) Other STP Projects

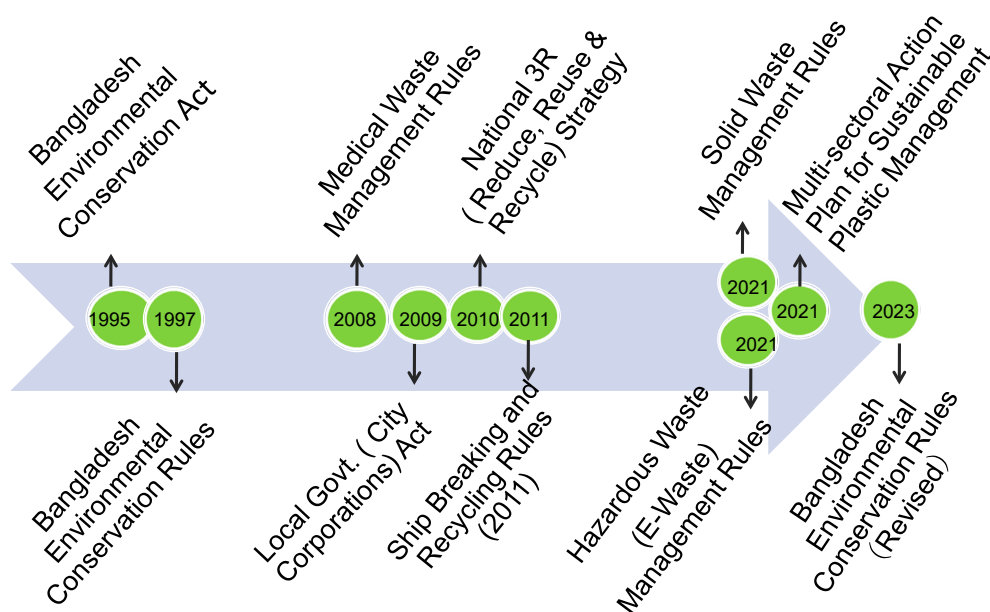
The several sewage treatment plant projects are on-going by WASAs at Dhaka City and Chattogram City. Currently, there is no regular information exchange system on water quality control between and the DoE and WASAs. It is prospected that the DoE will have responsible for water quality control in river basin level in the future. Therefore, it will be required to enhance cooperation for water pollution

control between the DoE in charge of river water quality control, and WASAs in charge of domestic wastewater control in urban areas.

2.1.5 Current Status and Issues on SWM

(1) Identification of Administrative Issues on Environmental Standards, Laws, Regulations and Guidelines on SWM

In Bangladesh, the Basic Law on SWM, such as Waste Management and Public Cleansing Act in Japan, had not been enacted. In 2021, the SWM Rule, the basic law for SWM in Bangladesh, was approved. In parallel, the ECA and the ECR also have functioned as legislations for SWM, and the Hazardous Waste (E-waste) Management Rule and the Medical Waste Management Rule have been enacted, as legislations related to industrial waste, particularly hazardous waste and medical waste. Although the National 3R Strategy have been developed, no technical guidelines for SWM have been developed. Some of the cities such as the DNCC and DSCC have developed SWM plans, but the SWM plan at national level has not been developed. Therefore, the monitoring system at the national level on the status of SWM implemented by local governments is not sufficient. The historical record regarding the formulation of major SWM-related laws and strategies are shown in Figure 2-4.



Source: JET

Figure 2-4 Historical Record regarding the Formulation of Waste-related laws and Strategies

Table 2-8 summarizes the regulations related to SWM.

Table 2-8 Law and Rules Related to Solid Waste Management

No.	Name	Overview
1	SWM Rule	The rule stipulates the basic requirements for SWM in Bangladesh. It stipulates the roles and responsibilities of manufacturers, importers, waste generators, and local governments. It is important to include the requirement to prepare an annual report on the amount of waste generated and its management activities. In addition, it is stipulated of

No.	Name	Overview
		the definition and classification of waste, monitoring items for air and water quality, standards for compost products, emission standards for treated leachate, standards for incinerators, etc.
2	Hazardous Waste (E-waste) Management Rule (2021)	The rules set out the requirements for managing hazardous wastes contained in E-waste of household appliances, medical devices, Information Technology (IT), communication devices, etc. It states the obligations of extended producer responsibility to manufacturers and assemblers and applies to all producers, traders, distributors, transporters, repairers, collection centres, recyclers, dismantlers, etc.
3	Medical Waste Management and Handling Rule (2008)	The rules define a total of 11 categories of medical waste and their respective treatment processes, along with treatment standards, and specify examples of each class or category of waste, along with treatment and disposal options.
4	Hazardous Waste and Ship Breaking Waste Management Rule (2011)	The type of hazardous waste is classified in consideration of combustibility, toxicity, etc in the rules. In addition, a list of wastes for which export is prohibited is shown. In addition, it is defined that hazardous waste disposal companies should prepare inventories, annual reports, safety procedures, etc.

Source: JET

(2) Outline of SWM Rule

A key issue in recent years has been the promulgation of the SWM Rule in 2021. These rules clarify the basic requirements for waste management in Bangladesh. The outline of the rule is as follows.

1) Establishment of the National Coordination Committee

- As a national waste management agency, the National Coordination Committee chaired by the Director-General of the MoEFCC will be established.
- A National Coordination Committee for Waste Management has been established, and more than twice a year has been convened. Resolutions require more than one-third of the participants, and the minutes of the meetings are published in Web of the ministries and agencies.
- The members of the Committee are chaired by the DG of the Ministry of Environment, Forestry and Environmental Change. The members of the Committee are composed of the Department of Finance, the Department of Local Government, the Ministry of Environment, Forests and Climate Change, the Ministry of Legislative Assembly, the Ministry of Housing and Public Works, the Ministry of Health, the Ministry of Agriculture, the Ministry of Water and Resources, the Ministry of Electricity, and members of the Environment Bureau as well as members of local cities, government-indicated waste management experts, non-governmental organizations, representatives of the Federation of Bangladesh Chambers of Commerce and Industry, and representatives of plastic manufacturers or importers.
- The committee's main roles are to review and approve waste management plans submitted by local governments and relevant organizations, to instruct the review and revision of annual reports, to deal with improper waste management resulting in environmental pollution, and to prepare and publicize various guidelines and directives.

2) Presentation of policy on the priority of waste management

The rule stipulates priority of SWM measures. the most important measure is to reduce the amount of solid waste. If the waste is not possible to reduce, as next steps, possibility of reuse, recycling, and energy recovery are orderly examined. According to the rule, treatment and disposal would be considered as final options of SWM measures.

3) Clear indication of the responsibility of the discharger

Responsibility of each waste generator is described as follows.

Main responsibilities of household waste dischargers

- Separation and storage of waste generated
- Prohibition of dumping in open areas and waterways and of open burning of waste

Main responsibilities of business establishment

- Waste from stores, markets, restaurants, hotels, community centers and other residential, commercial or industrial facilities is discharged to collection points and separated at source
- Prohibition of dumping on roads and drains or open burning
- Outsourcing of recyclable waste to certified waste collection and transportation companies and recycling companies
- Composting of biodegradable waste, promotion of volume reduction through bio gasification, separation discharge of recyclable waste, and outsourcing of remaining residual waste management to waste collection and transportation companies

Main responsibilities of manufacturers and importers

- Collection, appropriate recycling or disposal of cans, glasses, plastics, etc. by manufacturers and importers in accordance with the concepts of Extended Producer Responsibility (EPR) and the guidelines developed
- Annual Report on Recycled Plastics Submitted to the Director-General of DoE
- Implementation of awareness-raising activities for residents, etc. in order to implement appropriate waste management
- Consideration of measures to notify purchasers and consumers of the method of disposal of products manufactured or imported after use

Main responsibilities of the implementation bodies such as local government authorities, etc.

- Formulation and submission to the Committee of a comprehensive plan for SWM in accordance with national strategies and guidelines for waste management
- Collection, transporting, and disposing of waste produced from residential areas
- Submission of annual reports and accident reports in the event of an accident
- Collection and transportation and disposal of waste from households and business establishment based on three types of separated waste
- Separate collection and disposal of construction waste
- Management and disposal of medical waste in accordance with the Medical Waste Management Rules

- Promotion of waste recycling, biogas generation, Refuse Derived Fuel (RDF), Solid Recovered Fuel (SRF), power generation, and biodegradable fertilizer
- Intermediate treatment such as incineration of wastes that cannot be recycled and treatment and disposal at sanitary landfill sites

4) Penal Provisions

Penal provisions stipulate that penal servitude for a period not exceeding two years or payment of a fine shall be imposed in the event of a violation of a prohibited item.

5) Award System

Promote awards for good practices in waste management, sanitation and environmental management activities in consultation with the National Coordination Committee. A separate guideline is planned to be prepared for this purpose.

6) Others

The followings are attached as separate tables.

- Categorization and itemization of household hazardous wastes
- Waste disposal guidelines for composting
- Regulations on waste incineration such as operation standards and emission standards, etc.
- Guidelines and regulations on final disposal sites such as guidelines for selection of appropriate sites, operation, maintenance, and management, and the standards on wastewater and emission gases, etc.
- Indicators for the targets in SWM plan
- Contents of the annual report
- Contents of the accident report
- Outline of SWM regulations

(3) Legal and Institutional Issues related to SWM

As mentioned above, the SWM Rule clarifies the requirements for SWM. However, for practical implementation of the requirements stipulated by the rule, it is necessary to establish a legal system including technical and operational standards in the future.

1) Guidelines for SWM Rule

The SWM Rule was enforced and regulated to develop SWM plans and submit annual reports from local governments, but there are no guidelines or manuals for developing plans or preparing annual reports.

In addition, the SWM Rule regulates various technical requirements, but technical guidelines for collection, transport, disposal sites, etc. and EPR guidelines have not been prepared.

2) Law covering Industrial Waste and Industrial Waste Management System

The local governments in charge of practical work of SWM generally have several issues, such as necessity of improving technical capacity, or insufficient financial resources.

Although the rule states that it is necessary to manage industrial waste based on the principle of the responsibility of the discharger and the burden of the polluter, the institutional system is insufficient, and monitoring from waste generators to waste disposal service providers is not conducted.

3) National Annual Report and SWM Plan

SWM and 3R strategies have been developed as the National 3R strategies, but there are no national waste management programs that reflect future demand and targets, identify prioritized activities, and improve waste management with step by step approach. In addition, data on waste generation, composition, collection and transportation, treatment and disposal with conducted activities of SWM by Local Government Institutes (LGI) are not summarized. The technical guidelines for various waste management processes (collection and transportation, 3R and intermediate treatment, final disposal, etc.) need to be prepared.

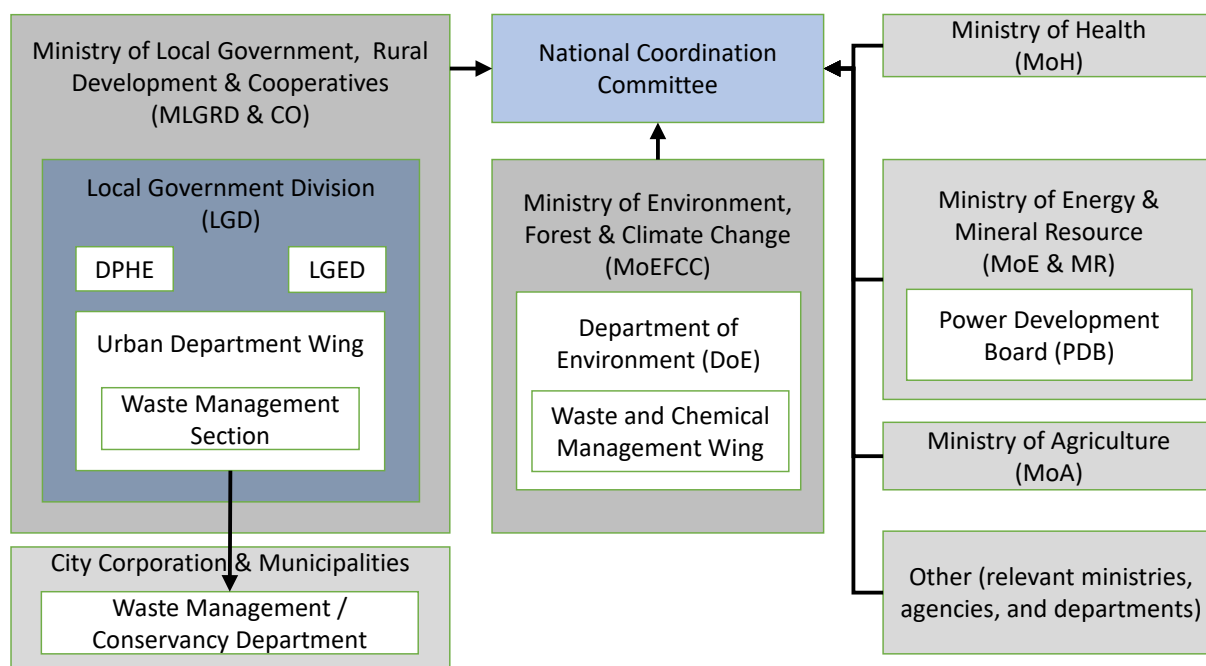
4) Consistency with Relevant Laws

The CC Act and Paurashava Act define the responsibilities of each CC and Paurashava respectively. However, Upazila Act does not specify the responsibility of SWM in Upazila. Therefore, Upazila does not have an organizational structure for SWM, and the waste collection service has not been provided.

(4) Activities of Relevant Ministries and Agencies, Other Stakeholders and donors related to SWM and Issues to be addressed

1) Efforts by Relevant Ministries and Agencies

Based on the SWM Rule enforced, a mechanism for holding annual coordination meetings with participation of the relevant ministries and agencies was developed, as shown in a diagram in Figure 2-5, to discuss resolve on institutional system and implementation status of SWM.



Source: JET

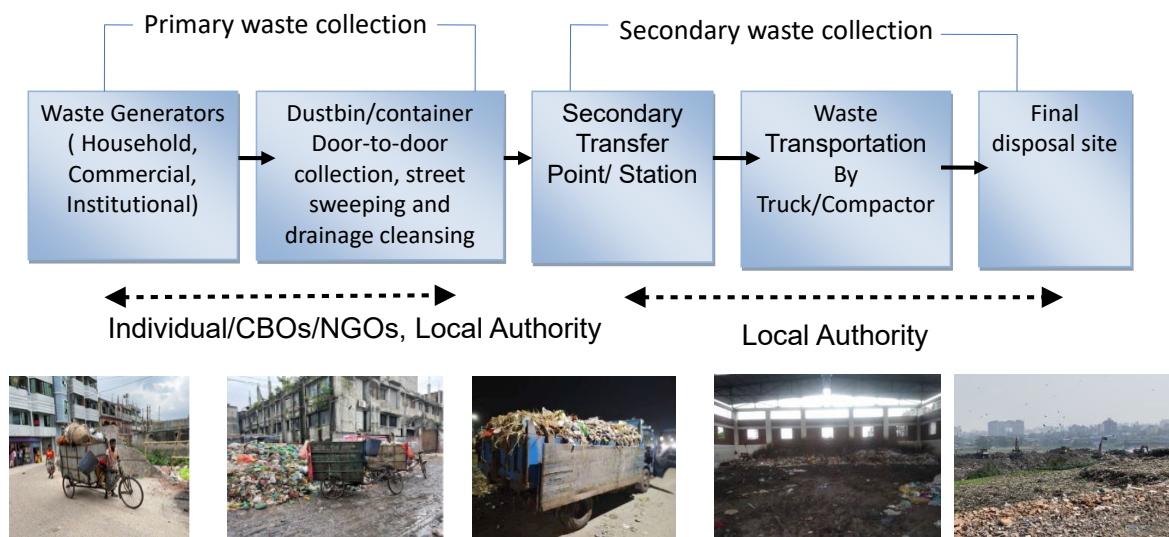
Figure 2-5 Major Ministries and Agencies and Local Governments under SWM Rule

The DoE is in charge of development of the legal system for SWM, and the LGD of the Ministry of Local Government, Rural Development and Co-operatives is in charge of supervising practical activities carried out by the municipal governments. As for practical waste management business (equipment procurement, facility development, operation and maintenance) is carried out by LGD for urban waste management.

For SWM, many ministries are concerned: the Ministry of Industry, the Ministry of Electricity, the Ministry of Energy and Mineral Resources, the Ministry of Agriculture for Agricultural Waste, and the Ministry of Health. According to the SWM Rule, although the National Coordination Committee has been established, regular meetings are held only twice a year, and the committee conducts just a high-level discussion. To conduct proper management against various type of wastes generated from various sources smoothly, communication among the relevant ministries need to be more frequently, especially for management of non-municipal solid waste.

2) Local Government Initiatives

The LGI are the main bodies of municipal waste management. Some municipalities are trying to sort out compostable and recyclable waste. As shown in Figure 2-6, many municipalities conduct primary collection of waste from households and enterprises by rickshaws, and transfer collected waste by secondary transportation vehicles at accumulation sites and relay stations. From the sites and stations, finally the waste is transported to final disposal sites, and then disposed in landfills.



Source: JET

Figure 2-6 Flow of SWM by Local Governments

(5) Administrative Issues on SWM

A Waste Management Department has been established in North and South Dhaka City respectively and each department has engineers with relatively good planning and technical skills. On the other hand, in the neighboring CCs and Paurashava, the Cleaning Department is in charge of SWM. The planning and designing of SWM facilities are carried out by technical divisions in other sectors such as roads and wastewater. As a result, planning, design and operation and maintenance of SWM facilities are carried out by different departments. Therefore there are some issues with inconsistency from planning phase to operation and maintenance phase, and the operation and maintenance manager does not understand the aim of plan and design of SWM facilities.

In Upazila, waste collection and transportation services are not provided by Upazila itself, since Upazila Act does not stipulate actor of SWM clearly and general Upazila does not have specific section for SWM. Currently, although a part of markets provide municipal waste collection service, collected waste is dumped at surrounding area of Upazila without any treatment, and generally, municipal solid waste collection service does not function.

Many local authorities have the following issues on SWM.

- Organizational structure of local government for SWM is weak such as insufficient number of officers in charge of SWM or lack of technical capacities, and budget is insufficient.
- Collection, transportation and disposal systems for industrial waste containing hazardous wastes as well as municipal waste have not been established. Required facilities for collection, treatment and disposal of solid waste have not been developed.
- Educational activities should be enhanced for solid waste generators, both local residents and enterprises, for improving mutual understanding about way of taking out solid waste with proper sorting between generators and collectors of solid waste.

(6) Activities of Other Donors on SWM and Issues to be addressed

1) Donors Activities

The donors, such as the JICA, the WB, and the ADB, have supported to improve SWM for various ministries and local governments. As for the DoE, the WB is providing support for plastic -based waste and e-waste management. The WB has commenced a support for revising Medical Waste Management Rule, too

At present, the WB is providing support for the DoE in fields other than plastic-based waste management mentioned above, such as introducing EPR. The concrete assistance for DoE by ADB or the other donors has not been identified. Major donors' projects in the past are shown in Table 2-9.

Table 2-9 Relevant Other Donor's Projects

Project	Donor	C/P	Term	Content	Target area
Coastal Environmental Infrastructure Project (CTEIP)	ADB	LGED	January 2014 to June 2022	Primary recovery, transportation, composting, and landfill	11 Paurashava
Third City Governance/Infrastructure Development Project (UGIIP-III)	ADB	LGED and DPHE	July 2014 to June 2022	Primary collection, transportation and landfill	27 Paurashavas
Urban Development-Project II (CRDP-II)	ADB	LGED	January 2019 to June 2024	Primary recovery, transportation, composting, and landfill	Khuluna CC, etc.
Urban Governance-Services Project (MGSP)	WB	LGED	January 2014 to June 2022	Primary recovery, transportation, and landfill	-
Urban Public and Environmental Health Sector Development Program	ADB	LGD	2010 to 2018	Primary collection and secondary transfer station	DSCC, CCC, etc
Program Clean Development Mechanism (CDM) projects using municipal organic solid waste in the 64 districts	Climate Change Trust Fund	DoE	July 2016 to June 2021	Compost facilities	CCC, Narayanganji CC, etc

Project	Donor	C/P	Term	Content	Target area
Dhaka and Chittagong 3R Project	Climate Change Trust Fund	DoE	December 2012 to June 2023	Distribution of waste boxes for sorted emission, awareness-raising, and mechanical road cleaning	DNCC, CCC
Medical waste management project	Foreign, Commonwealth and Development Office (FCDO)	NCC	2022	Waste sorting training, two medical waste transportation vehicles, and one incineration facility	NCC
Sustainable Solutions to Solid Waste: Local Response to Rohingya Crisis in Bangladesh	SIDA (Swedish International Development Cooperation Agency)	UNDP (United Nation Development Programme)	September 2018 to March 2022	Waste sorting, sorting, environmental education, recovery of wastes, secondary collection sites, waste transportation, recycling facilities, composting, landfill	Teknaf Paurashava, Teknaf Upazila, Ukhia Upazila
BEST Project	WB Trust Funds (PROBLUE)	MoEFCC/DoE	September 2021-	Environmental governance, air and water quality management, plastic management, medical waste management, electronic waste, etc.	DNCC, DSCC, CCC

Source: JET

2) Issues in Future

As mentioned above, the various donors are supporting several management and implementation agencies on legal system development and planning and implementation of SWM. Considering the status of SWM related legal systems are now in place such as SWM Rule, it will be necessary in the future to strengthen coordination among the donors and relevant ministries and agencies to ensure effective implementation of SWM in nationwide in accordance with the SWM Rule.

2.2 Capacity Development Activities (Output 2)

2.2.1 Activities on Examination of Capacity Development for DoE

(1) Examination of Training Plan

According to a training needs analysis conducted by DoE's Human Resource Development Wing in March 2023, based on interviews with the DoE officers, the following items are important as technical trainings in the water pollution control and SWM sectors;

- Evaluation capacity on design and operation of wastewater treatment facilities
- Capacity on EIA examination
- Capacity on handling lawsuit cases
- Monitoring capacity related to SWM

Currently, the main trainings implemented are to acquire basic knowledge as a government employee and to acquire basic knowledge related to the environment. Due to budget constraints, technical

training (Needs-based training) was not implemented in FY2022. In the future, it is necessary to strengthen the planning and implementation system for technical training.



Note: 85% of the training budget is allocated to the training to acquire basic knowledge as a government official and to acquire basic knowledge on environmental conservation.

Source: DoE

Figure 2-7 Budget Allocation Plan for Training Planned by DoE in 2023-24

In August 2022, interviews were conducted with two divisions of the DoE Headquarter (Natural Resource Management Wing, Waste and Chemical Management Wing), six local offices (Dhaka DoE Office, Narayanganj DoE Office, Munshiganji DoE Office, Gazipur DoE Office, Narsindgi DoE Office, Chattogram DoE Regional and Metropolitan Office), and two environmental analytical laboratories (Dhaka DoE Laboratory, Chattogram DoE Laboratory) on the advice/training needs of this work. As a result of the interviews, the following requests were mainly confirmed.

[Water Pollution Control]

- Providing technical advice for proper operation of the ECR
- Selection of priority industries for pollution load management considering current and future industrial structure
- Provision of technical information on appropriate wastewater treatment facilities and sludge treatment facilities
- Preparation of Standard Operating Procedures (SOPs) for water quality analysis (including items requiring new analyses due to the ECR revisions)
- Assistance on laboratory accreditation

[SWM]

- Advice for implementation of SWM Rules and planning of for SWM plan
- Advice on the management and monitoring of hazardous and plastic waste
- Way of building a network of partnerships among stakeholders
- Promotion and enlightenment of recycling and energy composting

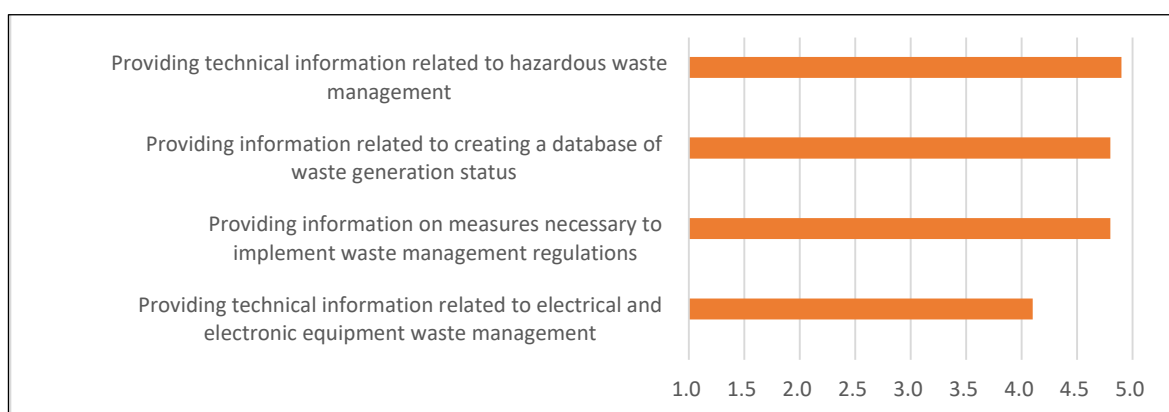
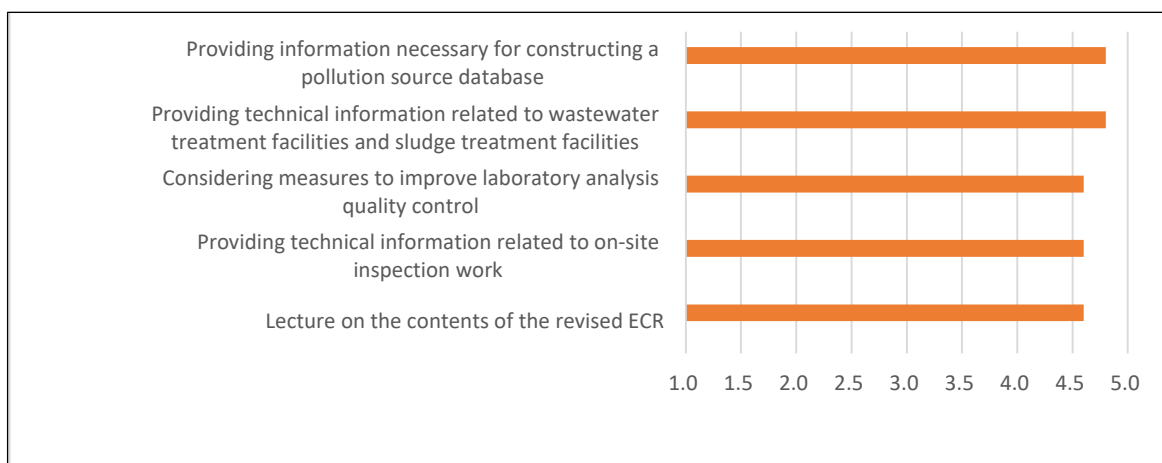
Based on the above interviews, in September 2022, the JET sent questionnaires to 6 wings of the DoE Headquarters, 6 local offices, and 2 environmental analytical laboratories selected by the DoE to collect comments on the training needs with the five-grade evaluation. Among the answers to the questionnaire on training needs, the followings were raised as requests for specific needs.

[Water Pollution]

- a) Lecture on the content of the revised the ECR
- b) Provision of technical information on wastewater treatment facilities and sludge treatment facilities
- c) Provision of technical information related to on-site work of on-site inspection
- d) Provision of information for development of pollution source database
- e) Examination of measures to improve laboratory analysis and quality control:

[Waste Management]

- a) Provision of information on measures necessary for implementation of SWM regulations:
- b) Provision of technical information on hazardous waste management
- c) Provision of technical information on waste management of electrical and electronic equipment
- d) Provision of information for development of a database of waste generation status



Note: The figure shows the average value of the responses obtained on a 5 grade evaluation of training needs.

Source: JET

Figure 2-8 Responses to Questionnaire regarding Training Needs

Since the DoE has obtained expectations for the implementation of the training, the DoE and the JET decided to hold a workshop. The content of each field was determined after consultation with the NRM Wing and WCM Wing based on the analyses of the training needs survey.

2.2.2 Activities in Water Pollution Control

(1) Advice on Strengthening of Cooperation between DoE and Other Ministries and Agencies

The number of enterprises to be inspected by the DoE on water pollution control (the number of factories) is enormous. For the DoE officers, the JET pointed out that the training for capacity development on inspection activities is essential. The JET also suggested to examine enhancement of cooperation with local governments having a large number of wastewater discharge sources in future, since it is difficult to implement inspection against those sources by the DoE officers alone. The DoE plans to introduce on-line monitoring to reduce work load of monitoring. Regarding this idea, the JET pointed out to have to consider that the parameters which can be monitored on-line system are limited, and difficulty on secure enough budget for installing and maintaining the system.

(2) Advice on Policies, Institutional Systems, Planning and Human Resource Development for DoE

Regarding policies on water pollution control by the DoE, JET discussed with the DoE on targeted type of wastewater to be controlled. Currently, the DoE concentrates on control of industrial wastewater, but in future, it is expected to control not only industrial wastewater, but also other types of wastewater such as domestic wastewater by cooperation with relevant agencies such as WASAs in case that water quality control will be implemented in river basin level.

As for the institutional system for water pollution control, the most important issue to be addressed is to develop the institutional system to enforce the revised ECR in 2023 properly. To develop such institutional system, JET pointed out that technical training on the officers in charge of the ECC issuing process during EIA, on-site inspection of ETP, and water quality analysis in the DoE laboratory.

(3) Holding of Workshops

For water pollution control, 2 times of the workshops were held as described bellow. The exercises on basic knowledge of water pollution control and wastewater treatment were conducted at the workshop. As the exercises, JET considered to be important to provide basic technical knowledge of water pollution mechanisms and wastewater treatment technology for DoE officers working on ETP evaluation during EIA and inspection, rather than introducing the latest technology of ETP.

1st Workshop

- 1) Date: 1st February 2023
- 2) Location: DoE Headquarter
- 3) Participants: 35 (DoE Headquarter, DoE Regional Office (Dhaka, Manikganj, Narayanganj, Barishal, Chattogram), Dhaka and Chattogram Analytical Laboratory)
- 4) Purpose :
 - (a) To share knowledge and experience among relevant government officials through interactive discussions on water pollution control systems and wastewater treatment technologies.

- (b) To identify priorities to be discussed for strengthening water pollution countermeasures in Bangladesh and discuss issues for improvement.

Table 2-10 Outline of 1st Workshop on Water Pollution Control

Content	Presenter
Session 1: Bangladesh wastewater management legislation and general characteristics of water pollution - Legal system in Bangladesh - Water quality in Bangladesh - General Characteristics and Mechanisms of Water Pollution - Discussion	Presentation: JET and NRM Wing of DoE Discussion: All participants in the workshop
Session 2: Basic knowledge of wastewater treatment technology (1) - Physical treatment: screen treatment and precipitation treatment - Discussion	Presentation: JET Discussion: All participants in the workshop
Session 3: Basic knowledge of wastewater treatment technology (2) - Biological treatment - Discussion	Presentation: JET Discussion: All participants in the workshop
Session 4: Comparison of Law Systems for Water Pollution Control in Bangladesh and Japan: Introduction of a Notification System for Wastewater Facilities - Comparison of Legal Systems for Water Pollution Control - Discussion	Presentation: JET Discussion: All participants in the workshop

Source: JET

2nd Workshop

- 1) Date: 9th July, 2023
- 2) Location: DoE Headquarter
- 3) Participants: 26 (DoE Headquarters and Regional Office (Dhaka City and Chattogram City))
- 4) Objectives:
 - (a) To identify the priority issues for addressing water pollution control with taking the revised ECR that came into effect in March 2023 into account, and
 - (b) To discuss the required actions to be conducted to resolve the issues by DoE.

Table 2-11 Outline of 2nd Workshop on Water Pollution Control

Content	Presenter
• Discussions on issues identified by the project activity	DoE and JET
• Discussions on technical skills issues for DoE staff	DoE and JET
• Introduction to the outline of the DoE staff training system and training needs analysis	DoE
• Introduction to Japan's Water Pollution Management and Monitoring System	JET
• Discussions on the expected activities by the DoE to address the identified issues	DoE and JET

Source: JET

In the workshop, the ECR in Bangladesh and the Japanese administrative measures for water pollution control were compared by the DoE and JET to examine the expected activities by the DoE for water pollution control. In the workshop, the JET also explained the outline of the Japanese water pollution control legislation and the Japanese licensing system on ETP with legislating and evaluating by the Japanese local governments. The following figures are the

examples of the slides used in the workshops.

Notification System of Effluent Generators as “Specified Facilities” by Water Pollution Prevention Act of Japan

Chapter 2-1 Regulations on Discharging Effluent

Article 5

A person that discharges effluent from factories or workplaces into Designated Areas of public waters must, when intending to install a “Specified Facility”, as provided for by order of the Ministry of the Environment, submit a report on the following to local(prefectural) governors.

- (i) name and address of the person, as well as the name of the representative if the person is a corporation;
- (ii) name and location of factories or workplaces;
- (iii) type of Specified Facilities;
- (iv) structure and construction of the Specified Facility;
- (v) equipment of the Specified Facility;
- (vi) use of the Specified Facility;
- (vii) means of Treatment of Polluted Water, etc.;
- (viii) the level of pollution and quantity of the Effluent;
- (ix) other particulars specified by Order of the Ministry of the Environment

34

Explanation of Article 5 of the Water Pollution Control Law in Japan. Local government involvement.

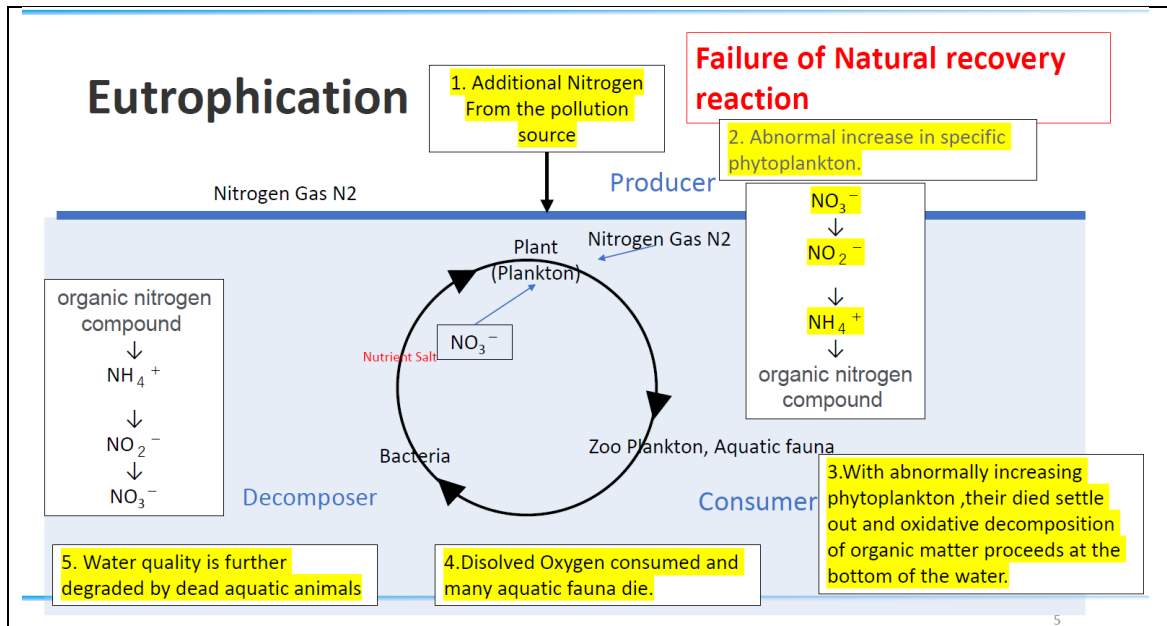
Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (2)

Item	Bangladesh	Japan
Frequency of issuing monitoring report	Once a year	Once a year (COD, N, P in specific area: every day to once a month depend on the quantity)
Manager of ETP	Not mandatory	Need to be dispatched licensed person
Certificate for analytical laboratory	Not mandatory	Mandatory (Need to be analyzed by certificated laboratory)

36

Source: JET

Figure 2-9 Example of Slides used in Workshop on Water Pollution Control (Comparing the contents between Bangladesh ECR and Water Pollution Control Act in Japan)



Water pollution mechanism

Physicochemical Treatment Processes

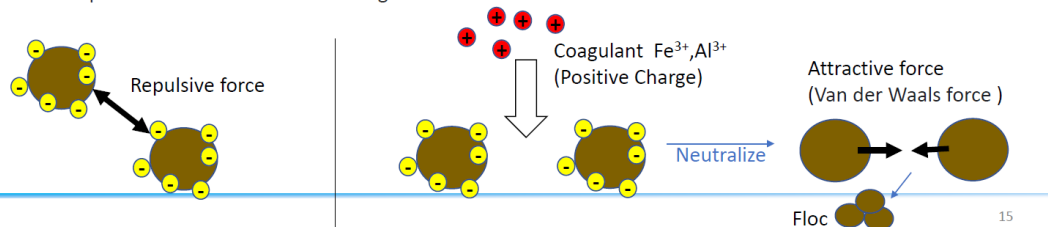
Physicochemical Treatment

Physicochemical treatment involves a set of processes which may be consecutively performed by coagulation, flocculation and sedimentation.

The coagulation, flocculation and sedimentation process is used when the particle size of suspended solids is small, and the natural sedimentation requires a long time.

Coagulation

Generally, the surface of fine particles floating in water is negative charged . When a chemical with the opposite charge is added to this to neutralize the charge of the target particles, the attractive force between the particles exceeds the repulsive force due to surface charge.



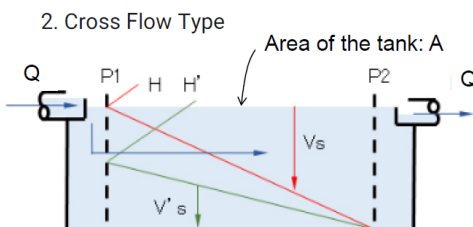
Source: JET

**Figure 2-10 Example of Slides used in Workshop on Water Pollution Control
(Wastewater treatment mechanism)**

Physicochemical Treatment Processes

Sedimentation

Sedimentation is critical for separating liquid from eventual solids that are formed as a result of previous stages of coagulation and flocculation. There are two typical kind of the settling tank.



If the sedimentation velocity is V_s [m/d], the water depth H_s [m] at which the particles settle is expressed by the following equation.

$$H_s = V_s \times T \quad (T: \text{Retention Time})$$

On the other hand, when the inflow rate Q [m³/d] of sewage flows into a settling tank having a depth H [m] and an area A [m²], the relationship with the retention time T is shown by the following equation.

$$T = A \times H / Q \rightarrow H = Q \times T / A$$

If $H_s > H$, the particles settle to the bottom before the wastewater flows out, so the following equation holds.

$$V_s \times T > Q \times T / A \rightarrow V_s > Q / A (= V) \quad \dots \dots \text{Equation (2)}$$

For example, when the inflow rate is 10,000 m³/day and the sedimentation velocity of particles is 15 mm/min, the required area of the settling tank is as follows.

$$A > Q [\text{m}^3/\text{d}] / V_s [\text{mm}/\text{min}] / 60 [\text{min}/\text{hr}] / 24 [\text{hr}/\text{d}] \times 1,000 [\text{mm}/\text{m}] = 10,000 / 15 / 60 / 24 \times 1,000 = 463 \text{ m}^2$$

Source: JET

**Figure 2-11 Example of Slides used in Workshop on Water Pollution Control
(Basic information of wastewater treatment with exercises)**

Through the discussion in the workshop, the training needs for the DoE officers to improve the overall knowledge of basic wastewater treatment technology were confirmed.

Regarding water quality analysis, the DoE officers pointed out the training needs to improve the DoE laboratories' quality control capacities on water sampling and analysis, and necessity on laboratory accreditation.

(4) Support for Laboratory Accreditation

The DoE's environmental analysis laboratories monitor wastewater and environmental water (rivers, lakes, groundwater, etc.) through on-site inspections and sampling, but there are no laboratories having International Organization for Standardization (ISO) certification. Laboratory accreditation is necessary to ensure reliability of laboratory analysis. The environmental Analysis laboratory of the DoE Chattogram Regional Office requested the Project to provide support for acquiring ISO certification. Based on the request, the meeting has been implemented from December 2022 to confirm the current status of quality control. In March, 2023, the activities shown in Table 2-12 were carried out to support the laboratory accreditation process to be done in future. A summarized document of these activities is attached in this report as the Appendix.

Table 2-12 Overview of Activities to Support Obtaining Lab Certification

Item	Contents
1. Time of Implementation	March 15-16, 2023
2. Location	DoE Chattogram Environmental Analysis Laboratory
3. Participants	Managers of the DoE Chattogram Environmental Analysis Laboratory and General Staff: 10
4. Contents	(a) Implementation of a gap analysis between the current status of laboratory management and the management system required to obtain certification a) On-site measurement: Confirmation of on-site measurement status of pH,

Item	Contents
	electric conductivity, TDS, and DO. b) Analysis: Confirmation of analysis of COD, BOD, iron, and arsenic c) Laboratory Management: Laboratory operation rules, quality control system of analysis results, management rules of analytical equipment, and audit system on analytical results were reviewed for gap analysis. (b) Orientation of the required laboratory management system (c) Review of activities required to acquire laboratory certification
5. Activities required to acquire certification for laboratories in the future	Through this activity, it was confirmed that the following activities would be necessary in the future. (a) Documentation and systems required for maintenance a) Laboratory Management Regulations b) Quality control system for analysis results c) Control rules for analytical instruments d) Audit system for analysis results (b) Implementation of training for laboratory staff a) Methods for evaluating the authentication process and uncertain analysis results of analysis results b) Internal audit activities based on the analysis results c) Equipment calibration and management activities

Source: JET

As a consequence of this activity, the Chattogram Environmental Analysis Laboratory was confirmed to be improved as shown in Table 2-13, compared with ISO17025 requirements. The activities required to acquire certification and the estimated budget were summarized. Based on the result, the Chattogram environmental analysis laboratory examined to request required budget in the next fiscal year and hire external experts to receive necessary assistances.

Table 2-13 Summary on Main Tasks to be Conducted for Obtaining ISO for Chattogram Environmental Analysis Laboratory

ISO 17025:2017 Requirements	Gap Analysis	Activities Necessary for Accreditation
Personnel, facilities, etc.		
Laboratory personnel Laboratories and calibration organizations should document the policies to address human resource requirements and to develop the procedure on how to comply with those policies.	Nine staffs have been engaged in laboratories for sampling, testing, and reporting of test results. Records of individual job descriptions, training and staff capacities are not documented.	Laboratory managers should document the roles and responsibilities of individual laboratory staff. The requirements on laboratory staffs should be set on education, qualifications, training, technical knowledge, skills and experience.
Facilities and environmental conditions Laboratories and calibration organizations should establish procedures for keeping proper laboratory condition with documenting the policies to provide instructions on how to comply with the requirements.	In general, the laboratory area was clean and well organized with sufficient space to perform the test in a safe manner.	Temperature criteria in the laboratory area should be described in the data collection form or standard operation procedure (SOP) depending on the parameters tested. Thermometers should be routinely calibrated and have the ability to provide minimum and maximum readings for a given time frame.

ISO 17025:2017 Requirements	Gap Analysis	Activities Necessary for Accreditation
<p>Equipment</p> <p>The laboratory should document the policies for addressing calibration and maintenance of the equipment, provide instructions on how to comply with the policies, and establish procedures for maintaining regular records as evidence of compliance with the policies and procedures.</p> <p>The laboratory should have procedures for handling, transportation, storage, use and systematic maintenance of equipment to ensure proper functioning and prevent contamination or deterioration.</p>	<p>The DoE Laboratory has the basic equipment required to perform both environmental parameter surveyed at fields and laboratory-based chemical testing. Available equipment was identified for the equipment inventory provided during the evaluation. The instrument calibration records were not documented. The analytical balance has not been calibrated and there is no standard weight that can be used for calibration of the balance.</p>	<p>Laboratory equipment should be calibrated using certified service providers, followed by laboratory staff training and general maintenance and routine calibration. In addition, valid calibration standards (either certified reference material or traceable standards) is necessary to be readily available for all equipment used in both field and laboratories. The procedure should be documented, and periodic maintenance and calibration system of analytical equipment should be owned in the laboratory.</p>
<p>Traceability on measurement</p> <p>The laboratory should establish and maintain the traceability on measurement and the measurement results by means of recorded sequential calibrations, which contribute to the uncertainties of the measurements and connect them with appropriate standards.</p>	<p>The laboratory has reference materials with certificates from manufacturers for analytical balance. However, the calibration procedure for daily measurement is not traceable.</p>	<p>In order to calibrate the analytical balance routinely and monitor its performance daily, the laboratory must obtain a set of standard or calibrated weight. If only standard weight will be procured, it should be calibrated by the National Institute of Metrology or other calibration laboratories.</p> <p>Calibrated thermometers should be sourced and used to check environmental conditions as appropriate.</p> <p>Volumetric devices (volumetric flasks, pipette burettes, etc.) should be calibrated at least twice a year.</p> <p>These calibration procedures should be prepared by the laboratory.</p>

Source: JET

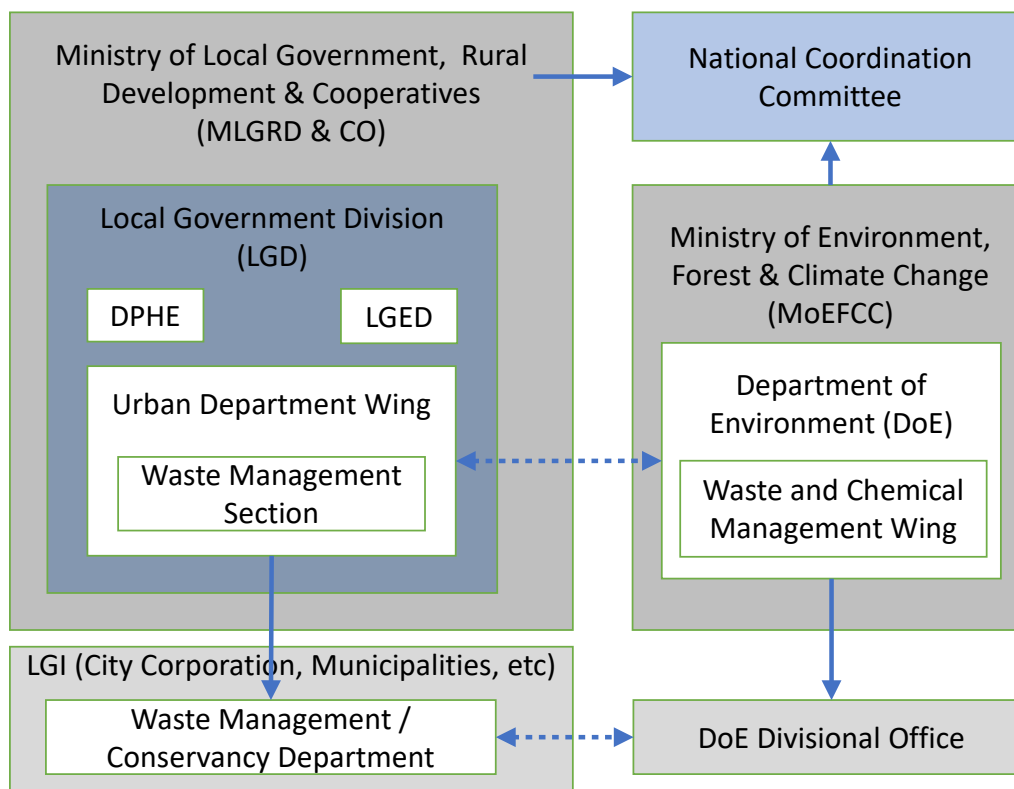
2.2.3 Activities in SWM

(1) Advice on Strengthening of Cooperation between DoE and Other Ministries and Agencies

The DoE is a regulatory agency and is in charge of development of the legal systems for SWM with and supervising and monitoring of their operation status. The SWM Rule have been enacted and a National Coordination Committee has been established. As a result, the DoE is required to function as the secretariat of the National Coordination Committee to operate the regulations.

The advices on strengthening collaboration were provided for enhancing collaboration with ministries and agencies included in the National Coordination Committee.

The WCM Wing was the newly established section in 2020 with several officers, and is in charge of both SWM and chemical substances management concurrently. Considering the current status of the wing, it is necessary to increase the number of officers and to strengthen the capacity of each personnel. Based on the SWM Rule, the DoE needs to cooperate with local governments. However, so far, it has not been sufficiently carried out. In the rule, local governments are clearly required to submit a waste management plan and annual monitoring reports to the DoE. In future, the WCM Wing and the LGD's Waste Management Section need to communicate for close cooperation between the LGI such as the CC or the Municipality (Paurashava) and the DoE. The image of the cooperation between the DoE and the LGI is shown in Figure 2-12.

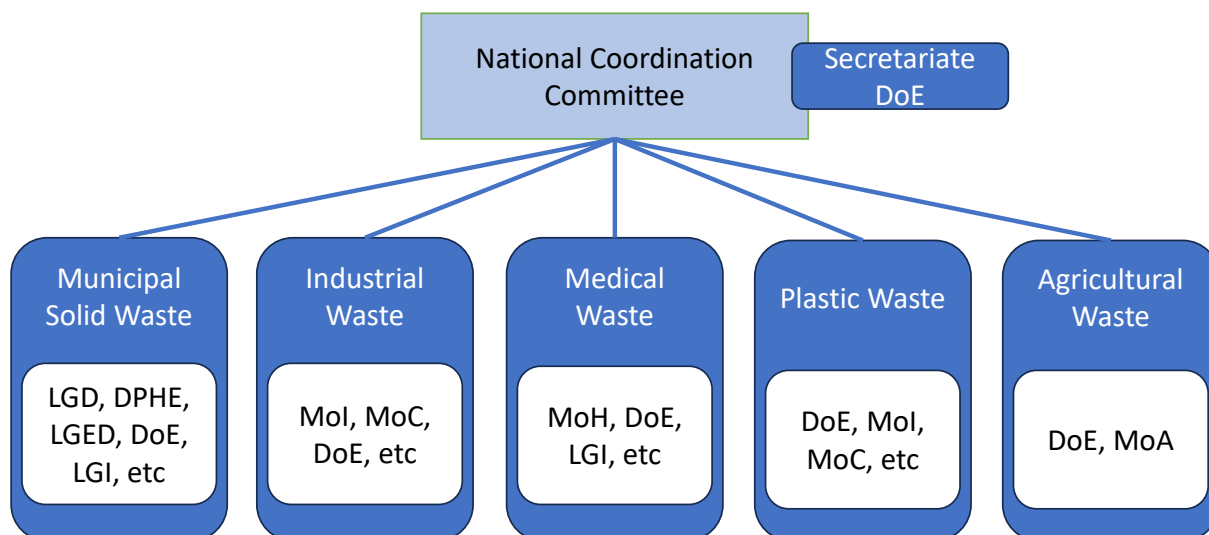


Source: JET

Figure 2-12 Image of Cooperation between DoE and Local Governments (LGI)

On the other hand, with regard to coordination between ministries and agencies, the WCM Wing of the DoE should conduct meetings not only when the National Coordination Committee is held, but also regularly with each ministry and agency, that is a member of the National Coordination Committee, to individually manage the waste to be treated. Because the types of solid waste are various including municipal solid waste, industrial waste and medical waste, the responsible ministries and agencies in charge of SWM are many. Therefore, it is recommended to establish working groups within the coordination committee to specialize in municipal waste, industrial waste, medical waste, plastic waste (including municipal solid waste and industrial waste), and agricultural waste. The working groups will comprise of the relevant ministries, agencies and implementation bodies, and the systems and the standards will be examined and developed by each type of the waste. Subsequently, a process of deliberating and obtaining approval can be considered by submitting them to the National Coordination Committee, twice a year. The image of the working group is shown in Figure 2-13.

In the future, the working groups will discuss specific topics depending on the types of the target solid waste. Based on the preliminary discussions within the DoE, future discussions will be required at the National Coordination Committee for launching the working groups. This proposal was presented by the JICA expert team, but the DoE's WCM Wing agreed on this proposal, and presented at the final seminar.



Source: JET

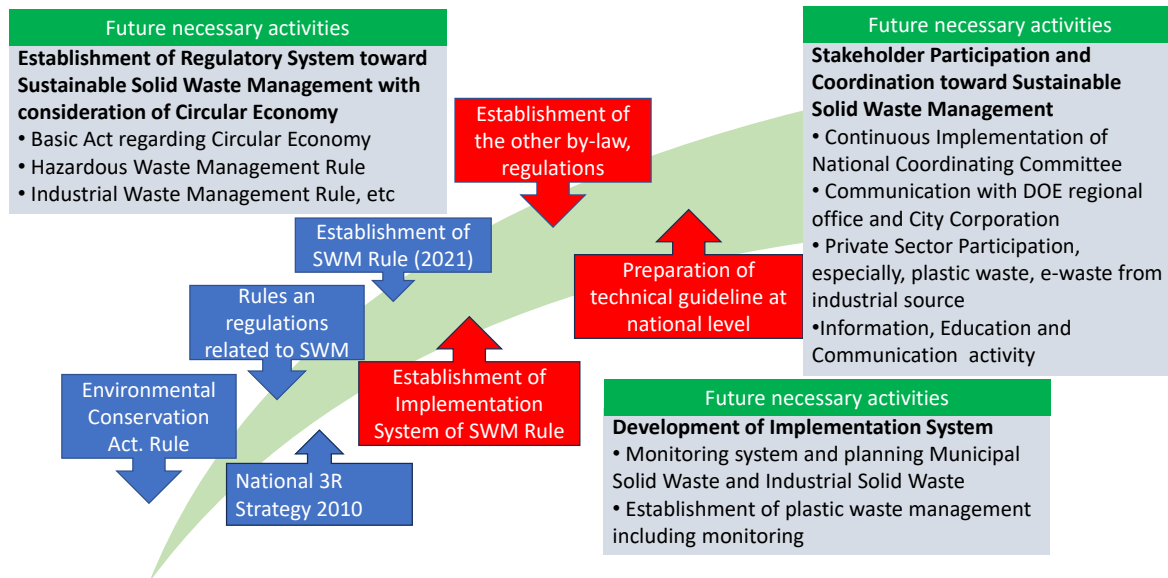
Figure 2-13 Establishment of a Working Group within the National Coordination Committee

(2) Assistance and Advice on Policies and Systems, Activity Planning and Human Resource Development for DoE

The policies, systems, activity planning, and human resource development were discussed through consultations and workshops with the DoE. Main advices provided through the Project are described as below.

1) Advise on DoE Policies, Institutions and Action Plans

The advice on waste-management policies and systems was provided mainly through the workshops. The history and future requirements on legal and policy system development is shown in Figure 2-14. The laws, rules and policies described in blue squares in the figure has been prepared and enacted. On the other hand, regulations and guidelines described in red squares in the figure will be required based on enforcement of SWM Rule and the Hazardous Waste Rules (E-waste,). With development of the regulations and guidelines, it is necessary to establish institutional system for their operation, and to enhance communication with the relevant stakeholders.



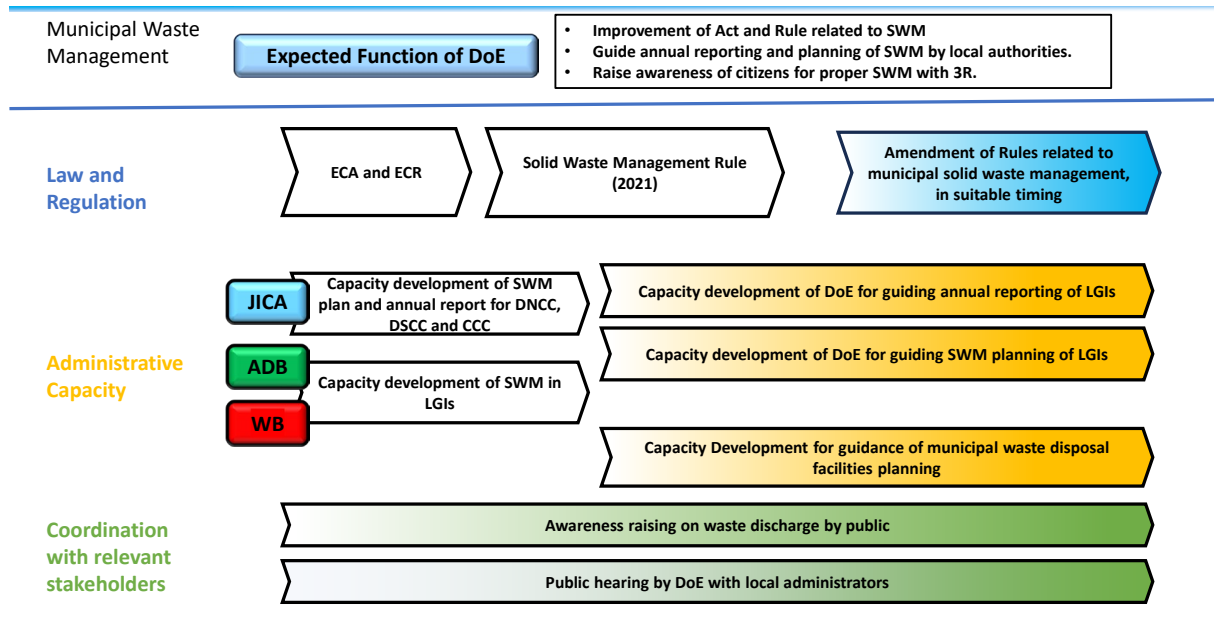
Source: JET

Figure 2-14 History of Legal and Policy Systems Development related to SWM and Necessary Actions for Its Improvement

In the following section, the history of enhancing SWM system so far with outline of the donor support and advices provided on future expected activities are described by municipal waste, industrial waste, and medical waste.

a) Municipal Waste

For municipal waste, various donors such as the JICA, the WB, and the ADB have supported the LGD, the LGED, the DPHE, that are supervisory organizations on SWM, and local governments as implementation bodies. Based on the requirements by the SWM Rule, the local governments require to submit SWM plans and annual reports, and the DoE needs to confirm and review the submitted documents and prepare a national SWM plan and monitoring reports with referring the information described in the documents submitted by the local governments. Therefore, it is necessary for the DoE to develop the concerned capacities and to prepare the guidelines describing implementation measures of the planned SWM activities. Regarding the legislative aspect, in order to be consistent between the SWM Rule and the relevant rules, it is necessary to revise the relevant rules and develop the capacities for operating rules with preparing guidelines on technical aspects of SWM. For enhancing coordination with the relevant organizations, it is proposed to encourage information disclosure using the DoE’s web-site and public hearing on SWM issues.



Note : The proposed Activities are described as colored arrows.

Source: JET

Figure 2-15 Development and Capacity Building of Municipal Waste Management Systems with Expected Coordination with Relevant Stakeholders

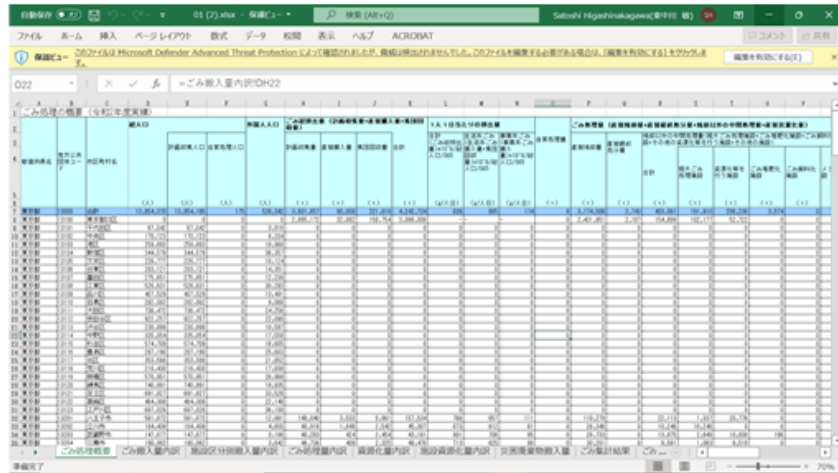
In the workshop, the slides on Japanese cases of SWM planning and annual reporting were prepared, and the JET advised by presenting them as reference materials for preparing SWM plan and annual reports by the LGI.

Regarding the annual reporting, in the case of Japan, local governments summarize the status of SWM in their target areas, and submit the reports to the Ministry of Environment. A format of reporting is provided by the Ministry of Environment, and the local governments prepare the annual report with using the format. The Ministry of Environment compiles the collected information, and discloses as the data showing SWM status in national level.

JET advised by introducing the examples of data sheet and the waste flow as the measures of data collection from local governments.

Data input and analysis for SWM Annual Report in Japan

- Prepare the data format of excel sheet
- Input the data from each local authorities
- Analyze the data



Each local authority Population Waste quantity Waste generation quantity per capita Waste treatment and disposal quantity

Source : Based on Ministry of Environment in Japan

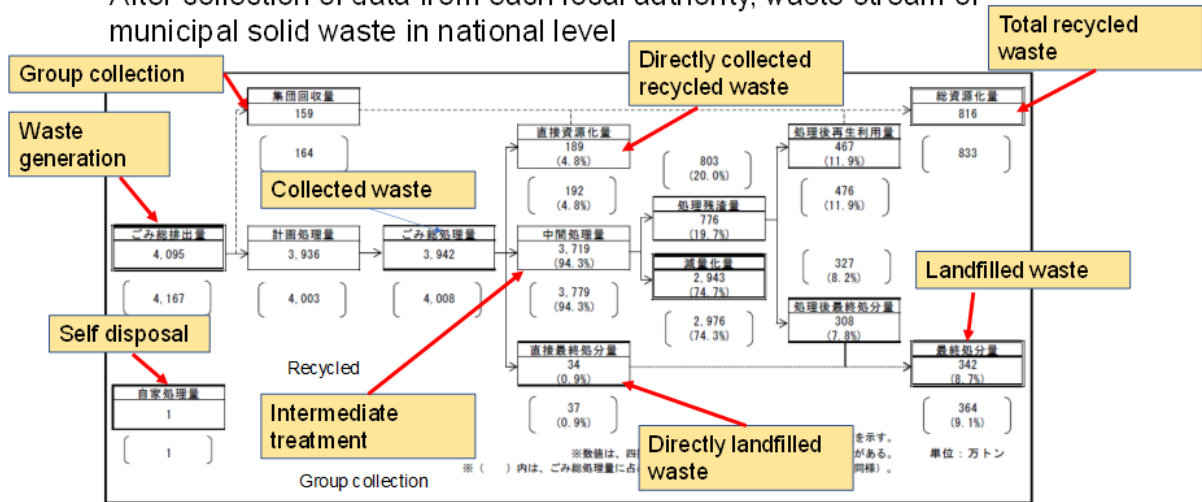
10

Source: JET

Figure 2-16 Example of Monitoring Sheet Summarizing SWM Data for Local Governments in Japan

SWM Annual Report (Case in Japan)

- After collection of data from each local authority, waste stream of municipal solid waste in national level



Source : Based on Ministry of Environment in Japan

12

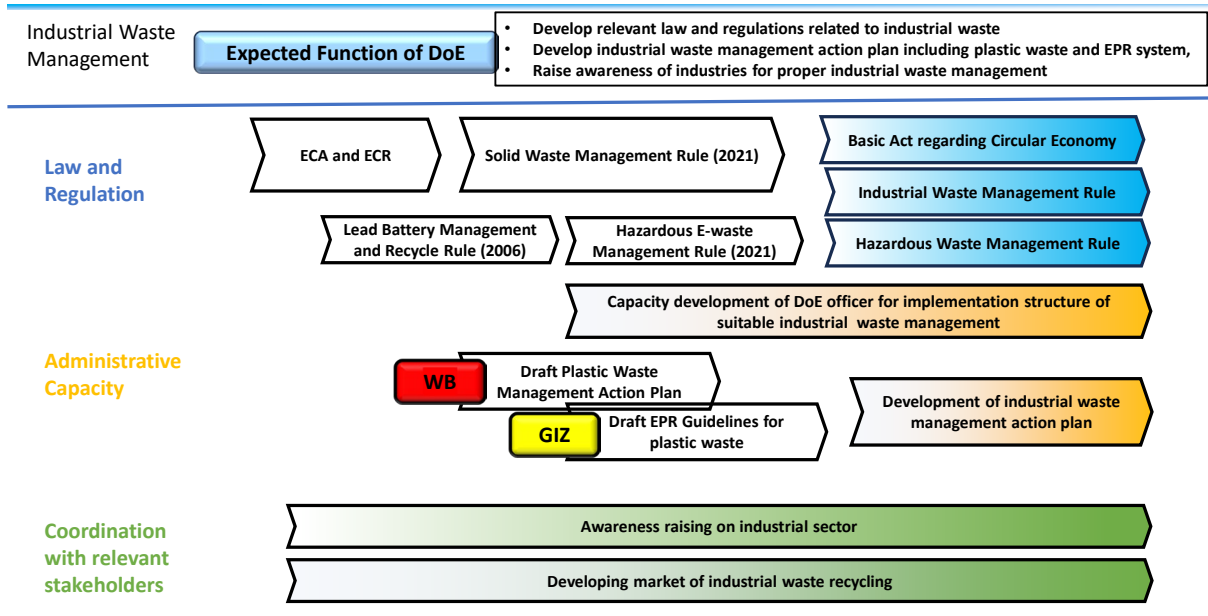
Source: JET

Figure 2-17 Example of Waste Flow in Japan Summarizing SWM data for Local Governments

b) Industrial Waste

Regarding industrial waste, the Hazardous Waste Management Rule concerning Ship Breaking and E-waste has been enacted, and the rule on recycling and management of the waste of lead acid batteries has been also enforced. However, the comprehensive rule on industrial waste has not been prepared. Meanwhile, the WB is formulating an action plan and the EPR guideline on plastic-waste. The project

related to E-waste management is also planned to be implemented in the BEST Project. In this context, it is considered that rules for industrial waste and hazardous waste management and enactment of a basic law for a sound material-cycle society and its associated sources will be required in future. At the same time, action plans for implementing these legal systems are also required. It will be necessary to raise awareness through consultations with each stakeholder in the industry, and efforts to develop and stabilize the market for recyclable waste regarding cooperation with related parties as our proposal.

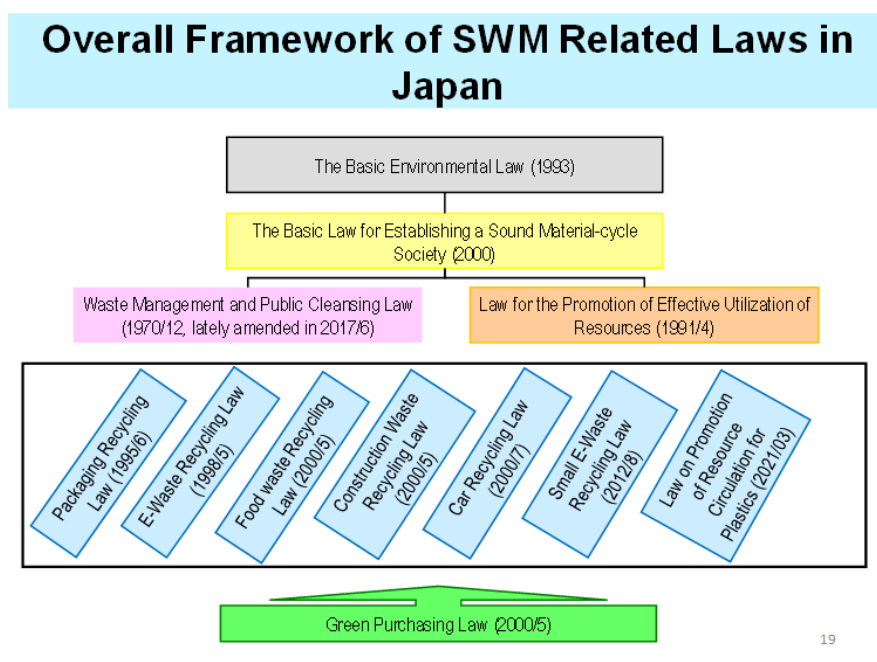


Note : The proposed part is shown as hatched portion.

Source: JET

Figure 2-18 Necessary Activities for Development and Capacity Building of Industrial Waste Management Systems with Expected Coordination with Relevant Stakeholders

As an example, the system of individual laws for each type of waste based on the Basic Law for a Sound Material-Cycle Society in Japan was introduced. In the future, in order to monitor, collection, sort, dispose of, and recycle waste by type of waste in Bangladesh, the appropriate system (for example, EPR system, etc.) differs for each type of waste. Therefore, the following Japanese cases were introduced and advised.

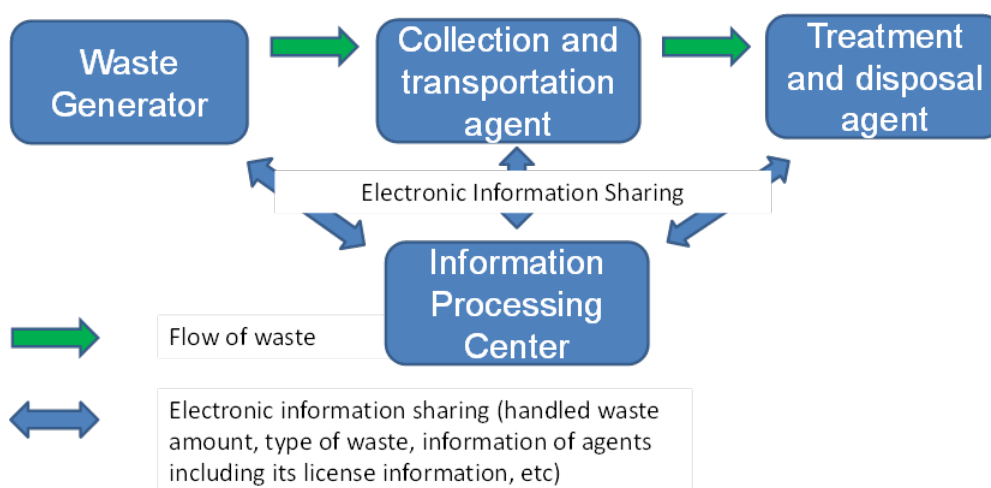


Source: JET

Figure 2-19 Relevant Laws concerning recycling-oriented Society and Waste Management in Japan

Regarding hazardous waste, the project introduced a manifest system as an example of Japanese monitoring system from generation source to disposal site. Regarding the manifest, the Project introduced both electronic manifest as shown in Figure 2-20 that is mainly carried out at present, and manifest on the document base which was carried out before.

- Manifest system (Electronic System)



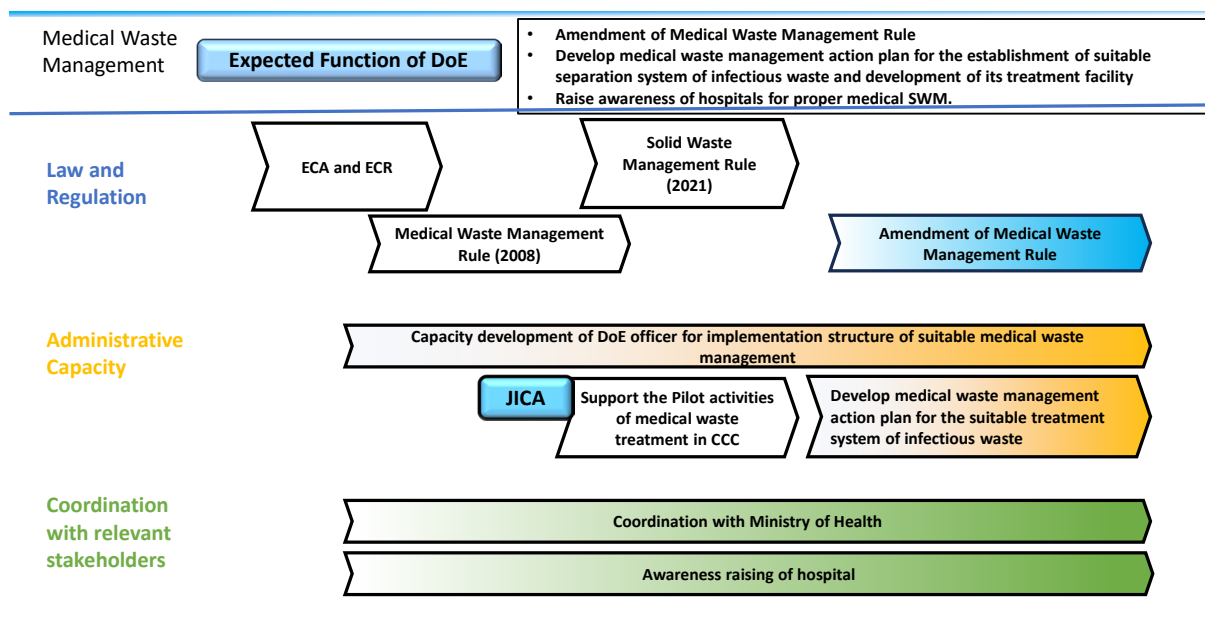
Source: JET

Figure 2-20 Monitoring System for Industrial Waste including Hazardous Waste

c) Medical Waste

Regarding medical waste, the Medical Waste Management Rule (2008) was enacted. The JICA is conducting a pilot-project on a waste incinerator in Chattogram. The management standards for the

separation, treatment, and disposal of medical wastes need to be revised, and the revising work is now ongoing with the support of the WB. It is necessary to promote strengthening of the treatment system of medical waste in future.



Note : The proposed part is shown as hatched portion.

Source: JET

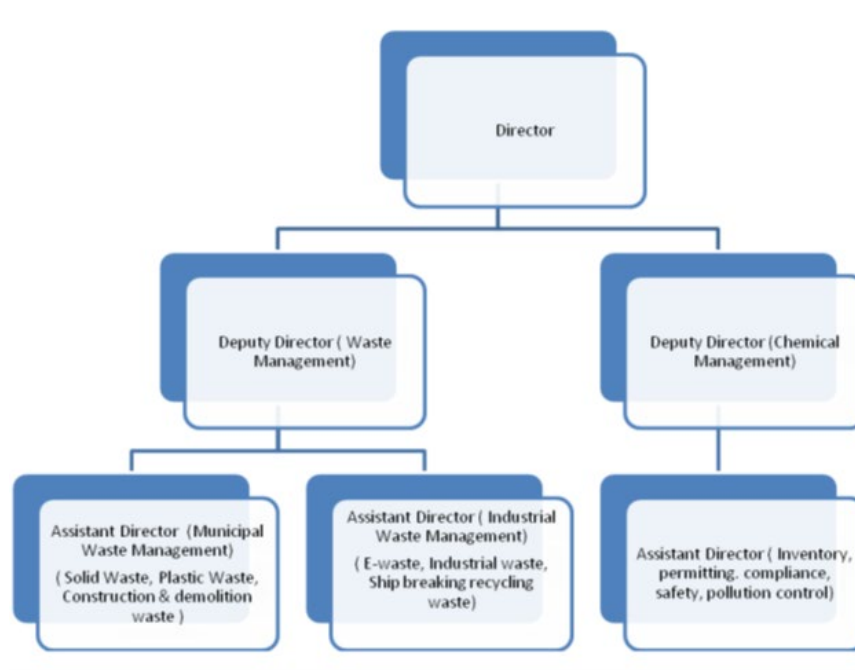
Figure 2-21 Development and Capacity Building of Medical Waste Management Systems with Expected Coordination with Relevant Stakeholders

2) Support and Advice contributing to Human Resource Development

Regarding DoE's responsibility for waste control policies and systems, the following matters were mainly implemented through individual consultations and workshops with the DoE personnel.

- Understanding DoE's WCM Wing personnel and job description, and exchanging views on the desired organizational structure in the future
- Providing institutional and technical knowledges through workshops
- Identifying issues through individual consultations, suggestion of solutions, and exchange of opinions

Currently, the WCM Wing has responsible for SWM and chemical substance management. Regarding SWM, the responsibilities for municipal waste and industrial waste are not classified. In order to strengthen activities such as monitoring of the waste management system in future, it is desirable to divide the monitoring targets into local governments and private companies, and to clarify the respective responsible persons. A draft idea for the wing's future organizational structure is shown in Figure 2-22.



Source: JET

Figure 2-22 Proposal for a Future DoE Waste and Chemical Wing Organizational Structure

3) Awareness Activities and Information Disclosure

Public awareness activities are mainly carried out with bottom-up manner by the LGI, the main implementation body of SWM. Regarding expected role of the DoE on awareness activity, by disclosing the information of SWM at national level, it will contribute to raising public awareness in nationwide.

(3) Holding of Workshops

For SWM component, 2 times of the workshops were held.

1) 1st Workshop

a) Purpose and Outline

The SWM in Bangladesh is carried out in cooperation with the DoE, the LGD, the LGED, and the LGI for municipal waste. The SWM Rule was formulated and enforced, but it is necessary to encourage its implementation among the relevant organizations. Under this circumstance, it was considered that holding of a workshop would be of some help to encourage implementation of the SWM Rule. Therefore, a workshop was planned by the DoE and the JET.

The 1st workshop was conducted as described below. In the workshop, the DoE and the JET presented status of SWM and the legal system in Bangladesh and Japan, and compared planning way by local governments, methods of sharing monitoring data, and the status of EPR system between two countries by presentation and discussion. The programs and presentation materials are shown in the Appendix of this report.

(a) Date: 21st December, 2022

(b) Location: DoE Headquarter

(c) Participants: 51 (DoE Headquarters, DoE Regional Office)

(d) Purpose :

- To share knowledge and experience with relevant government officials for discussion

- To identify priorities for the implementation of waste management and discuss how to improve the waste management system in Bangladesh

Table 2-14 Outline of the First Workshop on Waste Management

Content	Presenter
General Concept of Waste Management and Current Status of Waste Management in Bangladesh	JET
Introduction and discussion of waste management policies and systems in Bangladesh and Japan	WCM Wing and JET
Preparation of SWM plan and annual report by LGI and facilitation by DoE	WCM Wing and JET
Introduction of Japanese EPR systems and discussion of the possibility of introduction in Bangladesh	WCM Wing and JET
Current Status of Activities in Bangladesh to Monitor Greenhouse Gas Emissions Related to Waste Treatment and Disposal	Climate Change Wing

Source: JET

b) Results

In the workshop, discussion was made on way of strengthening relationship between the DoE and the LGI, such as sharing of good practices of SWM with awarding them. When the JET introduced current status of SWM in Japan, Bangladeshi participants interested about sorted collection at generated point, and way of reducing the amount of solid waste.

2) 2nd Workshop

a) Purpose and Outline

Based on the discussions at the 1st workshop, the 2nd workshop was held as described below.

- (a) Date: 20th July, 2023
- (b) Location: DoE Headquarter
- (c) Participants: 38 persons (MoEFCC, DoE Headquarters, DoE Regional Office (around Dhaka City and Chattogram City), and City Cooperation (northern and southern Dhaka City))
- (d) Purpose :
 - To share knowledge and experience in the process of developing and implementing waste management plans through dialogue with relevant government officers,
 - To discuss way of annual report preparation with method of generating and compiling required data for reporting, and
 - To discuss priority activities to be conducted for strengthening SWM in the future.

Table 2-15 Outline of 2nd Workshop on SWM

Content	Presenter
• Details and notes to be included in the waste management plan and in the preparation of the annual report	JET
• Waste Management Plan and Annual Report Described in Waste Management Rules (2021)	WCM Wing
• Introduction to the Waste Management Plan in North and South Dhaka City	DNCC and DSCC
• Discussions on the issues identified by the project	DoE and JET

Content	Presenter
activity and the activities necessary to resolve the issues	
• Group discussions and presentations on waste management plans and the preparation of annual reports	DoE and NDCC and DSCC

Source: JET

In the previous workshop, DoE officers discussed how to encourage local governments for preparation of SWM plans and annual reports under the SWM Rule. Based on the discussion, in the 2nd workshop, further discussion and exchange of opinions were made with required support for the DoE in future.

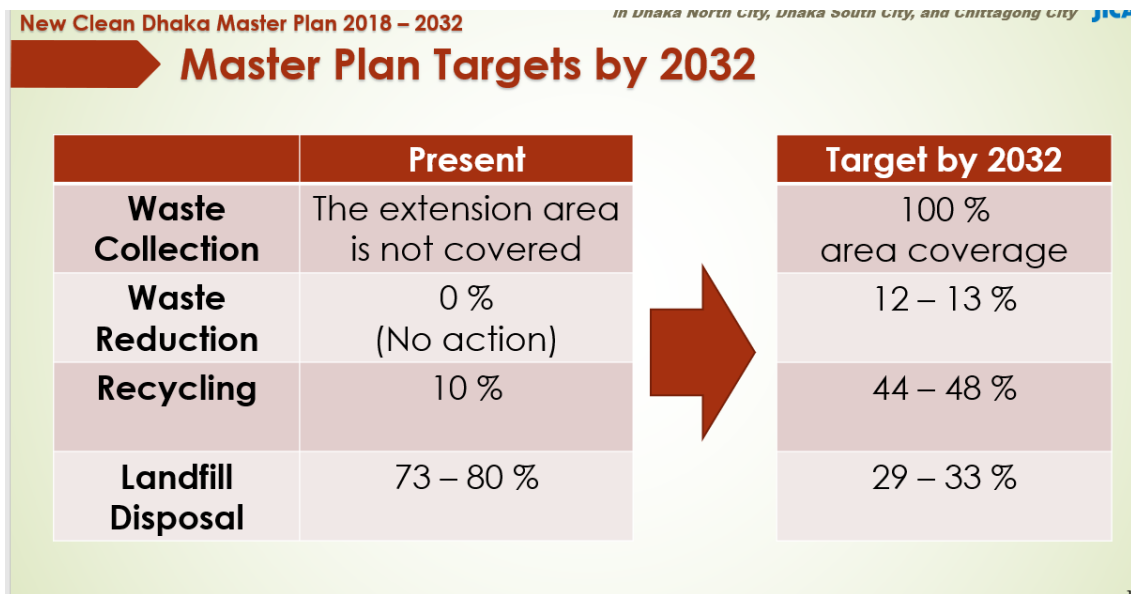
In the 2nd workshop, the JET presented Japanese cases on contents of the annual report and way of formulating and monitoring of SWM plan. Then, the DoE explained the necessity of planning and annual report preparation based on the SWM Rule to the local governments' participants. For discussing and trial exercising on preparation of annual reports and SWM plan, 2 groups consisting of DoE and municipal officers were created, and discussion and trial exercising were implemented. After trial exercising, 2 groups presented key points to be considered for planning and reporting, and discussed with the JET. The DoE also explained what the DoE expects to receive support from donors for improving SWM in future.

b) Results

Through this workshop, discussions were made among the participants on the priority issues and actions to be conducted under the SWM Rule. Based on the discussion, the DoE summarized the activities to be carried out in future with ideas on a presentation at the final seminar. It was considered that the preparation for the final seminar can be prepared from this workshop's outcome.

c) Content of the consultation

Dhaka North City officers participated in the workshop, and explained the Clean Dhaka Master Plan formulated in 2005. According to the explanation, DNCC/DSCC currently achieve their goals and are continually improving SWM. In the workshop, the contents of "New Clean Ducker Master Plan 2018-2032" were also explained. The master plan set a target value as 100% waste collection rate to be achieved by 2032. In the presentation, the following issues were pointed out: shortage of staffs, necessity of the proper operation of intermediate treatment facility, requirement on expansion of the final disposal site, and so on. As planned priority measures, improving efficiency of street cleaning, actualizing of intermediate treatment with energy recovery, and encouragement of recycling and resource recovery measures were raised.



Source: North Dhaka City

Figure 2-23 Targets of New Clean Dhaka Master Plan 2018-2032

The groups comprising of DoE and Dhaka North City officers discussed on key items to be remarked when SWM plan and annual report are prepared. During the discussion, the following points were raised.

Group 1: At the planning stage, it is necessary to examine effectiveness of technology improvement, installation plan of necessary equipment, and active public participation. It is also important to guide appropriate operation of the equipment and facilities, and examine way of waste reduction, segregation at source and recycling with utilizing the knowledges obtained in the field through daily work of waste collection and disposal. Periodic monitoring and evaluation of implementation status of SWM was also raised as important activities for improving SWM plan continuously and strategically.

Group 2: This group took up recycling activities as a main item to be discussed. The group pointed out that composting activities on biodegradable wastes can be carried out by each Ward level and the obtained useful experiences and lessons need to be shared with other Wards. Regarding monitoring and reporting system of SWM activities progress, the group pointed out that the LGI needs to be involved in the system, and semiannually reporting to the LGD will be necessary. In addition, the group expected the National Coordination Committee to use information of SWM activities described in annual reports for formulating and updating the national policy of SWM.

In order to strengthen SWM, DoE expressed the following activities as the priority actions to be conducted in the future, and continuous support for capacity building is also expected.

- Capacity building for providing technical guidance by DoE to local governments on preparation of annual reports, construction of waste databases, and preparation of SWM plans
- Strengthening the manifest system with import and export control on hazardous wastes

- Reliable implementation of the SWM Rule and the Hazardous Waste (E-waste) Management Rule
- Improvement of incineration power generation facilities and training for introducing waste power generation, resource recovery and composting
- Establishment of a system to manage plastic-waste with introduction of EPR concept

In the workshop, active discussions were also made on EPR and waste segregation. The main discussion areas are as follows.

- In Bangladesh, the generated amount of solid waste has increased with increasing and the basic unit are also on the increase due to population growth and economic growth. However, Bangladesh is trying to promote the reduction of wastes by enhancing legal systems and promoting economic incentives.
- In Japan, the increasing trend of waste generation has been halted, and in recent years, the waste generation rate has also been decreasing. As one of the reasons, the increase tendency was suppressed by the awareness of the citizen consciousness of the local government which was the national government and the implementation body, and by the implementation of waste separation and weight reduction measures.
- DoE has been working on developing guidelines to promote EPR, and commented that it would be better to develop these guidelines through consultations with various stakeholders, including the national government, local governments, and industry.
- Cases such as the transfer of the authority to separate collection of money by day of the week and to collect money violating Conservancy Inspector in India were raised, and these good cases were discussed.
- The National Coordinating Committee on Waste Management is considering reviewing and evaluating annual reports on waste management plans and waste management prepared by local governments and improving the contents of the plans and reports in a stepwise manner, and it is hoping to consider the award system of each local government. The roles of the DoE in these activities are considered to be crucial.

2.2.4 Final seminar

(1) Purpose and Outline

A final seminar was held to share the activities and outcomes of the Project and to exchange opinions between the DoE and the relevant governmental organizations regarding the expected activities in future that will be necessary to strengthen environmental management capacity of the DoE.

- (a) Date : 21st November 2023
- (b) Place : DoE Headquarter
- (c) Participants : 64 persons (MoEFCC, DoE Headquarter, DoE Divisional Office, DPHE, LGED, DNCC, DSCC, CCC, Donors (JICA, WB, GIZ), etc.)
- (d) Objective:
 - To share the activities and outcomes of the Project, especially the priority issues to be addressed and the expected activities by the DoE in future

- To exchange opinions the relevant governmental organizations regarding the expected activities in future for strengthening environmental management capacity of the DoE

Table 2-16 Overview of Final Seminar

Contents	Presenter
• Overview of the activities of this work	JET
• Finding and recommendation obtained from the Project (water pollution control and SWM)	JET
• Reporting on the expected activities to be conducted by the DoE for strengthening environmental management capacity	DoE
• Exchange the opinions regarding the expected activities to be conducted by the DoE	All participants

Source: JET

(2) Result

In the seminar, the DoE and the JET presented the expected activities in future by the DoE, as shown in Table 2-2, based on the findings obtained through the Project.

Table 2-17 Expected Activities in Future by DoE

Area	Current Institutional Aspect	Expected Activities in Future by DoE
Water Pollution Control	Environmental Conservation Rule (ECR) was revised in 2023 and the requirement of water quality monitoring and wastewater monitoring was enhanced.	<p>(Activities to be conducted in short term)</p> <ul style="list-style-type: none"> • To provide continuous technical training for proper inspections on industrial wastewater sources and issuing and updating Environmental Clearance Certificates (ECC). • To provide trainings for proper operation of laboratory equipment for environmental analysis and ensuring quality of analytical results. • To conduct required activities for accrediting of DoE's environmental analysis laboratories. <p>(Activities to be conducted in long term)</p> <ul style="list-style-type: none"> • To strengthen collaboration with the related ministries and the agencies to examine pollution loads including impacts of wastewater other than industrial wastewater • To examine systems to realize wastewater management in river basin level by collaboration with the related organizations • To address transboundary pollution issues in international rivers, etc.
SWM	The SWM Rule was enacted in 2021, and it was clarified of the obligation to report waste generation	<p>(Activities to be conducted in short term)</p> <ul style="list-style-type: none"> • To identify issues that prevent local governments from conducting the activities requested by SWM Rule with collecting good practices. • To provide trainings for strengthening the capacity for guiding and encouraging local governments to ensure

Area	Current Institutional Aspect	Expected Activities in Future by DoE
	and treatment status and to formulate a management plan.	monitoring and SWM planning with developing assistant tools. <ul style="list-style-type: none"> • To conduct pilot monitoring activities on industrial waste management with consultation to the relevant stakeholders including concerned private sectors. • To enhance the institutional system of SWM such as expanding of WCM Wing and setting working groups under the National Coordination Committee (Activities to be conducted in long term) <ul style="list-style-type: none"> • To develop a comprehensive monitoring system on industrial waste generation and treatment status

Source: DoE and JET

(3) Discussion

In the Final Seminar, the participants made active discussion on the presented expected activities for strengthening environmental management capacity by the DoE in future, and possible and required measures to be considered for implementing the proposed activities. The outline of discussion is described as below.

[Overall]

- JICA Headquarters pointed out that environmental management means to manage and control human activities. To actualize effective management and control, JICA Headquarters also suggested that active communication between the DoE and citizens is essential and important for the DoE to understand actual environmental problem distressing citizens at the field with receiving suggestion and recommendation from them, and for citizens to grasp the DoE's policies, and planed and conducted activities for environmental management. The active communication assists to involve citizens as actors for environmental management, and increase the momentum for enhancing environmental management in Bangladesh society. The DoE managers commented that they understood the suggestions by JICA Headquarters, and they will enhance communication with citizens (JICA Headquarters, DoE).
- The DoE commented that the outcome of the Project was effective for DoE. The DoE also suggested to use existing training needs analysis result for DoE's future training effectively (DoE).
- Through the seminar, the activities and outcomes of the Project were recognized by other donors, and positive opinion exchange was made on effective coordination of supporting activities for the DoE among donors (WB, GIZ).

[Water Pollution Control]

- The participants agreed on the proposal to enhance scientific based environmental management. For water pollution control, the participants pointed out necessity of the relevant officers' capacity and institutional system development for the environmental analysis

laboratories to obtain reliable monitoring data contributing to scientific basis environmental management. s (DoE, DPHE).

- A DoE local officer explained difficulty on control of wastewater discharged from middle and small textile industry, and proposed to introduce low-cost and effective wastewater treatment technology (DoE).
- Possibility on collaboration of analytical activities among environmental analysis laboratories belonging to different agencies was raised (DPHE).
- The participants agreed the proposal on water pollution control in river basin level in future, presented by the DoE and the JET. For adopting this approach, it was also pointed out that technical capacity improvement and institutional development for the DoE will be necessary (DoE).

[SWM]

- Regarding the proposal to encourage communication with citizens proposed by the JICA Headquarters, the participants agreed, and pointed out that it is very important for conducting SWM activities actively, involving local communities (DoE, LGI).
- A DoE manager requested for the LGI to invite the DoE officers in case that the LGI plan to hold technical workshop for environmental management. When the DoE officers attend such meeting, the officers can provide required technical and legislative information to the LGI for encouraging environmental management activities based on the national policies, laws and regulations, such as requested planning and reporting by SWM Rule (DoE).

3. Issues, Measures, and Lessons Learned in Project Implementation and Management

3.1 Overall Issues, Measures, and Lessons

3.1.1 Necessity of Fostering Comprehension on JICA Technical Cooperation at Begging of Project

(1) Situation

At the beginning of the project, JET needed to announce the project to DoE's senior managers sufficiently. Especially, it was important for the project to get DG of DoE to understand approach of JICA technical cooperation project.

(2) Measures

Although DG of DoE was generally busy, JET actively contacted DG with sending the letters at the beginning of the project, and wait for holding a kick-off meeting until the project was fully understood by DG. As a result, timing of the kick-off meeting was shifted by March 2022, but due to DG's well understanding about the project and active instruction to the main wings of DoE, many directors and DDs attended the kick-off meeting and the project was fully launched.

(3) Lessons

When technical cooperation is commenced, it is necessary to grasp the important stakeholders in advance, and to implement the project activities with enough consensus of top manager of the counterpart, such as DG. For that, it is better to keep enough preparatory period.

3.1.2 Implementation of Project Activities in Epidemic of COVID-19

(1) Status

At the beginning of the project, it was a time when COVID-19 was prevalent. Remote meetings were recommended and movement restrictions were adopted.

(2) Measures

Fortunately, DoE executives were familiar with remote meetings, and the main meetings could be held remotely. Therefore, remote meetings by Zoom were held as necessary at the beginning of the project. In addition, since it was necessary to avoid meetings with a large number of participants, hybrids meetings were held by multiple ways, such as face to face and remote. However, some remote meetings were disturbed due to bad internet connection. To address this issue, JET purchased an own router to use alternative internet line as necessary.

(3) Lessons

Regardless of whether COVID-19 is prevalent or not, remote meetings should be conducted as necessary to address special cases, such as moving restriction from safety viewpoints.

3.1.3 Hiring Local Experts

(1) Status

In Bangladesh, many legislative and management documents are written in Bengali only. In addition, some of the staff at the regional offices cannot speak English well. Therefore, it is required to be able to confirm documents, and make communication by not only English but also Bengali.

(2) Measures

JET always works at Dhak and Chattogram with hiring local experts for confirming Bengali documents and communicating with local DoE officers by Bengali smoothly.

(3) Lessons

Employment of local experts is essential to conduct technical cooperation in Bangladesh. It is desirable to secure experts whose expertise are environmental field. Collaboration with university professors is also effective.

3.2 Water Pollution Control Component

(1) Status

In DoE, several wings work for water pollution control. During technical cooperation, JET needed to continuously communicate well.

(2) Measures

For water pollution control sector, National Resource Management Wing of DoE is the main counterpart, but technical cooperation has been carried out by continuous communication and discussion with the officers of not only National Resource Management Wing, but also other relevant wings, such as Environmental Clearance Wing, and Monitoring and Enforcement Wing. These relevant departments were significant, since industrial wastewater quality control in Bangladesh was operated with ECC approval and updating system, and these wings concern about the system closely.

(3) Lessons

Environmental Clearance Wing and Monitoring and Enforcement Wing are focused to control industrial wastewater mainly, but by communicating with Natural Resource Management Wing as a main counterpart, JET can discuss on water quality conservation from various viewpoints including non-industrial wastewater control and biodiversity conservation. Substantial communication for deciding way of technical cooperation was conducted with not only Director but also DDs and Assistant Directors of each wing.

3.3 SWM Component

3.3.1 Developing Relations with DoE's Waste and Chemical Management Wing

(1) Status

Waste and Chemical Management Wing, that was the main counterpart of technical cooperation in SWM sector, was only a few years since its establishment as existing structure. In addition, this project was the first JICA technical cooperation project for DoE, and at the beginning of the project, it was not easy to make communication, even though small and daily discussion.

(2) Measures

By introducing the achievements of JICA's technical cooperation for North and South Dhaka City and Japanese administrative experience on SWM, the DoE side's understanding on Japanese technical cooperation was gradually being deepened. During the technical cooperation, JET responded in a timely manner to several requests from DoE, such as providing advices on the materials for the National Coordination Committee and introduction of Japanese legislative system on SWM.

As a result of developing relationships, 2 workshops could be held to exchange opinions, share information, and provide advices.

(3) Lessons

It is important to take a certain time to develop a mutual understanding with counterparts without hasty actions.

3.3.2 Execution of Technical Cooperation Involving Relevant Organizations

(1) Status

The project needs to involve local governments and relevant ministries and agencies for proceeding technical cooperation, since those organizations are administrative executors and stakeholders for SWM in Bangladesh.

(2) Measures

As represented by North and South Dhaka City, the local governments engaging in practical work of SWM were considered to have obtained large experiences through their daily work and by support of international donors such as JICA. The managing organizations concerning with SWM like LGD and DPHE were also considered as the organizations to be involved for the project. Therefore, the project had meeting with and invited these organizations to the workshops. Through discussion between DoE and these organization, the project tried to examine priority issues and actions to be conducted in the future with practical experience of SWM obtained by the concerned organizations activities done so far.

(3) Lessons

The local governments, represented by NDCC and SDCC, have already received technical cooperation from JICA for a long period. The officers of such local governments understand technical cooperation, and have well knowledges on technical and institutional aspects of SWM. On the other hand, other local governments do not have enough knowledges such as semi-aerobic landfill technic or way of encouraging waste segregation and recycling by Ward based approach. To such local governments, it is important to share such technical and institutional knowledges, cooperating with the LGI receiving technical assistance by the JICA. The DoE is expected to collect good practices of SWM applied and conducted by the LGI to share such information in nationwide.

4. Achievements of Outputs

The project purpose is that " the issues to be addressed for enhancing environmental management administration mainly in water pollution control and SWM are identified, and the direction for capacity development (CD) of DoE for conducting comprehensive environmental management is proposed." The expected outcomes are "Output 1: Legal and institutional issues in water pollution countermeasures and SWM related to administrative mandate of DoE are identified." And "Output 2: Analysis and examination on the required CD are conducted for comprehensive environmental management by DoE". The achievements of outputs are described below.

4.1 Output 1: Legal and institutional issues in water pollution countermeasures and solid waste management related to administrative mandate of DoE are identified.

Through discussion and workshops with DoE, relevant ministry and agencies, and local governments, the administrative issues on environmental management in water pollution control and SWM were identified. Therefore, it is considered that under Output 1, the expected outcomes were obtained.

Regarding water pollution control, as described in the section 2.1.4 and Table 4-1, necessity of strengthening the capacity on water pollution control according to revision of ECR, lack of legislative system on administrative guidance for improving operation of wastewater treatment facilities, requirement on laboratory accreditation, and the shortage of human resources for the implementation of inspections and monitoring were raised as the priority issues to be addressed.

Regarding SWM, as described in the section 2.1.5 and Table 4-2, necessity of capacity development and legislative arrangement with guidelines preparation for encouraging implementation of SWM Rule, and necessity of legislative arrangement and enhancing monitoring capacity on industrial solid waste were raised as the priority issues to be addressed.

To make the DoE understand the priority issues identified, and examine the expected activities in future by the DoE themselves, the JET provided information on legislative, technical and institutional system in Japan as referential information, and discussed with the DoE. JET also provided the opportunities on discussion between the DoE and the relevant governmental organizations to identify the priority issues from various viewpoints by holding the workshops. As a result, the DoE identified the priority issued to be addressed for water pollution control and SWM. Therefore, it is considered that the Output 1 was achieved.

4.2 Output 2: Analysis and examination on the required CD are conducted for comprehensive environmental management by DoE

Based on the analysis on the priority issues of the DoE, analysis and examination of the necessary activities in the future were jointly carried out with the DoE and the JET. The outline of the study results is shown in Fig. 4-1, Table 4-1 and Table 4-2. During the project implementation period, Bangladesh enhanced legislative system for proceeding science based environmental management in water pollution control and SWM by the revision of the ECR and enforcement of the SWM Rule, respectively. In addition, the continuous support by the donors for both fields contributes to enhancement of environmental management capacity. Taking these factors into account, the

directivity of DoE to strengthen its environmental management capacity and the expected activities by the DoE were examined and proposed.

The proposal on the expected activities by the DoE for water pollution control and SWM was presented in the Final Seminar by the DoE and JET, as shown in Table 1-4, and Table 2-17. In the seminar, the presented proposal was discussed with the relevant governmental organizations, and got agreement from them. Considering the presentation and discussion in the Final Seminar, it is considered that Output 2 was achieved.

In addition to the outcome mentioned above, through the workshops and the Final Seminar, the JET introduced past and on-going technical support by JICA and technical and institutional topics that could be applied in Bangladesh. These activities are thought to contribute to making concrete ideas on the DoE's needs in the future. In the Final Seminar, the several donors were participated. Through the seminar, the activities and outcomes of the Project were recognized by other donors, and positive opinion exchange was made on effective coordination of supporting activities for the DoE among donors.

Table 4-1 Current Status, Issues and Expected Future Activities in Water Pollution Control Sector

Item	Legislative System			DoE's Administrative and Planning Capacity and Technical Capacity			DoE's Implementation System/Relationship with Other Ministries and Agencies		
	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors
Wastewater management	<ul style="list-style-type: none"> - Bangladesh Environment Conservation Act (1995, 2010 revision) - ECRs (1997) - ECR(1997) is scheduled to be revised this year. 	<ul style="list-style-type: none"> - With the revision of ECR, the number of regulated items increases and the standards for some items become stricter, but the degree of comprehension of the necessity of strengthening the control system is insufficient. 	<ul style="list-style-type: none"> - Arrangement of detailed rules for operation of ECR revised rules 	<ul style="list-style-type: none"> - Only the industrial wastewater defined in ECR is managed. 	<ul style="list-style-type: none"> - Pollution sources other than industry are not targeted for pollution control (domestic wastewater, agriculture wastewater, etc.). - Especially, there is no plan concerning the septic tank management, and it affects the load of the domestic wastewater. 	<ul style="list-style-type: none"> - Understanding industrial wastewater pollution load - Enhancement of wastewater control capacity for not only industrial wastewater but also other types such as domestic wastewater 	<ul style="list-style-type: none"> - Ad hoc meetings are held with related ministries and departments in charge of water resource management (BWDB), sanitary management (DPHE), sewerage development and operation (WASA), etc. 	<ul style="list-style-type: none"> - It is necessary to strengthen collaboration with related ministries and bureaus concerning comprehensive wastewater management. 	<ul style="list-style-type: none"> - Strengthening coordination with related ministries and bureaus concerning comprehensive wastewater management
On-site inspection of emission sources	<ul style="list-style-type: none"> - On-site inspections shall be conducted in accordance with ECR. - Environmental Court Act (2000, 2002 and 2010 Revision) 	<ul style="list-style-type: none"> - The rules for providing fines by on-site inspections is existed, but no rules on administrative guidance for improvement of operation of wastewater treatment facilities is existed. - Wastewater analysis for providing fines can be conducted only in government laboratories. 	<ul style="list-style-type: none"> - Improvement for effective operation of on-site inspection results 	<ul style="list-style-type: none"> - DoE personnel conduct on-site inspections of industrial wastewater discharge sources, including in local areas. - Only the results of analysis by the government laboratory can be used as test results. 	<ul style="list-style-type: none"> - Improvement of knowledge of wastewater treatment facilities by on-site inspectors is required. - Government analysis laboratories not certified 	<ul style="list-style-type: none"> - Training of on-site inspection staff - Acquisition of Certification for Government Analysis Laboratories (Support for related donors) - GIZ: (a) Laboratory Accreditation Support; (b) Standard Operating Procedures (SOP) Preparation Support; and (c) Laboratory Performance Check. - (Support for related donors) - WB: BEST Project organizes the analytical laboratories (central 1, Division 4, District 30) and conducts an automated monitoring PP of wastewater discharge sources. 	<ul style="list-style-type: none"> - Local wastewater sources are also subject to on-site inspections by DoE local office staff, but only one DD, one to two AD, and several inspectors are assigned to each office. 	<ul style="list-style-type: none"> - Inspection is not fully implemented due to lack of human resources. (e.g., in Gajipur, there are approximately 3,000 wastewater sources in the area in charge, but there is no need to conduct an in-house inspection.) 	<ul style="list-style-type: none"> - Strengthening DoE on-site inspections - Examination of a management system involving local governments
EIA	<ul style="list-style-type: none"> - EIA Guidelines for Industries (1997, currently 	-	-	<ul style="list-style-type: none"> - Implementation of EIA in accordance with 	<ul style="list-style-type: none"> - Some staff have insufficient knowledge to 	<ul style="list-style-type: none"> - Strengthening knowledge and experience in wastewater 	<ul style="list-style-type: none"> - Several people are in charge of ECC renewal at local 	<ul style="list-style-type: none"> - It was found shortage of staff engaged in ECC 	<ul style="list-style-type: none"> - Strengthening the capacity of local offices for ECC

Item	Legislative System			DoE's Administrative and Planning Capacity and Technical Capacity			DoE's Implementation System/Relationship with Other Ministries and Agencies		
	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors
	being revised)			ECA, ECR regulations	assess the validity of wastewater treatment facilities at the time of EIA review and renewal of licenses.	treatment facilities (Support for related donors) Preparation of guidelines for designing wastewater treatment facilities for use in GIZ: EIA approval review	offices.	renewal. (e.g., in Narayanganji, about 10 ECC renewal applications may need to be processed daily.)	updating
Environmental water management (river management, lake management, river basin management)	<ul style="list-style-type: none"> - Water Act (2013) - Water Resource Planning Act (1992) - National Water Policy (1999) - Bangladesh Water Rules (2018) - WARPO Union Parishad Guideline (2020) - WARPO District Guideline (2020) - WARPO Upazila Guideline (2020) 	<ul style="list-style-type: none"> - Rules for water quality management in watersheds are not clear (emphasis is placed on water resource management). - Although there are restrictions on protected areas, there is no system to distinguish and manage river water quality upstream and downstream in the river basin. 	Strengthening Water quality management system in river basin level	- The planning of the river environment recovery is examined.	- Planning for the recovery of river environment is insufficient.	- Drafting plans for river environmental management	- BWDB emphasizes water resource control. Plans to strengthen the water quality management system in the future (plans to increase the number of water quality monitoring sites from 18 to 357)	- Reinforcement of monitoring system is necessary (confirmation by hearing that there are not sufficient reagents to test all parameters, etc.)	- Necessity of coordination among stakeholders for policy examination on water environment management

Source:

Table 4-2 Current Status, Issues and Expected Future Activities in SWM Sector

Subject to environmental management	Legislative System			DoE's Administrative and Planning Capacity and Technical Capacity			DoE's Implementation System/Relationship with Other Ministries and Agencies		
	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors
Municipal solid waste	-SWM Rule were enacted to clarify the legal obligations of local governments to report on the status quo and to formulate business planning.	-SWM Rule, that is the basic law for waste management, was enacted. However, there is uncertainty regarding the type of waste, and it needs to be improved. -There is a format for preparing plans and reports, but there are no guidelines for how to prepare them. -Although there are basic laws, there are no technical guidelines on collection, transport, disposal sites, etc. for implementing waste management necessary for local governments.	-Arrangement of matters to be improved for the next revision of SWM Rules -Support for local governments in the formulation of annual report plans and guidelines	-Data for grasping the present state and planning are accumulated with the support of donors in large cities such as Ducker and Chittagong, but they are insufficient for grasping the present state of CC and Uppazilla. -National 3R Strategy-making —An action program for plastic-waste control with WB support was formulated.	-Insufficient monitoring system for grasping the current situation. -Data on waste generation, composition, collection, transportation and disposal have not yet been summarized. -There are no national waste management plans that reflect future demand or target values. -It is necessary to establish an implementation system for realizing an action plan for plastic waste management.	-Enhancing capacity for providing advice on planning and guidelines for annual reports to local governments -Preparing guidelines on how to prepare annual reports submitted by local governments - Development of waste management plans at the national level (Support to Relevant Donors) -WB: Support for the establishment of a system for implementing the Plastic Waste Management Action Plan	-DoE has five personnel in charge of waste control and is working in parallel with the monitoring of chemical imports and exports. -DoE is a waste-management regulatory body -Implementing agencies are local governments and technical assistance agencies (LGD, DPHE, LGED). -The first coordination meeting between the Ministries and Local Governments was held based on SWM Rule.	- Lack of DoE waste managers. - The cooperative relation between DoE and LGD, LGED, DPHE is weak.	-Enhancing capacity for preparation of materials for the Inter-Ministerial Coordination Conference in this work -Strengthening coordination between related ministries and agencies (Support to Relevant Donors) -SWM Technical Assistance Project in JICA"DNCC · DSCC: Conducted information-sharing meetings with LGD and related organizations. Public relations and awareness-raising activities for Dhaka City, support for disposal sites, and improvement of collection and transportation systems in Chattogram City were also carried out. -JICA, WB, ADB, etc.: Support for local governments to strengthen waste collection, transport, and disposal systems - WB: BEST Projects Help Reinforce the Organizational Structure of DoE -GIZ: Support for developing national chemical DB
Industrial waste disposal	-There is a provision that ECA should be carried out on the basis of the principle of discharge person responsibility and	-There is a provision that ECA should be carried out on the basis of the principle of emission supervisor and the principle of	-Consider and advise on measures such as manifest of discharge manager and burden on polluters. (Support to Relevant Donors)	-Management and monitoring of industrial waste is responsible, but monitoring of sources and emissions is not possible.	-An efficient monitoring system needs to be established.	- Introducing the manifest system as a means of collecting information from waste generators and monitoring from waste generation to disposal	-It is not possible to grasp annual emissions of industrial wastes and information on the emissions and wastes.	-A system has not been established to monitor the proper disposal of industrial wastes from waste generators to waste generators.	-Establishing a monitoring system from sources to appropriate disposal

Subject to environmental management	Legislative System			DoE's Administrative and Planning Capacity and Technical Capacity			DoE's Implementation System/Relationship with Other Ministries and Agencies		
	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors	Current Status	Issues	Future Activities/Support for Related Donors
	the principle of polluter burden.	polluter burden, but there is no rule. -No EPR legislation or guidelines have been developed.	-WB is developing EPR guidelines.						
Hazardous waste	- Hazardous waste (E-waste) control rules (2021) - Rules for Recycling and Management of Lead Storage Batteries (2006)	- There are no rules covering hazardous waste.	-	-Electronic waste and lead-acid batteries are specified, but there are no facilities for proper disposal and disposal.	- In the future, it is necessary to improve the treatment and disposal facilities of hazardous wastes.	-Preparation of guidelines for development of hazardous waste treatment facilities	-No department specializes in the management and monitoring of hazardous wastes, and it is implemented in a department with dual duties.	-A department specializing in the management and monitoring of hazardous wastes should be established.	-Enhancing capacity for guiding local governments for encouraging monitoring activities
Techno trash	- Hazardous waste (E-waste) control rules (2021)	-	-	- There are regulations, but there are no facilities for proper treatment and disposal.	- In the future, it is necessary to improve the treatment and disposal facilities of hazardous wastes.	- Examination and advice on necessity of facility improvement	-The implementation system of the treatment has not been established in E-waste. -	-In order to improve the implementation system, collaboration with other ministries and private organizations is necessary.	-
Medical waste	Medical Waste Management Rules (2008)	-	-	- Although there are rules, there are few institutions where appropriate disposal takes place, and the separation between infectious and non-infectious is inadequate.	- It is necessary to strengthen collaboration with the MoH.	-	-MoHFW manages health-care-related waste internally and is managed by LGED of LGD, CC and its senior management.	-It is necessary to strengthen medical waste control in cooperation with LGD, LGED.	(Support to Relevant Donors) JICA: The technical assistance project helps medical waste management at Chattogram City.

Source:

5. Recommendations

5.1 Recommendations for Achieving Overall Goals

The overall goal of the project is that " Environmental management capacity in Bangladesh is strengthened." In order to achieve the goals, it is necessary to pay attention to the following points.

(1) Strengthening and Continuing Environmental Management Systems based on Scientific Basis

During the project period, Bangladesh enhanced legislative system for environmental management in water pollution control and SWM sector by enforcing the following rules.

- Water Pollution Control Sector: Monitoring items were added by revised ECR.
- SWM sector: Obligation to monitor waste generation and management system by enforcing the SWM Rule

Throughout this project, JICA expert team has exchanged views on importance of scientific based environmental management with reliable monitoring data. With enhancing DoE's awareness on importance of ensuring reliable monitoring data, the way for the achievement of the overall goal will be paved.

(2) Strengthening Collaboration between DoE and Relevant Organizations with Keeping Mandate in Mind

In order to strengthen environmental management in Bangladesh, it is necessary to develop national strategies involving relevant stakeholders, including local agencies, and clearly shared. Therefore, DoE and the agencies involved in environmental control need to work closely together to draw on the necessary activities and to share knowledge and experiences.

Chattogram City and other local governments in and around Dhaka City have already begun environmental management activities. These administrative bodies are front runners for environmental management in Bangladesh and are expected to share their experiences with other local agencies. DoE is expected to provide an opportunity to inform and share advanced experiences in Bangladesh that are being implemented and planned by regional agencies.

5.1.2 Water Quality Management

(1) Strengthening Monitoring Systems through Effective Use of Planned Facilities and Equipment

The WB BEST project has begun this year. The project will strengthen DoE environmental monitoring system, including the development of new environmental analysis laboratories and the procurement of analytical instruments to existing analytical laboratories. In particular, support will be provided for facilities and instruments. At the same time, DoE will focus on hiring new staff. Strengthening the monitoring system will be realized by integrating good operation and maintenance of these facilities and equipment, and the securing of the capacity of the human resources to operate them. Planning and implementation of continuous technical training are important for effective use of planned facilities

and equipment, and acquisition of analytical laboratory certification will be necessary to ensure the analytical quality of environmental analytical laboratories.

5.1.3 Waste Management Field

(1) Establishment of System for Encouraging implementation of SWM Rule

SWM Rule has been established, and it is necessary for DoE to confirm waste management plans and annual monitoring report prepared by local governments. To conduct these activities, it is required to establish a review and guiding system with assigning officers and preparing guidelines for assigned officers. This year is the first year of this kinds activities, but the status of report submission is not sufficient currently. It is essential that DoE continue to encourage local governments, identify local governments that have not established a monitoring system to prepare annual reports, and strengthen the guidance and advisory capacities for preparation of annual reports and waste control programs for local governments that utilize the experiences of local governments, such as the city of Dhaka, that can become front-runners.

(2) Establishment of Monitoring System for Industrial Waste

It is necessary to establish a monitoring system from the discharge source of industrial waste including hazardous waste to the treatment and disposal. JICA Expert Team proposed to establish a system by referring to the manifest system in Japan with revising it considering Bangladesh's situation. When the manifest system is introduced, it takes about 8 years from the start of operation of the system to its application to industrial waste in Japan. Therefore, it is necessary to examine the introduction plan in a stepwise manner. In addition, since collaboration with related ministries and agencies and private enterprises is required. Consultations through National Coordination Committee and meetings with private enterprises need to be held in order to form agreements between the relevant parties for the establishment and operation of the system.

(3) Increase Personnel and Organizational Reform

It is an urgent task to increase the number of personnel and develop human resources to implement SWM Rule. Although it needs a certain time to increase the number of staff, it is necessary to train DoE officers, particularly local officers, at the stage when new personnel are hired, and continuous training programs for capacity building needs to be planed and implemented.

(4) Close Cooperation with Other Ministries and Agencies and Local Governments

It is important to cooperate with relevant ministries and agencies to formulate and implement SWM plans. It is desirable that the functions of National Coordination Committee be utilized successfully, and that a system be developed by holding individual meetings with the ministries and agencies in charge. DoE needs to be able to ascertain the status of waste generation/management based on the information obtained from the annual reports submitted by local governments, and to strengthen its capacity to provide appropriate advice to the National Coordination Committee.

JICA will continue to provide technical assistance to major cities such as Dhaka City. It is expected that DoE will actively cooperate with this technical assistance, since it will be useful for DoE's own capacity building.

Appendices: Technical Cooperation Products
(Materials on Workshops and Advice)

Appendices

Appendix 1 : Materials for 1st Water Pollution Control Workshop

Appendix 2 : Materials for 2nd Water Pollution Control Workshop

Appendix 3 : Materials for 1st Solid Waste Management Workshop

Appendix 4 : Materials for 2nd Solid Waste Management Workshop

Appendix 5 : Materials for Final Seminar

**Appendix 6 : Working Paper for National Coordination Committee on
Waste Management**

**Appendix 7 : Report on Accreditation Procedure for Chattogram DOE
Environmental Analysis Laboratory**

Appendix 1

Materials for 1st Water Pollution Control Workshop

Agenda of Interactive Training Workshop on Water Pollution Control in “Advisor on Environmental Management in Bangladesh”

1. Background

DoE conducts water pollution control activities such as issuing license for operation of ETP, ETP performance evaluation and monitoring etc. For enhancing the effectiveness of such activities, it is required to identify the actions to be done considering priority issues to be addressed. In this interactive training WS, information on the Japanese water pollution control system and basic information on ETP with viewpoints to be checked for confirming their proper operation will be provided, and have a discussion for identifying priority issues and required future actions.

2. Objectives

The main objectives of the meeting are as follows;

- (1) To review Bangladesh water pollution control legislative systems with introduction of Japanese legislative systems and examine actions to be adopted, and
- (2) To identify priority issues on ETP inspection and monitoring with introduction of basic information on wastewater treatment system.

3. Participants

(1) Bangladesh Side

DOE (Natural Resource Management Wing), DOE (Monitoring & Enforcement wing), DoE (Environmental Clearance Wing), DoE (Waste & Chemical Management wing), DOE (Dhaka Metropolitan), DOE (Dhaka District), DOE (Chattogram Metropolitan), DOE (Chattogram district), Narayanganj DOE, Gazipur DOE, Munshiganj DOE, Narsingdi DOE, Manikganj DoE, Tangail DOE.

Note: This will be basic training in the Wastewater Treatment Process as well as the legal systems of Bangladesh and Japan. As a result, Deputy Directors, Assistant Directors, and Inspectors involved in inspection and water pollution control are expected to attend.

(2) Japanese Side

JICA Bangladesh Office

1. Shin Murakami, Representative at JICA Bangladesh Office
2. Abdullah Hossain Bin Shawon, Senior Program Officer, JICA Bangladesh Office

JICA Expert Team

1. Kengo Naganuma, Team Leader
2. Shinji Tanaka, Water Pollution Control Expert (International)
3. ABM Sadiqur Rahman, Water Pollution Control Expert (National)
4. Md. AL Mussabbir Hossen, Junior Water Pollution Control Expert and Project Coordinator

**Schedule of Interactive Training Workshop on Water Pollution Control under
“Advisor on Environmental Management in Bangladesh” Project**

Time: 9:30 am

Date: 1st February 2023

Venue: DoE head office (a hybrid of a face-to-face meeting in 2nd floor conference room of DoE and a remote meeting by Zoom)

Time	Content	Speaker	Time expected
9:30-10:00	Registration	-	-
10:00-10:05	Welcome Speech	Shin Murakami, Representative at JICA Bangladesh Office	5 min.
10:05-10:15	Project Brief	Kengo Naganuma, Team Leader, JICA Study Team (over Zoom)	10 min.
10:15-10:20	Speech of Special Guest	ADG, DoE	5 min.
10:20-10:25	Speech of Chief Guest	DG, DoE	5 min.
10:25-10:30	Coffee break		5 min
10:30-11:40	Session 1/ General concept of the wastewater treatment - Legal system of Bangladesh - Status of water quality of Bangladesh - General characteristics of water pollution and its mechanism - Discussion	Shinji Tanaka, Water Pollution Control Expert, JICA Expert Team Md. AKM Rafiqul Islam, Deputy Director, NRM Wing, DOE	60 min.
11:40-12:40	Session 2/ Basics of a wastewater treatment (ETP) technique 1 - Screen and physical treatment Note: The information provided is basically basic information of the wastewater treatment process - Discussion	Shinji Tanaka, Water Pollution Control Expert, JICA Expert Team	60 min.
12:40-13:40	Lunch		60 min.
13:40-14:40	Session 3/ Basics of a wastewater treatment (ETP) technique 2 - Biological treatment Note: The information provided is basically basic information of the wastewater treatment process - Discussion	Shinji Tanaka, Water Pollution Control Expert, JICA Expert Team	60 min.
14:40-15:40	Session 4/ Comparison of Legislative System on Water Pollution Control between Bangladesh and Japan – Introduction of Notification System of Effluent Discharge Facilities - Comparison of the legal system on water pollution management - Discussion	Kengo Naganuma, Team Leader, JICA Expert Team & Shinji Tanaka, Water Pollution Control Expert, JICA Expert Team (Over Zoom)	60 min.
15:40-15:45	Speech of Chair of the Programme	Director, NRM, DoE	5 min.
15:45-16:00	Closing & Refreshment		15 min

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**Advisor on Environment Management
in Bangladesh**

Training Workshop on Water Pollution Control

Session-1
General Concept of Wastewater Treatment

1st February 2023
JICA Expert Team

1

Program of Workshop

- Session 1 General Concept of Wastewater Treatment
- Session 2 Basics of Wastewater Treatment (ETP) Technique 1
Coagulation/ Flocculation / Settling (Physicochemical Treatment)
- Session 3 Basics of Wastewater Treatment (ETP) Technique 2
Biological Treatment
- Session 4 Comparison of Legislative System on Water Pollution
Control between Bangladesh and Japan

2

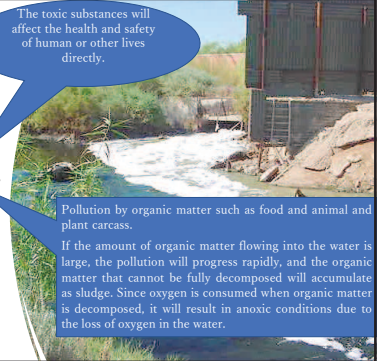
General Water Pollution Mechanism

3

3

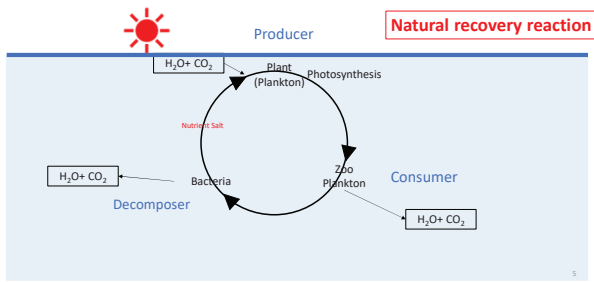
What is Water Pollution?

- Water pollution is the discharge of **toxic substances** and **organic matter** into rivers, lakes, ponds, oceans, etc. due to human activities and industrial development.
- Sources include domestic wastewater, industrial wastewater, agricultural/pastoral wastewater.



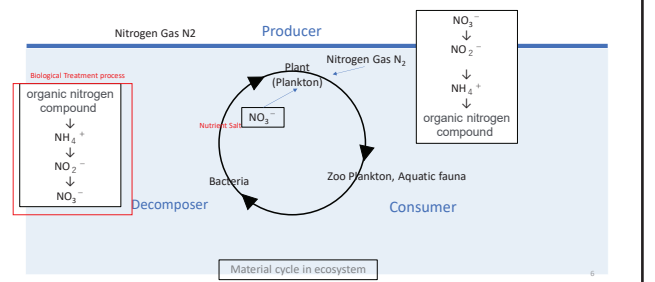
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Material Cycle and Biological Action

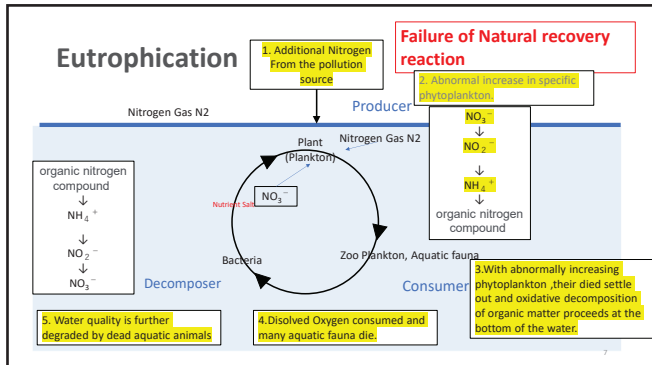


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Nitrogen Cycle



6



7

What is the source of pollution?

- The main sources of water pollution are considered as below.

Category	Detailed sector
Multiple effluent in urban area	Domestic wastewater form Households, Commercials, Hotels, Schools, Hospitals and Restaurants
Industrial effluent	Industrial park, Factories, Power plants
Agricultural wastewater	Irrigation farmland, Poultry farm, Livestock farm
Others	Ship transportation, Dumping site, Construction site

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What is the source of pollution?

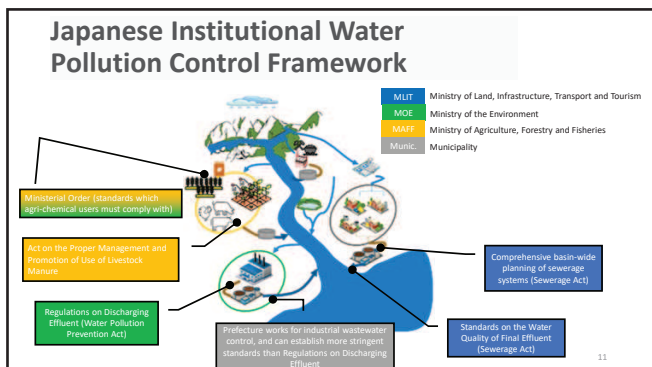
- The main sources of water pollution are considered as below.

Category	Detailed sector	Major pollutant
Multiple effluent in urban area	Domestic wastewater form Households, Commercials, Hotels, Schools, Hospitals and Restaurants	Organic matter (OC, N, P)
Industrial effluent	Industrial park, Factories, Power plants	Heavy metals, Acidic /alkaline effluent, Organic matter, Oils
Agricultural wastewater	Irrigation farmland, Poultry farm, Livestock farm	Organic matter (OC, N, P)
Others	Ship transportation, Dumping site, Construction site	Heavy metals, Acidic /alkaline effluent, Organic matter, Oils

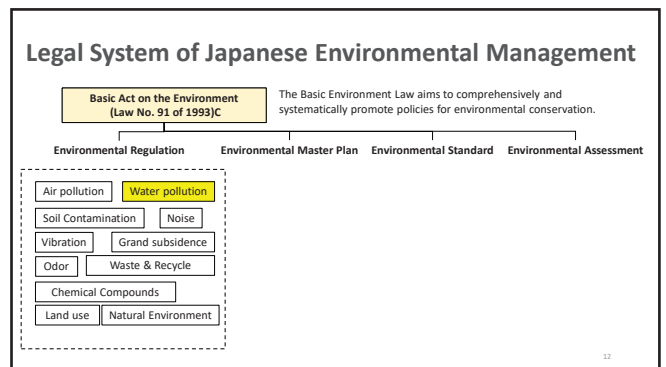
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Industrial Pollution Control Administrative Measures – Japanese example -

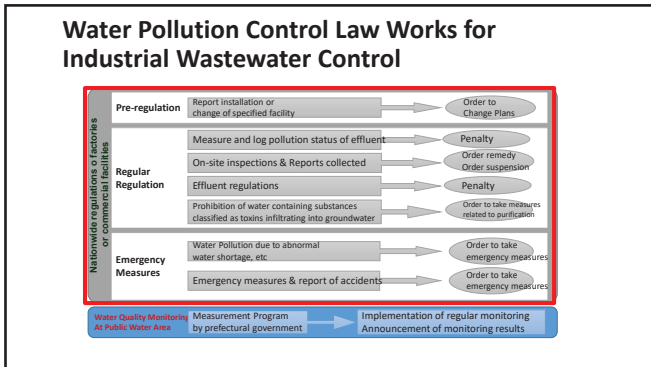
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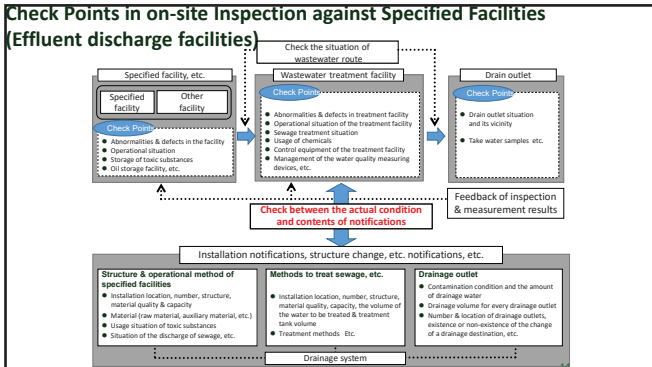
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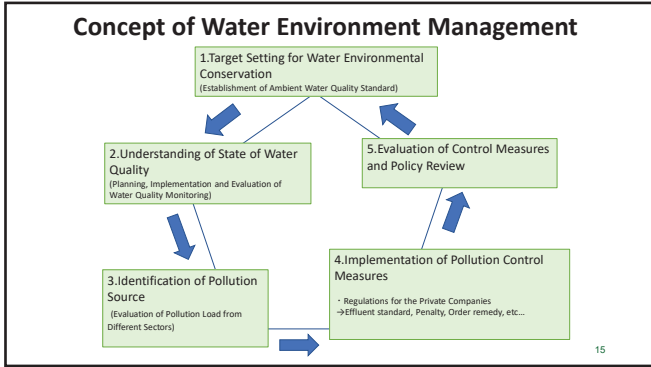
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Points of Discussion

- 1. Major water pollution source in Bangladesh**
Do you think which discharge sources are affecting the water environment?
- 2. Current legislative system for water quality conservation**
Are there any problems with the current water conservation legislative system in Bangladesh?

If the issue is existing in the system, what is the that?
- 3. Wastewater discharge sources to be targeted (factory only or other pollution sources to be controlled seriously?)**

16

**Advisor on Environment Management
in Bangladesh**

Training Workshop on Water Pollution Control

Session-2

Basics of a Wastewater Treatment (ETP) Technique 1
Coagulation/ Flocculation / Settling (Physicochemical Treatment)

1st February 2023
JICA Expert Team

1

Basics of a Wastewater Treatment (ETP) Technique

- In general, there are many kind of technology for wastewater treatment. However, it is possible to categorized into two major groups; the first is Physico-Chemical treatment and other is biological treatment.
- These two processing methods are usually used in combination.

2

Physicochemical Treatment Processes

Physicochemical Treatment
Physicochemical treatment involves a set of processes which may be consecutively performed by coagulation, flocculation and sedimentation.

The coagulation, flocculation and sedimentation process is used when the particle size of suspended solids is small, and the natural sedimentation requires a long time.

Coagulation
Generally, the surface of fine particles floating in water is negative charged . When a chemical with the opposite charge is added to this to neutralize the charge of the target particles, the attractive force between the particles exceeds the repulsive force due to surface charge.

3

Physicochemical Treatment Processes

Physicochemical Treatment
Physicochemical treatment involves a set of processes which may be consecutively performed by coagulation, flocculation and sedimentation.

Flocculation

4

Physicochemical Treatment Processes

<https://youtu.be/hp97IGbrlOI>

5

Physicochemical Treatment Processes

Sedimentation

The rising speed V [m/d] of wastewater is expressed by the following equation.
 $V = Q/A$ Equation (1)
 Q : Inflow of sewage [m³/d], A : Area of settling basin [m²]

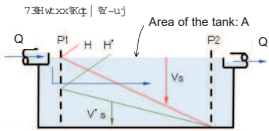
In the design of the settling tank, the area A of the settling tank is set so that $V_s > V$. V_s is the sedimentation velocity . The required area A of the settling tank with the inflow rate Q and the settling velocity V_s of the particles is $A > Q/V_s$ from Eq.(1).

6

Physicochemical Treatment Processes

Sedimentation

Xjim jayfyt...
tkuwj (stzx xyfl jxkldht fl zqfyt s fesi wq hhzdfyts...)



If the sedimentation velocity is V_s (m/d), the water depth H (m) at which the particles settle is expressed by the following equation.
 $H_s = V_s \times T$ (T: Retention Time)
 On the other hand, when the inflow rate Q (m³/d) of sewage flows into a settling tank having a depth H (m) and an area A (m²), the relationship with the retention time T is shown by the following equation.
 $T = A \times H / Q \rightarrow H = Q \times T / A$
 If $H_s > H$, the particles settle to the bottom before the wastewater flows out, so the following equation holds.
 $V_s \times T > Q \times T / A \rightarrow V_s > Q / A$ (= V) Equation (2)

For example, when the inflow rate is 10,000 m³/day and the sedimentation velocity of particles is 15 mm/min, the required area of the settling tank is as follows.
 $A > Q [m^3/d] / V_s [mm/min] / 60 [min/hr] / 24 [hr/d] \times 1,000 [mm/m] = 10,000 / 15 / 60 / 24 \times 1,000 = 463 \text{ m}^2$

Physicochemical Treatment Processes

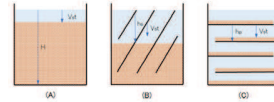
Sedimentation

Xjim jayfyt...
tkuwj (stzx xyfl jxkldht fl zqfyt s fesi wq hhzdfyts...)

Efficiency with inclined plates

Previous discussions have shown that increasing the surface area A of the settling tank increases the efficiency of the settling process.

If the area of the facility is limited, the effective separation area can be increased by implementing multiple plate in the settling tank.



(A) Ordinary settling tank, (B) Settling tank with parallel inclined plates, (C) Settling tank with parallel horizontal plates

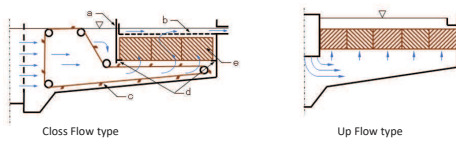
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I j u j s i n e l e a b m j k c j y g e l k a t e s i q u j z m j w j e j s i d d j w j e y a u j k e l d m j k e b a g e j i k u f y j 3



Points of Discussion

1. Have you observed sedimentation facility?
2. How about sedimentation facility operation condition in Bangladesh?
3. Let us discuss on how to check the necessary capacity of sedimentation facility at the site.
4. Which points should be focus on checking operation condition of sedimentation facilities?

**Advisor on Environment Management
in Bangladesh**

Training Workshop on Water Pollution Control

Session-3

Basics of Wastewater Treatment (ETP) Technique 2

Biological Treatment

1st February 2023

JICA Expert Team

1

Biological Treatment

It is divided into **aerobic biological** treatment using microorganisms that require oxygen for the decomposition of organic matters and the growth, and **anaerobic biological** treatment using microorganisms that do not require oxygen.

In addition, it is divided into a **suspended type** treatment method in which the applied microorganisms are maintained in a suspended state in water in the biological reaction tank, and a **biofilm type** treatment method in which the microorganisms are adhered in a medium.

Types of the microorganism	Bacterial growth condition	Living type	Applied Treatment system
Aerobic Microorganism	Aerobic condition	Suspended (Free floating)	Conventional Activated Sludge Method
		Biofilm (Adherence)	Trickling filter
Anaerobic Microorganism	Anaerobic or Facultative anaerobic	Suspended	Up-flow Anaerobic Sludge Blanket(UASB)
		Biofilm	Anaerobic filter(Anaerobic digestion)

2

Activated Sludge Method (1)

The **activated sludge method** which is widely used for treating sewage and industrial wastewater. Wastewater from which contains large solid such as sand and is sent to the **first settling basin**, where solid substances and oils are removed. Then wastewater is sent into a biological reaction tank (**aeration tank**) and contacted with microbial flocs (activated sludge) under aeration and stirring (**Hydraulic retention time (HRT)** is 4 to 24 hours). The organic matter in wastewater is decomposed by activated sludge. The activated sludge mixture is separated into activated sludge and treated water by gravity settling (settling time 2 to 3 hours) in the next final settling tank. Then treated water is chlorinated and discharged.

The activated sludge treatment removes 95% or more of BOD from wastewater.

3

Activated Sludge Method (2)

In general, aerobic biological treatment can decomposes efficiently with highly concentrated sewage by microorganisms which are increased in the blowing air into the sewage. The activated sludge method is a typical example of aerobic treatment.

4

Nitrogen Cycle

Material cycle in ecosystem

5

Hydraulic Retention Time (HRT)

HRT is called the hydraulic retention time, which indicates the average time [h] that the inflow water stays in the treatment tank. HRT is an important item in facility design.

$$HRT(hr) = \frac{\text{Total Volume of the reaction tank}(m^3)}{\text{Flow Rate of Effluent}(m^3/hr)}$$

$$HRT(hr) = \frac{\text{Total Volume of the reaction tank}(m^3)}{\text{Flow Rate of Effluent}(m^3/day)} \times 24$$

Example

If the daily effluent volume is 1,000m³/day, and the capacity of the aeration tank is 900m³. Then the HRT is calculated as below.

$$HRT = \text{Volume of the reaction tank}(m^3) / \text{Flow Rate of Effluent}(m^3/day) \times 24 = 900 / 1,000 \times 24 = 21.6 \text{ hr}$$

6

Volumetric BOD Loading or Volumetric Organic Loading

The amount of organic matter (BOD equivalent) that flows into the aeration tank is an empirical parameter of the treatment tank. The **volumetric BOD loading** is as the BOD applied per unit volume of aeration tank, per day. If the S is BOD concentration of the effluent in mg/L, Q is effluent flowrate in m^3/day , and V is volume of aeration tank in m^3 then,

$$\text{Volumetric BOD loading in mg/L per day} = Q \times 10^3 \times S / (V \times 10^3) = Q \times S / V.$$

This parameter is used for the estimation of the required volume of aeration tank.

On conventional activated sludge process, the normal value of **volumetric BOD loading** shows 500 to 1,500 mg/L/day.

Example -1

The daily effluent volume is 1,000 m^3/day , and its average BOD concentration is 400 mg/L.

If the volumetric BOD loading = 600(mg/L/day) as the conventional activated sludge, then the required aeration tank volume is calculated as below.

$$V = Q \times S / \text{volumetric BOD loading} = 1,000 \times 400 / 600 = 667 \text{ m}^3$$

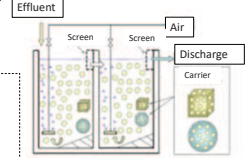
7

Moving Bed Biofilm Reactor (MBBR)

The MBBR system consists of an aeration tank with special plastic carriers that provide a surface where a biofilm can grow. The carriers are made of a material with a density close to the density of water (1 g/cm^3). Organic matter in the wastewater is removed by forming a biofilm on the surface of carriers. The reaction bed is equipped with a screen designed to prevent the carriers from flowing out, and the carriers continue to circulate in the reaction tank.

This method can increase the **volumetric BOD loading** around 2,000 to 3,000. The features of the MBBR are as follows

- (1) The return sludge is not required and the amount of sludge is small.
- (2) The filling ratio should be 50-70% because dense carrier may cause blockage.
- (3) High BOD load can be taken, so the aeration tank is small.



Example -2

Moving Bed Biofilm Reactor (MBBR) system has the high **volumetric BOD loading** in general. If the value is 2,000 mg/m³/day, then the required capacity of the aeration tank is calculated as below.

$$V = Q \times S / \text{volumetric BOD loading} = 1,000 \times 400 / 2,000 = 200 \text{ m}^3$$

8

Moving Bed Biofilm Reactor (MBBR)



<https://www.youtube.com/watch?v=hNUdq50QBGM>

9

Points of Discussion

1. Have you observed any aerobic biological treatment facilities?
2. What types of technology was used by the observed treatment facilities?
3. Let us discuss on how to check/ confirm the capacity of the bioreactor tank.
4. Which points should be focus on checking operation of biological treatment facilities?

10

**Advisor on Environment Management
in Bangladesh**

Training Workshop on Water Pollution Control

Session-4

**Comparison of Legislative System on Water Pollution Control
between Bangladesh and Japan – Introduction of Notification System
of Effluent Discharge Facilities**

1st February 2023

JICA Expert Team

1

**Introduction of Japanese Water Pollution Control System and
Comparing with Bangladesh Legislative System**

On technical session-4, we will introduce the legal system of water pollution control in Japan as a reference. You can compare the legal and implementing system of both countries.

Japan has the different system from Bangladesh on water pollution management. The legal system of Japan had been developed through the experience of highly polluted history in past Japan. After the enforcement of this legal system, the water quality has been improved drastically in Japan.




Water pollution condition at Kitakyusyu in 1960s
Current condition

2

**Water Pollution Prevention Act
(Act No. 138 of 1970)**

The purpose of this Act is to prevent the pollution of water in the Designated Areas of Public Waters and in groundwater by regulating effluent discharged by factories and workplaces into the Designated Areas of Public Waters.

This Act is a specific law for water pollution control, different from the general regulations of ECC or EIA system in Bangladesh.

Water Pollution Prevention Act (Act No. 138 of 1970)

Chapter 1 General Provisions

Chapter 2-1 Regulations on Discharging Effluent

Chapter 2-2 Promotion of Domestic Wastewater Measures

Chapter 3 Monitoring the Status of Water Pollution

Chapter 4 Compensation for Loss or Damage

Chapter V Miscellaneous Provisions

Chapter VI Penal Provisions

3

Notification System of Effluent Generators as “Specified Facilities” by Water Pollution Prevention Act of Japan

Chapter 2-1 Regulations on Discharging Effluent

Article 5

A person that discharges effluent from factories or workplaces into Designated Areas of public waters must, when intending to install a “Specified Facility”, as provided for by order of the Ministry of the Environment, submit a report on the following to local (prefectural) governors.

(i) name and address of the person, as well as the name of the representative if the person is a corporation;

(ii) name and location of factories or workplaces;

(iii) type of Specified Facilities;

(iv) structure and construction of the Specified Facility;

(v) equipment of the Specified Facility;

(vi) use of the Specified Facility;

(vii) means of Treatment of Polluted Water, etc.;

(viii) the level of pollution and quantity of the Effluent;

(ix) other particulars specified by Order of the Ministry of the Environment

4

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (1)

Item	Bangladesh	Japan
Law	The Environmental Conservation Rules 1997	Water Pollution Prevention Act (Act No. 138 of 1970)
Enforcement agency	Department of Environment (DoE)	Local government
Target facility	Orange-B, Red categorized facilities	<ul style="list-style-type: none"> The facilities discharging effluent equal or more than 50m³/day Not only the industrial facility but all facilities discharging effluent

5

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (2)

Item	Bangladesh	Japan
Frequency of issuing monitoring report	Once a year	Once a year (COD, N, P in specific area: every day to once a month depend on the quantity)
Manager of ETP	Not mandatory	Need to be dispatched licensed person
Certificate for analytical laboratory	Not mandatory	Mandatory (Need to be analyzed by certificated laboratory)

6

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (3)

Item	Bangladesh	Japan
Required period of monitoring data storing	Not mandatory	3 years
Necessary action in case of accidental case (e.g., Spilling of harmful effluent)	Not mentioned in ECR	<ul style="list-style-type: none"> • Need to take necessary measures immediately • Need to report status of accident and measure taken to provincial governor

7

The points for the discussion

1. What is the major difference between the legal system of both countries? And is there any Japanese measure which can be referenced for Bangladesh?
2. How do you manage all the effluent discharge by DoE in feature? (Is it possible to increase the number of DoE officers to manage all the effluent generators by DoE?)
3. Do you have any idea on future industrial wastewater control in Bangladesh?

8

Appendix 2

Materials for 2nd Water Pollution Control Workshop

**Agenda of 2nd Interactive Training Workshop on WPC in
“Advisor on Environmental Management in Bangladesh”**

Time: 9:30 am

Date: 9th of July 2023

Venue: DoE head office (a hybrid of a face-to-face meeting in the 2nd-floor auditorium room of DoE and a remote meeting by Zoom)

1. Background

Through the 1st workshop and interviews to the DoE officials, JICA Expert Team (JET) team identifies the current issues on water pollution control and management in Bangladesh. Based on that, JET holds a training session on the basics of the ETP for the junior level staffs of the DoE. On continuation of that JET would like to continue the discussion sessions with the senior officials related to the identified issues and possible upcoming assistance for the DoE. Considering that JET requests the DoE to hold a 2nd Workshop to discuss the issues and its solutions for the next activities should be taken by DoE.

2. Objectives

- I. Through the discussion in the Workshop, DoE officials know the issues pointed out by foreign advisors and they can show their own opinion for those issues.
- II. If the issues which identified by JET are acceptable for DoE officials, they should discuss the solutions for that for the next action-plan should be taken by DoE.

3. Draft Agenda of the Training Program

Time	Content	Speaker	Time expected
9.30 – 10:00	Registration		15 min
10:00 – 10:05	Welcome speech	JICA Representative, JICA Bangladesh Office	5 min.
10:05 – 10:10	Welcome speech	Director, NRM of DoE	5 min.
10:10 – 10:15	Inaugural Speech	1 st preference: Add. Sec., Development Wing 2 nd Preference: DG	5 min.
10:15 – 10:25	Summary of Previous Training Workshop and Purpose of Training Workshop	Shinji Tanaka, Water Pollution Control Expert JICA Advisory Team	10 min.
10.25 – 10:45	Snacks Break		20 min
10:45 - 11:05	Summary of the identified issues by JET	Kengo Naganuma, Chief Advisor, JICA Expert Team	20 min.

Time	Content	Speaker	Time expected
11:05 - 11:25	Introduction of the training system of junior officials in DoE	Mr. Md. Mohiuddin Manik, DD, Coordination, DOE	20 min.
11:25 - 11:45	Discussion of the Issues on Technical Capacity of DoE Officials	Shinji Tanaka, Water Pollution Control Expert, JICA Expert Team	20 min.
11:05 - 11:25	Introduction of the environmental pollution control and monitoring system in Japan (by JET)	Shinji Tanaka, Water Pollution Control Expert, JICA Expert Team	20 min.
11:25 - 11:45	Presentation on the new proposals based on the identified issues (by JET)	Kengo Naganuma, Chief Advisor, JICA Expert Team	20 min.
11:45 - 12:15	Open discussion on the new proposals (by JET and DoE)	JET and DoE	30 min.
12:15 - 12:30	Proposal for further assistance from international donor	Mr. Md. Hasan Habibur Rahman, DD, Planning, DoE	15 min.
12:30 - 12:40	Comments from JICA Representative	JICA Representative, JICA Head Quarter	10 min.
12:40 - 12:55	Comments on Chief Guest	1 st preference: DG 2 nd Preference: Add. Sec., Development Wing	15 min.
12:55 - 13:00	Closing Remarks	Project Focal Person	10 min.
13:00 - 14:00	Lunch	All participants	

4. Participants

I. Bangladesh Side

The tentatively expected participants are described in Attachment-1.

II. Japanese Side

JICA Senior Advisor, JICA Expert Team, JICA Bangladesh Office, JET

Attachment-1

Expected Participants:

Main Target participant

DOE (Natural Resource Management Wing)- 5, DOE (Waste & Chemical Management wing)- 2, DOE (Monitoring & Enforcement wing)-2, DoE (Planning Wing)- 2, DoE (Climate Change and International Convention Wing) - 2, DoE (Environmental Clearance Wing) – 3,

DOE (Dhaka Metropolitan)-2, DoE (Dhaka Laboratory) – 2, DoE (Dhaka Region) – 2, DOE (Dhaka District)-1, DOE (Chattogram Metropolitan)-2, DOE (Chattogram district)-1, Narayanganj DOE - 1, Gazipur DOE -1, Munshigonj DOE - 1, Narshindi DOE 1, Manikganj DOE 1, Tangail DOE 1.

**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Water Pollution Control

Summary of Previous Training Workshop
and Purpose of Training Workshop

9th July 2023

JICA Expert Team

1

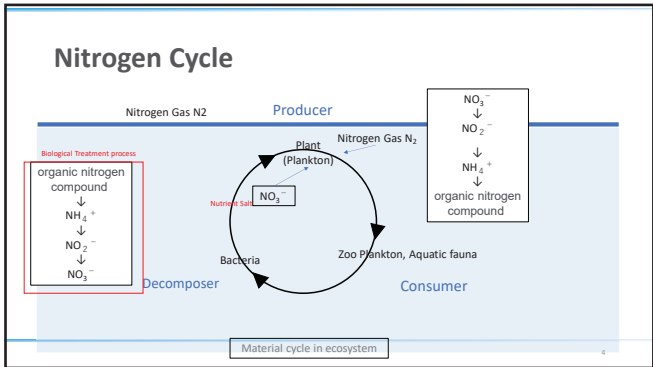
Program of Workshop

- Session 1 General Concept of Wastewater Treatment
- Session 2 Basics of Wastewater Treatment (ETP) Technique 1
Coagulation/ Flocculation / Settling (Physicochemical Treatment)
- Session 3 Basics of Wastewater Treatment (ETP) Technique 2
Biological Treatment
- Session 4 Comparison of Legislative System on Water Pollution
Control between Bangladesh and Japan

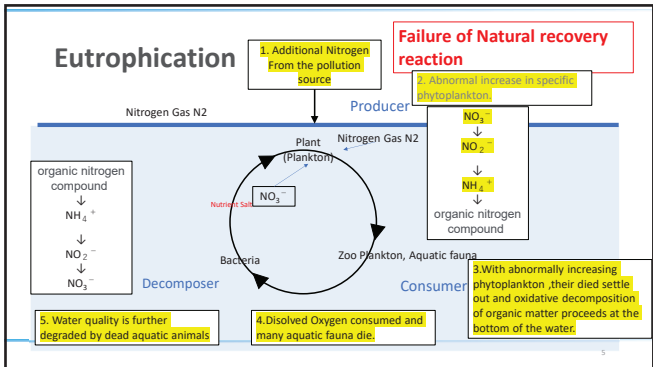
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Session-1
General Concept of Wastewater Treatment

3



4



5

What is the source of pollution?

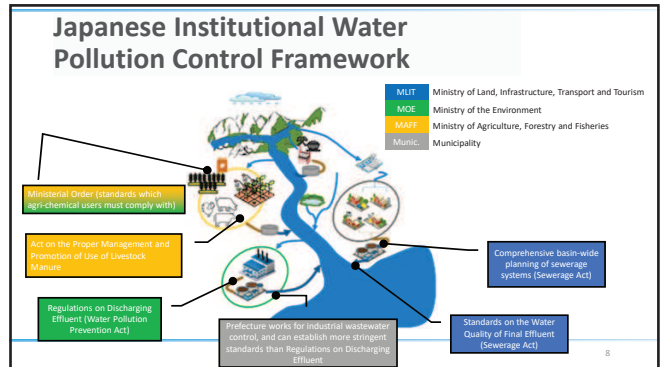
• The main sources of water pollution are considered as below.

Category	Detailed sector	Major pollutant
Multiple effluent in urban area	Domestic wastewater form Households, Commercials, Hotels, Schools, Hospitals and Restaurants	Organic matter (OC, N, P)
Industrial effluent	Industrial park, Factories, Power plants	Heavy metals, Acidic /alkaline effluent, Organic matter, Oils
Agricultural wastewater	Irrigation farmland, Poultry farm, Livestock farm	Organic matter (OC, N, P)
Others	Ship transportation, Dumping site, Construction site	Heavy metals, Acidic /alkaline effluent, Organic matter, Oils

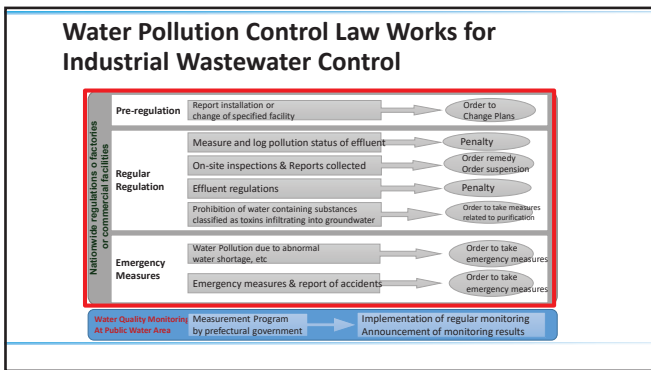
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Industrial Pollution Control Administrative Measures – Japanese example -

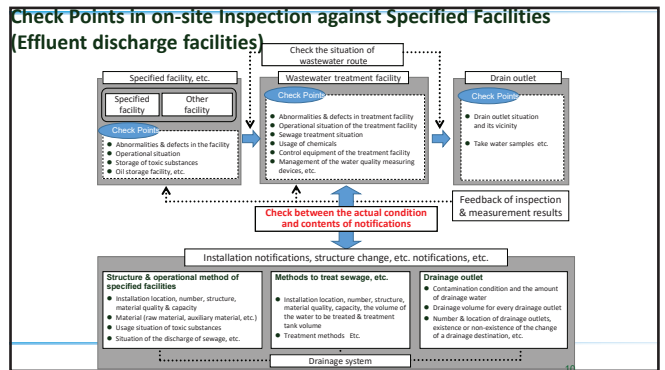
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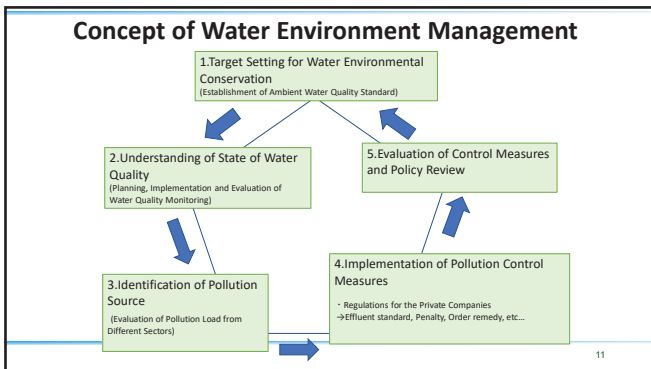
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9



10



11

Points of Discussion

- Major water pollution source in Bangladesh
Do you think which discharge sources are affecting the water environment?
- Current legislative system for water quality conservation
Are there any problems with the current water conservation legislative system in Bangladesh?
If the issue is existing in the system, what is the that?
- Wastewater discharge sources to be targeted (factory only or other pollution sources to be controlled seriously?)

12

Session-2
Basics of a Wastewater Treatment (ETP) Technique 1
Coagulation/ Flocculation / Settling (Physicochemical Treatment)

13

Basics of a Wastewater Treatment (ETP) Technique

- In general, there are many kind of technology for wastewater treatment. However, it is possible to categorized into two major groups; the first is Physico-Chemical treatment and other is biological treatment.
- These two processing methods are usually used in combination.

14

Physicochemical Treatment Processes

Physicochemical Treatment
 Physicochemical treatment involves a set of processes which may be consecutively performed by coagulation, flocculation and sedimentation.

The coagulation, flocculation and sedimentation process is used when the particle size of suspended solids is small, and the natural sedimentation requires a long time.

Coagulation
 Generally, the surface of fine particles floating in water is negative charged . When a chemical with the opposite charge is added to this to neutralize the charge of the target particles, the attractive force between the particles exceeds the repulsive force due to surface charge.

15

Physicochemical Treatment Processes

Physicochemical Treatment
 Physicochemical treatment involves a set of processes which may be consecutively performed by coagulation, flocculation and sedimentation.

Flocculation

16

Physicochemical Treatment Processes

Sedimentation

The rising speed V [m/d] of wastewater is expressed by the following equation.
 $V = Q/A$ Equation (1)
 Q : Inflow of sewage [m³/d], A : Area of settling basin [m²]

In the design of the settling tank, the area A of the settling tank is set so that $V_s > V$. V_s is the sedimentation velocity . The required area A of the settling tank with the inflow rate Q and the settling velocity V_s of the particles is $A > Q/V_s$ from Eq.(1).

17

Physicochemical Treatment Processes

Sedimentation

If the sedimentation velocity is V_s [m/d], the water depth H [m] at which the particles settle is expressed by the following equation.
 $H_s = V_s \times T$ (T: Retention Time)
 On the other hand, when the inflow rate Q [m³/d] of sewage flows into a settling tank having a depth H [m] and an area A [m²], the relationship with the retention time T is shown by the following equation.
 $T = A \times H / Q \rightarrow H = Q \times T / A$
 If $H_s > H$, the particles settle to the bottom before the wastewater flows out, so the following equation holds.
 $V_s \times T > Q \times T / A \rightarrow V_s > Q/A (= V)$ Equation (2)

For example, when the inflow rate is 10,000 m³/day and the sedimentation velocity of particles is 15 mm/min, the required area of the settling tank is as follows.
 $A > Q [m^3/d] / V_s [mm/min] / 60 [min/hr] / 24 [hr/d] \times 1,000 [mm/m] = 10,000 / 15 / 60 / 24 \times 1,000 = 463 \text{ m}^2$

18

Physicochemical Treatment Processes

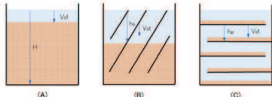
Sedimentation

Xjint jayfyt... (Bengali text)

Efficiency with inclined plates

Previous discussions have shown that increasing the surface area A of the settling tank increases the efficiency of the settling process.

If the area of the facility is limited, the effective separation area can be increased by implementing multiple plate in the settling tank.



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19

19

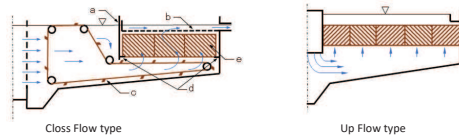
Physicochemical Treatment Processes

Sedimentation

Xjint jayfyt... (Bengali text)

Efficiency with inclined plates

I jujas... (Bengali text)



Cross Flow type

Up Flow type

20

20

Points of Discussion

1. Have you observed sedimentation facility?
2. How about sedimentation facility operation condition in Bangladesh?
3. Let us discuss on how to check the necessary capacity of sedimentation facility at the site.
4. Which points should be focus on checking operation condition of sedimentation facilities?

21

21

Session-3

Basics of Wastewater Treatment (ETP) Technique 2 Biological Treatment

22

Biological Treatment

It is divided into **aerobic biological** treatment using microorganisms that require oxygen for the decomposition of organic matters and the growth, and **anaerobic biological** treatment using microorganisms that do not require oxygen.

In addition, it is divided into a **suspended type** treatment method in which the applied microorganisms are maintained in a suspended state in water in the biological reaction tank, and a **biofilm type** treatment method in which the microorganisms are adhered in a medium.

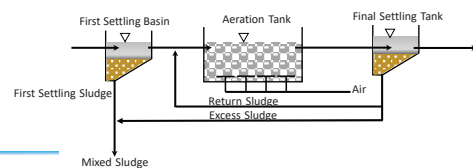
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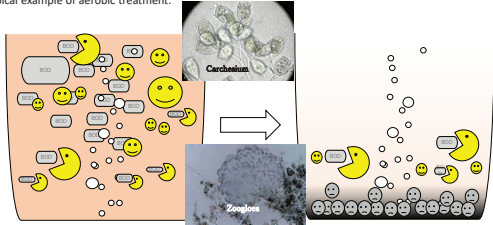


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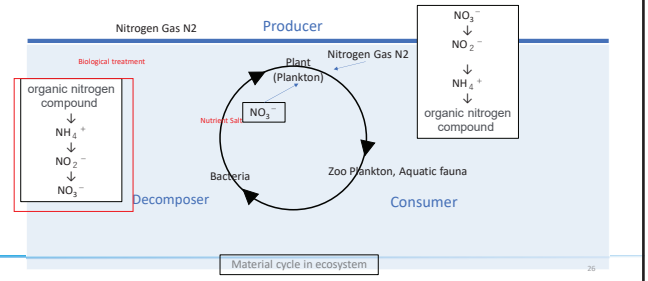
Activated Sludge Method (2)

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25

Nitrogen Cycle



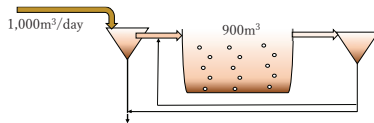
26

Hydraulic Retention Time (HRT)

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$$\text{HRT (hr)} = \frac{\text{Total Volume of the reaction tank (m}^3\text{)}}{\text{Flow Rate of Effluent (m}^3\text{/hr)}}$$

$$\text{HRT (hr)} = \frac{\text{Total Volume of the reaction tank (m}^3\text{)}}{\text{Flow Rate of Effluent (m}^3\text{/day)}} \times 24$$



Example

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27

Volumetric BOD Loading or Volumetric Organic Loading

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$$\text{Volumetric BOD loading in mg/L per day} = Q \times 10^3 \times S / (V \times 10^3) = Q \times S / V$$

This parameter is used for the estimation of the required volume of aeration tank.

On conventional activated sludge process, the normal value of **volumetric BOD loading** shows 500 to 1,500 mg/L/day.

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If the volumetric BOD loading is 600(mg/L/day) as the conventional activated sludge, then the required aeration tank volume is calculated as below.

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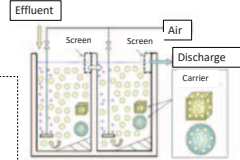
28

Moving Bed Biofilm Reactor (MBBR)

The MBBR system consists of an aeration tank with special plastic carriers that provide a surface where a biofilm can grow. The carriers are made of a material with a density close to the density of water (1 g/cm³). Organic matter in the wastewater is removed by forming a biofilm on the surface of carriers. The reaction bed is equipped with a screen designed to prevent the carriers from flowing out, and the carriers continue to circulate in the reaction tank.

This method can increase the **volumetric BOD loading** around 2,000 to 3,000. The features of the MBBR are as follows

- (1) The return sludge is not required and the amount of sludge is small.
- (2) The filling ratio should be 50-70% because dense carrier may cause blockage.
- (3) High BOD load can be taken, so the aeration tank is small.



Example -2

Moving Bed Biofilm Reactor (MBBR) system has the high **volumetric BOD loading** in general. If the value is 2,000 mg/m³/day, then the required capacity of the aeration tank is calculated as below.

$$V = Q \times S / \text{volumetric BOD loading} = 1,000 \times 400 / 2,000 = 200 \text{ m}^3$$

29

Points of Discussion

1. Have you observed any aerobic biological treatment facilities?
2. What types of technology was used by the observed treatment facilities?
3. Let us discuss on how to check/ confirm the capacity of the bioreactor tank.
4. Which points should be focus on checking operation of biological treatment facilities?

30

Session-4

Comparison of Legislative System on Water Pollution Control between Bangladesh and Japan – Introduction of Notification System of Effluent Discharge Facilities

31

Introduction of Japanese Water Pollution Control System and Comparing with Bangladesh Legislative System

On technical session-4, we will introduce the legal system of water pollution control in Japan as a reference. You can compare the legal and implementing system of both countries.

Japan has the different system from Bangladesh on water pollution management. The legal system of Japan had been developed through the experience of highly polluted history in past Japan. After the enforcement of this legal system, the water quality has been improved drastically in Japan.

Water pollution condition at Kitakyusyu in 1960s Current condition

32

Water Pollution Prevention Act (Act No. 138 of 1970)

The purpose of this Act is to prevent the pollution of water in the Designated Areas of Public Waters and in groundwater by regulating effluent discharged by factories and workplaces into the Designated Areas of Public Waters.

This Act is a specific law for water pollution control, different from the general regulations of ECC or EIA system in Bangladesh.

Water Pollution Prevention Act (Act No. 138 of 1970)
 Chapter 1 General Provisions
Chapter 2-1 Regulations on Discharging Effluent
 Chapter 2-2 Promotion of Domestic Wastewater Measures
 Chapter 3 Monitoring the Status of Water Pollution
 Chapter 4 Compensation for Loss or Damage
 Chapter V Miscellaneous Provisions
 Chapter VI Penal Provisions

33

Notification System of Effluent Generators as “Specified Facilities” by Water Pollution Prevention Act of Japan

Chapter 2-1 Regulations on Discharging Effluent

Article 5
 A person that discharges effluent from factories or workplaces into Designated Areas of public waters must, when intending to install a “Specified Facility”, as provided for by order of the Ministry of the Environment, submit a report on the following to local (prefectural) governors.

(i) name and address of the person, as well as the name of the representative if the person is a corporation;
 (ii) name and location of factories or workplaces;
 (iii) type of Specified Facilities;
 (iv) structure and construction of the Specified Facility;
 (v) equipment of the Specified Facility;
 (vi) use of the Specified Facility;
 (vii) means of Treatment of Polluted Water, etc.;
 (viii) the level of pollution and quantity of the Effluent;
 (ix) other particulars specified by Order of the Ministry of the Environment

34

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (1)

Item	Bangladesh	Japan
Law	The Environmental Conservation Rules 1997	Water Pollution Prevention Act (Act No. 138 of 1970)
Enforcement agency	Department of Environment (DoE)	Local government
Target facility	Orange-B, Red categorized facilities	<ul style="list-style-type: none"> The facilities discharging effluent equal or more than 50m³/day Not only the industrial facility but all facilities discharging effluent

35

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (2)

Item	Bangladesh	Japan
Frequency of issuing monitoring report	Once a year	Once a year (COD, N, P in specific area: every day to once a month depend on the quantity)
Manager of ETP	Not mandatory	Need to be dispatched licensed person
Certificate for analytical laboratory	Not mandatory	Mandatory (Need to be analyzed by certificated laboratory)

36

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (3)

Item	Bangladesh	Japan
Required period of monitoring data storing	Not mandatory	3 years
Necessary action in case of accidental case (e.g., Spilling of harmful effluent)	Not mentioned in ECR	<ul style="list-style-type: none"> • Need to take necessary measures immediately • Need to report status of accident and measure taken to provincial governor

37

37

The points for the discussion

1. What is the major difference between the legal system of both countries? And is there any Japanese measure which can be referenced for Bangladesh?
2. How do you manage all the effluent discharge by DoE in feature? (Is it possible to increase the number of DoE officers to manage all the effluent generators by DoE?)
3. Do you have any idea on future industrial wastewater control in Bangladesh?

38

38

**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Water Pollution Control

Session 2: Summary of Identified Issues by JET and DoE

9th July 2023

JICA Expert Team

1

1. Measures for Identifying Issues on Water Pollution Control

(1) Setting target items for identifying issues

- (a) Legal system
- (b) Administrative and technical capacity
- (c) Cooperation with relevant organizations

↓

(2) Collecting information on current status and discuss on challenges

- (a) Meeting with DoE relevant wings and local offices
- (b) Field survey
- (c) Questionnaires survey with DoE officers
- (d) Laboratory capacity assessment (Chattogram laboratory)
- (e) Training workshop

2

2. Identified Issues (1) – Regal System

Item	Current Status	Challenges
Water Pollution Control	- Bangladesh Environment Conservation Act (ECA) 1995, 2010 revision - Environmental Conservation Rules (ECR), 2023	• To monitor newly regulated parameters, e.g. nutrients and heavy metals • To guide pollution control with severer standard values on N (nitrogen) and P (phosphorous)
On-site Inspection	- On-site inspections is conducted in accordance with ECR. - Environmental Court Act (2000, 2002 and 2010 revisions)	• To enhance capacity on administrative guidance for improvement of operation of ETP
EIA	Currently being revised EIA Guidelines for Industries (1997)	• To issue and update ECC based on the revised ECR
River, Lake and Watershed Management	- Water Act (2013) - Water Resource Planning Act (1992) - National Water Policy (1999) - Bangladesh Water Rules (2018) - WARPO Guidelines (2020)	• To enhance capacity to manage water resource with adopting watershed management concept

3

2. Identified Issues (2) – Administrative and Technical Capacity

Item	Current Status	Challenges
Water Pollution Control	- DoE concentrates to control industrial wastewater, especially specified in the revised ECR.	• To grasp impact on water pollution load by wastewater discharged from various sectors, e.g. domestic sector, agriculture sector, etc.)
On-site Inspection	- DoE is in charge of on-site inspection in nationwide by limited number of local officers. - DoE laboratories analytical capacities are insufficient, and has no their accredited system.	• To develop a system for identifying priority targets to be inspected and controlled. • To enhance DoE laboratories capacities for improving credibility of wastewater analysis for granting fines based on the analytical results under the revised ECR. • To adopt laboratory accrediting system for DoE laboratories
EIA	- DoE conducts EIA and issue ECC in accordance with ECA and the revised ECR.	• To enhance capacity of DoE officers (especially local officers) for assessing validity of ETP at the timing of EIA review and renewal of ECC.
River, Lake and Watershed Management	- Preparation of plans for river environment restoration are being considered.	• To enhance capacity for planning water pollution control in watershed level

4

2. Identified Issues (3) – Cooperation with Relevant Organizations

Item	Current Status	Challenges
Water Pollution Control	- The meetings are held on an irregular basis with related ministries and agencies responsible for water resource management (BWDB), sanitation (DPHE), sewerage development and operation (WASA), and etc.	• To strengthen necessary cooperation with related ministries, agencies and bureaus for comprehensive wastewater management.
On-site Inspection	- Local industrial pollution source control is conducted by limited DoE local officers, such as dispatched one DD, one or two AD, with several inspectors only in each DoE local office.	• To examine the way of enhancing local pollution source control capacities by cooperating with local administrative bodies, especially at the cities/areas having large number of industrial wastewater sources to be controlled.
River, Lake and Watershed Management	- BWDB emphasizes water resource management as watershed level with planning to increase the number of monitoring sites from 18 to 357 for .	• To enhance water monitoring data sharing mechanism with relevant ministries and agencies • To improve water quality monitoring capacity of relevant ministries and agencies with solving existing issues such as lack of equipment and reagents

5

3. Items to be discussed

- ✓ Is there any other serious issues to be raised for improvement of water pollution control capacity of DoE?
- ✓ Among the identified issues, which ones are considered as priority ones?

6

**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Water Pollution Control

Discussion on the Issues on Technical
Capacity of DoE officers

9th July 2023
JICA Expert Team

1

Discussion of the Issues on Technical
Capacity of DoE Officials

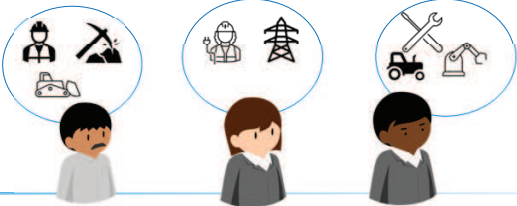
- In addition, Monitoring & Enforcement officials must find whether the STP is functioning properly and conduct monitoring sampling.



4

Discussion of the Issues on Technical
Capacity of DoE Officials

- Junior DoE officials come from a variety of backgrounds and need to be trained in environmental administration.



2

Points of Discussion

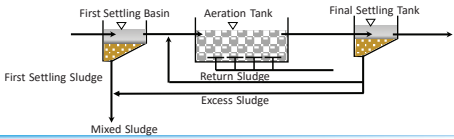
From the last Workshop, there are few opportunities for systematic education throughout the DoE on such basic knowledge.

Field	Issues on training for DoE Junior officials	Assumed Countermeasures
Water quality management		
ECC assessment		
Monitoring Enforcement		

5

Discussion of the Issues on Technical
Capacity of DoE Officials

- In particular, staff involved in ECC assessment need to know the basic functions of a wastewater treatment. For example, they need to know these basics because they need to confirm whether the tanks have sufficient.



3

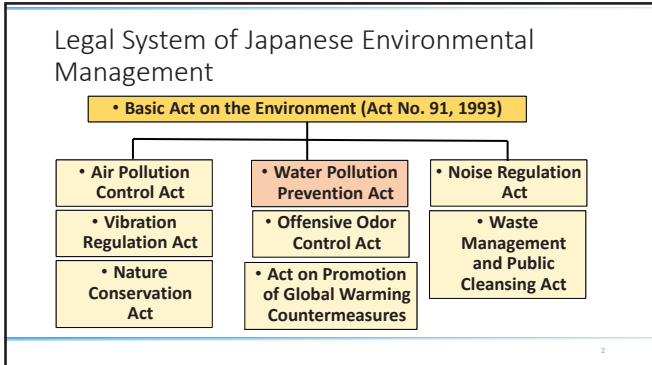
**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Water Pollution Control

Introduction of Environmental Pollution
Control and Monitoring System in Japan

9th July 2023
JICA Expert Team

1



2

Introduction of the environmental pollution control and monitoring system in Japan

- The purpose of this Act is to prevent the pollution of water in Areas of Public Waters and in groundwater by regulating Effluent discharged by factories and workplaces.

3

Introduction of the environmental pollution control and monitoring system in Japan

- The purpose of this Act is to prevent the pollution of water in Areas of Public Waters and in groundwater by regulating Effluent discharged by **Specified factories and workplaces.**

The factory/ workspace which discharge the harmful substances or pollutant into public water area or the groundwater. The specified factories are defined by the government regulations and there are 101 types of factories currently.

4

Introduction of the environmental pollution control and monitoring system in Japan

- The Entrepreneur of a Specified Factory must submit a document to the Governor at least 60 days prior to the construction of the factory.

<ul style="list-style-type: none"> (i) Name and address, and in the case of a juridical person, name of its representative (ii) Name and location of the factory or workplace (iii) Type of specified facility (iv) Structure of the specified facility (v) Equipment of the specified facility (vi) Method of using the specified facilities (Process flow diagram, Raw material, Operation time, Quality & Amount of the Effluent) (vii) Method of treatment of sewage, etc. (Types of the treatment method, System diagram treatment operation time, amount of the agent, Sediment discharge method) (viii) Pollution status and amount of effluent water (ix) Others
--

5

Introduction of the environmental pollution control and monitoring system in Japan

- Another law, Act on Improvement of Pollution Prevention Systems in Specified Factories, requires the installation of a **pollution control manager**. He/ She is the holder of a state license and is not an equipment operator. He is a professional manager with responsibility for pollution control.

6

Introduction of the environmental pollution control and monitoring system in Japan

- Monitoring of wastewater quality is mandatory to ensure that wastewater standards are being followed **by the entrepreneur**.
- The law requires that measurements be taken at least once a year, and that the results be recorded and stored.
- The analysis of water quality can be outsourced to a **qualified laboratory** as required by another law.



7

7

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (1)

Item	Bangladesh	Japan
Law	The Environmental Conservation Rules 1997	Water Pollution Prevention Act (Act No. 138 of 1970)
Enforcement agency	Department of Environment (DoE)	Local government
Target facility	Orange-B, Red categorized facilities	<ul style="list-style-type: none"> The facilities discharging effluent equal or more than 50m³/day Not only the industrial facility but all facilities discharging effluent

8

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (2)

Item	Bangladesh	Japan
Frequency of issuing monitoring report	Once a year	Once a year (COD, N, P in specific area: every day to once a month depend on the quantity)
Manager of ETP	Not mandatory	Need to be dispatched licensed person
Certificate for analytical laboratory	Not mandatory	Mandatory (Need to be analyzed by certificated laboratory)

9

9

Comparison of the Legislative System on Water Pollution Control between Bangladesh and Japan (3)

Item	Bangladesh	Japan
Required period of monitoring data storing	Not mandatory	3 years
Necessary action in case of accidental case (e.g., Spilling of harmful effluent)	Not mentioned in ECR	<ul style="list-style-type: none"> Need to take necessary measures immediately Need to report status of accident and measure taken to provincial governor

10

10

The major differences in laws between the two countries

- (1) The local government is the law enforcement agency
- (2) The law requires the establishment of a supervising engineer for ETP
- (3) In Japan, the analysis can be performed by a qualified laboratory.

11

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The outcome of this Act

- Water Pollution Prevention Act was enacted in 1970. Since the enactment of this law, significant results have been achieved in preventing and improving water pollution, especially that caused by factories.



Water pollution condition at Kitakyusyu in 1960s

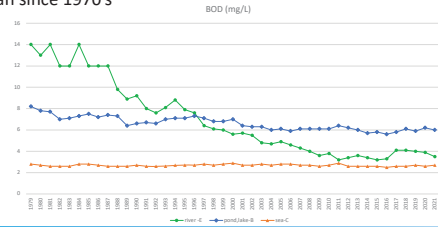
Current condition

12

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The outcome of this Act

- Changes in average of BOD value in public water monitoring point in Japan since 1970's



13

**Advisor on Environment Management
in Bangladesh**

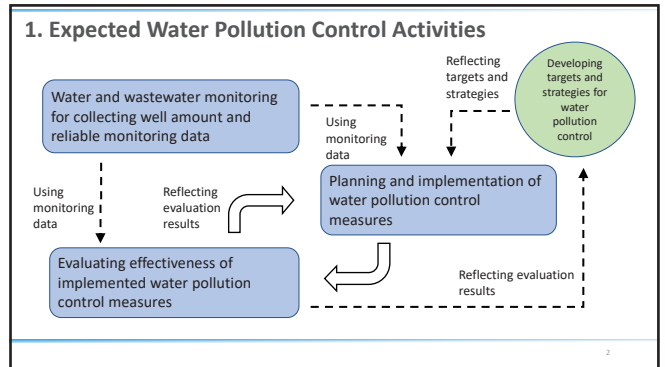
2nd Interactive Training Workshop on Water Pollution Control

**Session 5: Proposal on Expected Activities
based on the Identified Issues by JET**

9th July 2023

JICA Expert Team

1



2

2. Proposed Activities (1) – Regal System

Item	Challenges	Possible Proposed Activities
Water Pollution Control	<ul style="list-style-type: none"> To monitor newly regulated parameters, e.g. nutrients and heavy metals To guide pollution control with severer standard values on N (nitrogen) and P (phosphorous) 	<ul style="list-style-type: none"> Prepare water quality monitoring and water pollution control strategies Develop mechanism for preparation of periodical white book on water quality status with pollution load information Prepare guidelines for step-by-step adaptation and practical operation on the requirement of the revised ECR Develop a mechanism to review the revised ECR implementation periodically and update as necessary
On-site Inspection	<ul style="list-style-type: none"> To enhance capacity on administrative guidance for improvement of operation of ETP 	<ul style="list-style-type: none"> Prepare guidelines for on-site inspection to conduct active administrative guidance for improvement of operation of ETP
EIA	<ul style="list-style-type: none"> To issue and update ECC based on the revised ECR 	<ul style="list-style-type: none"> Prepare guidelines describing the items to be checked for evaluating proper ETP operation during issuing and updating process of ECC <p>(Note) GIZ supports DoE to prepare the guidelines.</p>
River, Lake and Watershed Management	<ul style="list-style-type: none"> To enhance capacity to manage water resource with watershed management concept 	<ul style="list-style-type: none"> Prepare guidelines for water pollution control planning in watershed level

3

2. Proposed Activities (2) – Administrative and Technical Capacity

Item	Challenges	Possible Proposed Activities
Water Pollution Control	<ul style="list-style-type: none"> To grasp impact on water pollution load by wastewater discharged from various sectors, e.g. domestic sector, agriculture sector, etc.) 	<ul style="list-style-type: none"> Conduct trial pollution load analysis for understanding impact of wastewater discharged from various type of sources, cooperating with relevant ministries and agencies Develop water pollution control capacity enhancement plan of DoE
On-site Inspection	<ul style="list-style-type: none"> To develop a system for identifying priority targets to be inspected and controlled. To enhance DoE laboratories capacities for improving credibility of wastewater analysis. 	<ul style="list-style-type: none"> Develop on-site inspection capacity development plan including human resource development plan with training program Plan and conduct required activities for obtaining laboratory accreditation for DoE laboratory <p>(Note) WB supports to develop and upgrade DoE laboratories. GIZ supports DoE Dhaka Lab. for obtaining accreditation.</p>
EIA	<ul style="list-style-type: none"> To enhance capacity of DoE officers (especially local officers) for assessing validity of ETP at the timing of EIA review and renewal of ECC. 	<ul style="list-style-type: none"> Provide training for officers in charge of issuing and updating ECC
River, Lake and Watershed Management	<ul style="list-style-type: none"> To enhance capacity for water pollution control planning in watershed level 	<ul style="list-style-type: none"> Prepare capacity development plan for water pollution control planning and implementation in watershed level

4

2. Proposed Activities (3) – Cooperation with Relevant Organizations

Item	Challenges	Possible Proposed Activities
Water Pollution Control	<ul style="list-style-type: none"> To strengthen necessary cooperation with related ministries, agencies and bureaus for comprehensive wastewater management. 	<ul style="list-style-type: none"> Prepare recommendation and develop a mechanism for enhancing cooperation of relevant organization for water pollution control led by DoE
On-site Inspection	<ul style="list-style-type: none"> To examine the way of enhancing local pollution source control capacities by cooperating with local administrative bodies. 	<ul style="list-style-type: none"> Examine possibility to handover on-site inspection mandate to local administrative bodies with MoEFCC Discuss for capacity development of local administrative bodies with sharing on-site inspection skills and experiences by DoE
River, Lake and Watershed Management	<ul style="list-style-type: none"> To enhance water quality monitoring data sharing mechanism with relevant ministries and agencies To improve water quality monitoring capacity of relevant ministries and agencies 	<ul style="list-style-type: none"> Prepare recommendation and develop a mechanism for sharing water quality monitoring data led by DoE Develop national capacity development plan on water quality monitoring for not only DoE but also other ministries and agencies

5

3. Items to be discussed

- ✓ Is there any other new activities to be conducted for improvement of water pollution control capacity of DoE?
- ✓ How do you consider on timeline for implementing the proposed activities
- ✓ What kinds of external support do you need?

6

Appendix 3

Materials for 1st Solid Waste Management Workshop

**Agenda of Interactive Training Workshop on SWM in
“Advisor on Environmental Management in Bangladesh”**

Time: 9:00 am

Date: 21 December 2022

Venue: DoE head office (a hybrid of a face-to-face meeting in 2nd floor auditorium room of DoE and a remote meeting by Zoom)

1. Background

DoE continuously tries to improve the SWM in Bangladesh through cooperation with LGDs, LGEDs and/or LGIs. As basic action, SWM Rule (2021) has been formulated and promulgated last year. It is necessary to actualize the concept of the rule. To do so, this training program is initiated.

2. Objectives

The main objectives of the meeting are as follows;

- (1) To share the knowledge and experience for the concerned governmental officers through interactive discussion, and
- (2) To identify priority issues to be talked for SWM implementation and discuss how to improve the SWM system in Bangladesh together through this training.

3. Draft Agenda of the Training Program

Time	Content	Speaker	Time expected
8:45 – 9:00	Registration		15 min
9:00 - 9:05	Welcome speech	Director, NRM and Focal Person of the DoE Advisory Project	5 min.
9:05 - 9.15	Project Brief	Team Leader, JICA Study Team	10 min.
9:15 - 9.25	Inauguration speech	Additional Director General, Department of Environment	10 min
9:25 - 9:30	Coffee break		5 min.
9:30 - 10:25	General Concept of the SWM and Introduction of the current situation in Bangladesh (including the brief introduction of SWM Rule)	JICA Expert Team	55 min.
10:25 - 10:30	Coffee break		5 min.
10:30 - 11:25	Introduction of policy & institutional system of SWM in Bangladesh & Japan.	DOE WCM Wing, JICA Expert Team	55 min.
11:25 - 11:30	Coffee break		5 min.
11:30 - 12:25	Preparation of SWM plan and annual report by LGI and facilitation by DOE	DOE WCM Wing, JICA Expert Team	55 min.
12:25 - 12:30	Coffee break		5 min.
12:30 - 13:30	Introduction of EPR system of container and packaging waste in Japan and how it can be introduced in Bangladesh	DOE WCM Wing, JICA Expert Team	60 min.
13:30 - 14:30	Lunch	All participants	60 min.

Time	Content	Speaker	Time expected
14:30 - 15:30	Capacity Building on the emission monitoring (land, water & air) for Waste Treatment and Disposal and feedback of all the session.	DOE Climate Change Wing, JICA Expert Team, all participants	60 min.
15:30 - 16:00	Closing Remarks	Director General/Additional Director General, DoE	10 min.

4. Participants

(1) Bangladesh Side

The tentatively expected participants are described in Attachment-1.

(2) Japanese Side

JICA Senior Advisor, JICA Expert Team

Attachment-1

Expected Participants:

Main Target participant

DOE (Waste & Chemical Management wing)- 5, DOE (Natural Resource Management Wing)- 1 or 2,

DOE (Monitoring & Enforcement wing)-1, DoE (Planning Wing)- 1, DoE (Climate Change and

International Convention Wing) - 1, DoE (Air Quality Management) – 1,

DOE (Dhaka Metropolitan)-1, DOE (Dhaka District)-1, DOE (Chattogram Metropolitan)-1, DOE

(Chattogram district)-1, Narayanganj DOE/NCC- 1+1, Gazipur DOE/GCC-1+1, Munshigonj DOE/

Paurashava- 1+1, Narshindi DOE/ Paurashava 1+1,

DNCC/DSCC -1+1, CCC-1,

Ministry of Environment, Forest & Climate Change (MOEF&CC) -1, Local Government Division

(LGD)-1, Local Government Engineering Department (LGED)-1, Department of Public Health

Engineering (DPHE)-1,

End of Document

**Advisor on Environment Management
in Bangladesh**

Training Workshop on SWM

**General Concept of the SWM
and Introduction of Current Situation
in Bangladesh**

**21st December 2022
JICA Expert Team**

1

Why we do SWM?

Overall objectives
Minimization of hazardous impact of domestic solid waste on human health and environment
Specific objectives
Reduction of waste generation
Minimization of need for safe disposal (through waste avoidance, reuse & recycling)
Safe disposal of residual waste in sanitary landfill
Awareness raising and behaviour change towards adequate waste handling

4

Table of Contents

- What is Solid Waste Management?
- Current SWM Situation in Bangladesh
- Current SWM Situation in Japan
- How to Improve the situation in Bangladesh ?

2

Waste Hierarchy

Most favoured option: Reduce (lowering the amount of waste produced)

Reuse: using materials repeatedly

Recycle: using materials to make new products

Recovery: recovering energy from waste

Landfill: safe disposal of waste to landfill

Least favoured option: Landfill

Working principles (in order of priority)
1) Avoidance of waste generation (especially inorganic and non-recyclable waste)
2) Establishment of a complete SWM system (for waste which cannot be avoided, as proposed under 1.); waste segregation > collection > transport > value recovery > safe disposal
3) Ensuring adequate waste handling (through awareness raising and behaviour change)
4) Source segregation of waste (and maintaining of segregation throughout SWM system)
5) Reuse of segregated waste
6) Recycling of segregated waste
7) Safe disposal of residual waste (which cannot be avoided, reused or recycled)

5

What is Solid Waste Management ?

According to SWM Rules 2021:

"Solid Waste Management" defines the functions related to reduction of waste at source, source segregation, separate collection, recovery, reuse, control, transfer, transport, processing, and disposal in accordance with the best principle of public health and environmental considerations.

Why Solid Waste Management (SWM) is important?

Protection of Public health
Protection of Environment
Reduction of Green house gas emission
.....

3

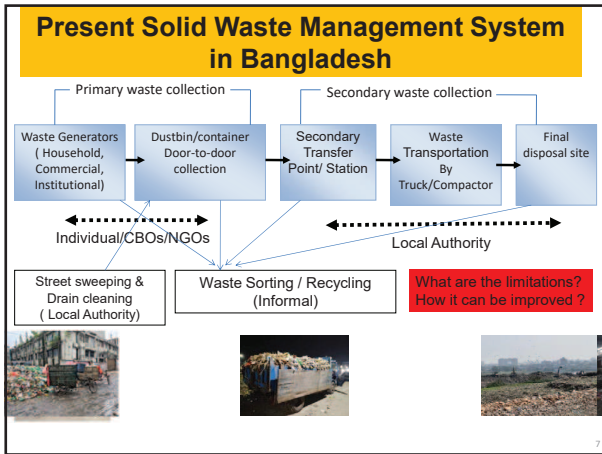
Why waste segregation is Important?

Importance of Waste Segregation	If waste is segregated...	...waste becomes a valuable resource!
		...SWM becomes a business opportunity!
	If waste is not segregated...	...waste remains waste, and needs to be disposed
		...unsafe waste disposal is the easiest and cheapest approach!
		...very likely, waste becomes a threat to human health and environment!

Waste Segregation at Source Waste segregation at source is the most effective approach...

- ...recyclables are not soiled, and can easily be recovered
- ...organic material is not contaminated with plastics etc.

6



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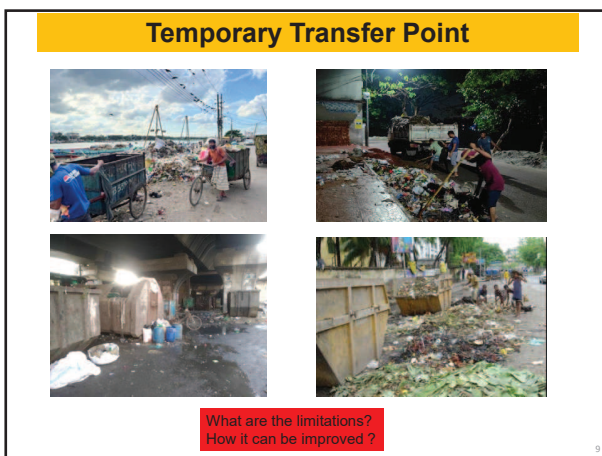
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9



12

Improvement of Waste transfer

What is your Opinion?

13

Sanitary Landfill Construction & Operation

16

Waste Disposal

Is this common problem with the landfill sites?
What are the basic requirements of a controlled landfill site ?

14

Leachate Treatment at DNCC

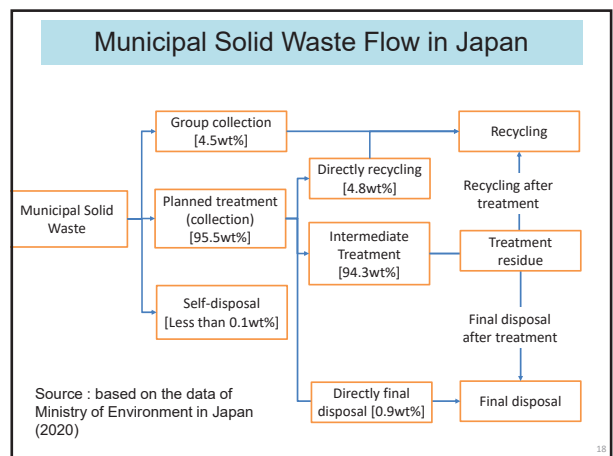
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Facilities to be considered in Sanitary Landfill (SWM Rules 2021)

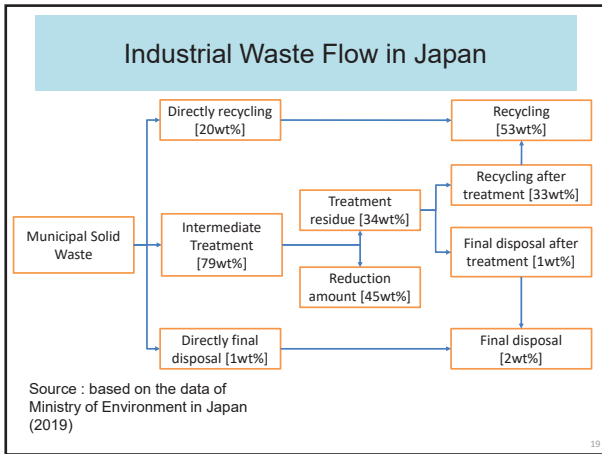
- (A) Walls and appropriate gates (**Security & access control**)
- (B) Landfill access and internal roads shall be paved or concrete (**Truck movement**).
- (C) Office shall be kept for keeping waste records and sheds for keeping machineries and equipment (**Control building and Equipment shed**)
- (D) Weigh bridges for measuring waste and appropriate fire protection measures (**Weighbridge and Emergency Management**)
- (E) Provision of drinking water, sanitary facilities, adequate lighting for the workers working in the landfill and routine health check up facilities of the workers (**Health & Safety Issue**).
- (F) Adequate arrangements shall be made for vehicle parking, cleaning and washing facilities of waste carrying vehicles. (**Car washing Facility**)
- (G) Waste storage facilities if it is not possible to process the waste due to natural calamity or any other reason (**Waste storage facility**)

What are the gaps in SWM Rules for Sanitary Landfill facilities construction & operation?

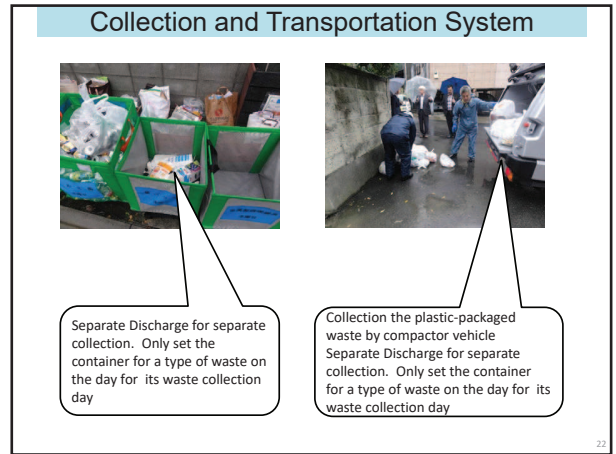
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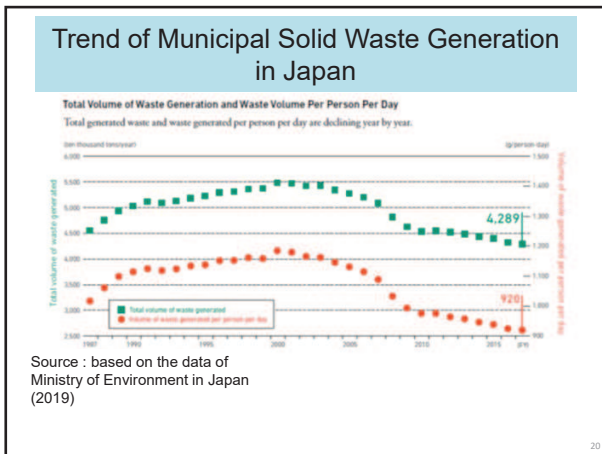
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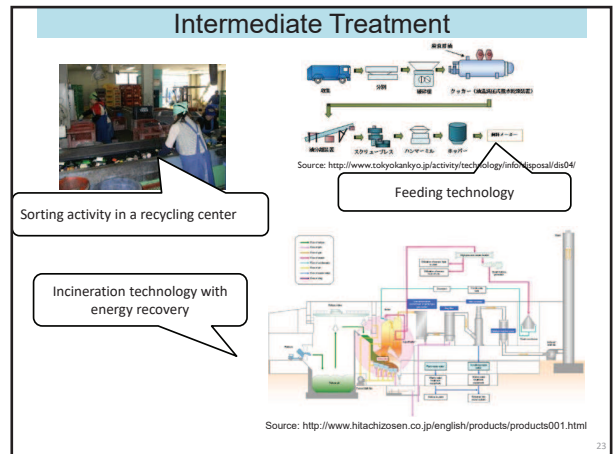
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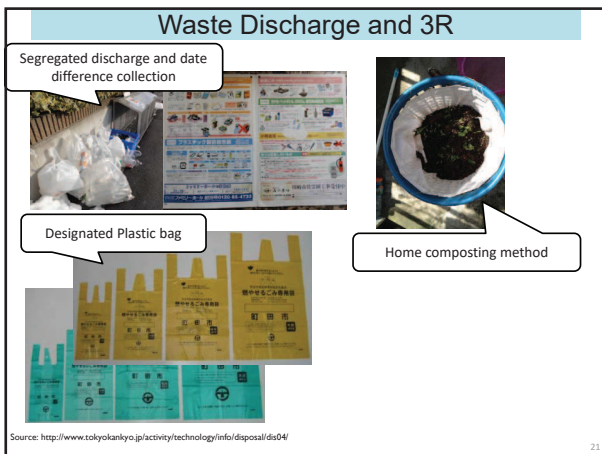
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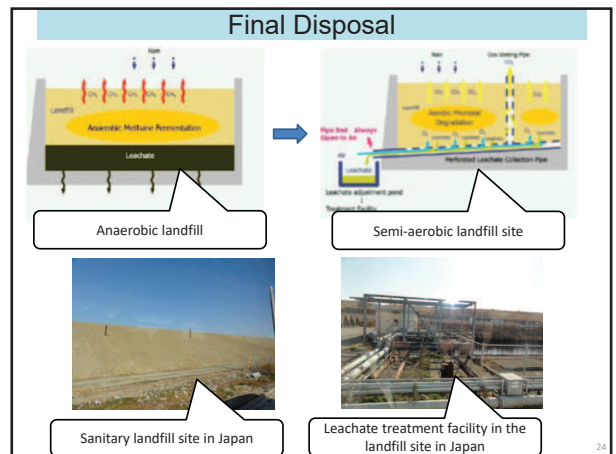
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21



24

How to improve the situation in Bangladesh

Fundamental law has been established.

- Establishment of Fundamental Law for SWM : SWM Rule (2021)

Participants Opinions

- (1)
- (2)
- (3)

[I Got Garbage - a Mindtree initiative.mp4](#)

25

**Advisor on Environment Management
in Bangladesh**

Training Workshop on SWM

**Policy & Institutional System of SWM
in Bangladesh & Japan**

21st December 2022

DOE Waste and Chemical Management Wing

/JICA Expert Team

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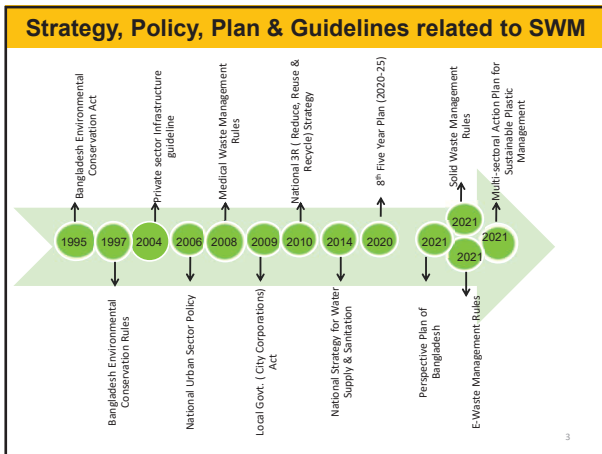
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Contents

- SWM Rules 2021
- Current Institutional System of SWM in Bangladesh
- Historical Trend and Current Institutional System in Japan
- How to improve the Institutional & Regulatory System in Bangladesh?

2

2



3

Constitutional Declaration on Protection of the Environment

- Article 18A of “The Constitution Of The People’s Republic of Bangladesh” states:-
- **Protection and improvement of environment and biodiversity: #**
- *The State shall endeavor to protect and improve the environment and to preserve and safeguard the natural resources, bio-diversity, wetlands, forests and wild life for the present and future citizens.*

Is it Possible Without Environmentally Sound Solid Waste Management?

4

4

Background of Formulation of SWM Rules

- ❖ According to the projection, by 2041, the urban population will **increase to 80%**. Safe waste management will be **raised to 100%** (Bangladesh Perspective Plan, 2021-2041).
- ❖ According to the projection, **the city is expected to generate 47,000 tons per day in 2025**, which could increase to 17.2 million tons per year (Eighth Five Year Plan, 2020-2025).
- ❖ In big cities of the country, **44-76% of the total waste can be collected**. Waste that is not collected or mismanagement a threat to human health (Eighth Five Year Plan)
- ❖ About **10 percent** of the total waste is mixed plastic. 40% of plastic is recycled. The remaining 40% is landfilled and 20% is discharged in water. Single use plastics are not usually reused or recycled. Moreover, modern management of **medical waste** in a scientific manner is becoming challenging. (Eighth Five Year Plan)

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Formulation of Solid Waste Management Rules 2021

Solid Waste Management Rules 2021 has been formulated by the Ministry of Environment, Forest & Climate Change in its authority under Section 20 of the Bangladesh Environmental Conservation Act, 1995 and is enacted on 9th December 2021.

6

6

Contents of SWM Rules 2021

- Source reduction, source segregation, segregated collection, transportation, proper treatment and final disposal of waste are part of SWM system
- Waste should be segregated into three categories and deposited in three different color bins Green (Wet), Yellow (Dry) and household hazardous waste (Red)
- Create awareness among the people on waste reduction and segregation of waste at source
- Prepare Action plan for proper management of solid waste
- Annual Waste Report based on the prescribed format (Table-2) and submit it by 30 September
- Medical Waste should be managed according to the provisions stipulated in Medical Waste (Management and Processing) Rules 2008
- The producers/ manufacturer should take responsibility of management and disposal of non-degradable materials such as Single use plastic (SUP) and the Multiple Layer Plastic (MLP) through adopting Extended Producers Responsibility (EPR)

7

The responsibilities of the LGAs as prescribed in Rule 10 & 12 of the SWM Rules, 2021 includes-

- Environment-friendly and hygienic management of solid waste;
- Preparation of comprehensive plans for solid waste management in line with the strategies of 3Rs;
- Collection, transportation, and management of solid waste separately in 3 different categories; arrange for separate collection facilities for 3 types of wastes in dustbins, containers, secondary transfer stations
- Initiate waste recycling and final disposal in compliance with standards prescribed in Schedule 2 and 3;
- Comply with Medical Waste (Management and Processing) Rules, 2008
- Take measures for converting wastes to energy and refuse derive fuel (RDF);
- Take joint projects with government and non-government agencies (PPP);
- Prepare framework for implementing joint projects in line EPR guidelines/directives and so on.

8

National Coordinating Committee (Rule-3)

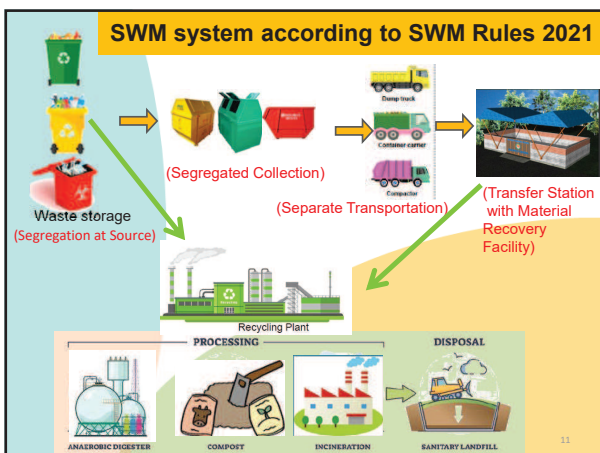
- ❖ In order to fulfill the objectives of these rules, there are representatives of various ministries / departments, departments/agencies in the National Coordinating Committee on Solid Waste Management. In addition, the committee has representatives from waste management experts, NGO representatives, FBCCI representatives and representatives of plastic manufacturers or importers.
- ❖ The Government, in consultation with the National Coordinating Committee, may, if necessary, form a **supervisory committee** at the divisional and district level, consisting of persons concerned with local **administration, local government authorities** and solid waste management department.

9

Roles & Responsibilities

- **National Coordination Committee (NCC)** under the SWM Rules, 2021 (issue directions required for implementation of SWM Rules; frame EPR guidelines; issue directions to stop or limit products creating polluting, hazardous waste; approve SWM plans of the LGAs; monitor performance of actors responsible for SWM; review annual reports on SWM)
- **Local Government Agencies** (perform SWM in environment-friendly and hygienic way; prepare SWM plans; prepare and submit annual plans; ensure segregation; collect, transport, manage SW; provide infrastructure; initiate recycling; measures for waste to energy; take PPP projects; set up and manage landfills)
- **Department of Environment** (control over all environmental matter; empowered to regulate products harmful to environment; framing and updating the guidelines/directives. For the execution of SWM Rules, 2021)

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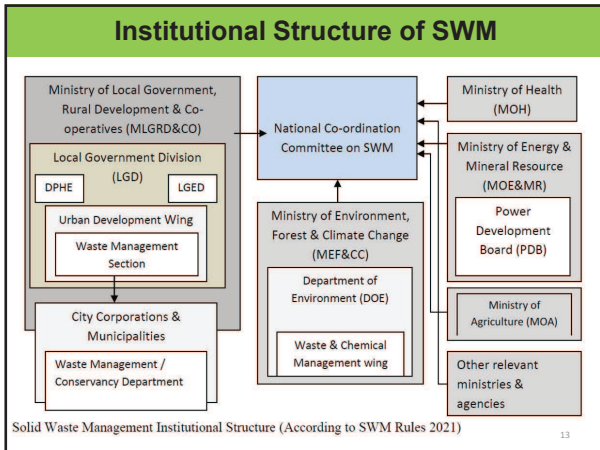


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Challenges in implementing the SWM Rules

- (1) Capacity of the Department of Environment and local government Agencies
- (2) Lack of Manpower & Skilled Resources
- (3) Monitoring and enforcement
- (4) EPR formulation
- (5) Circular Economy **Establishment**

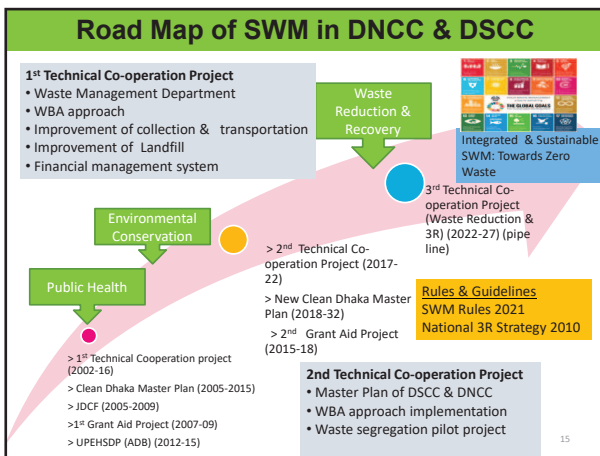
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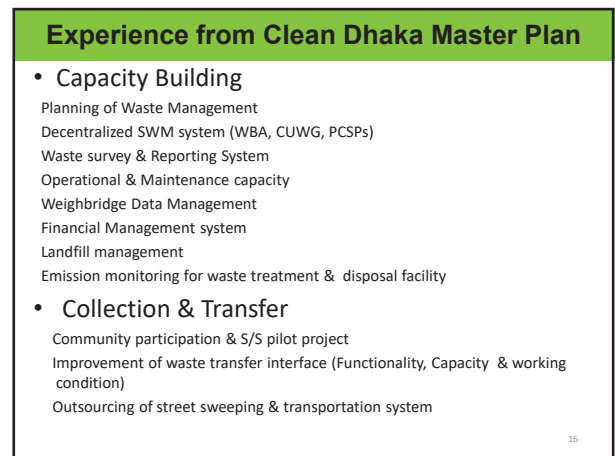
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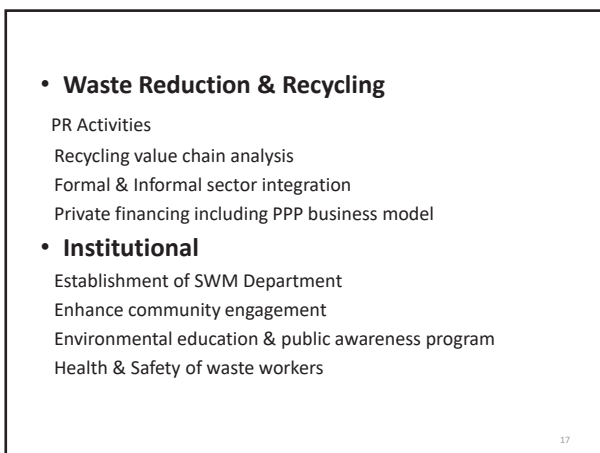
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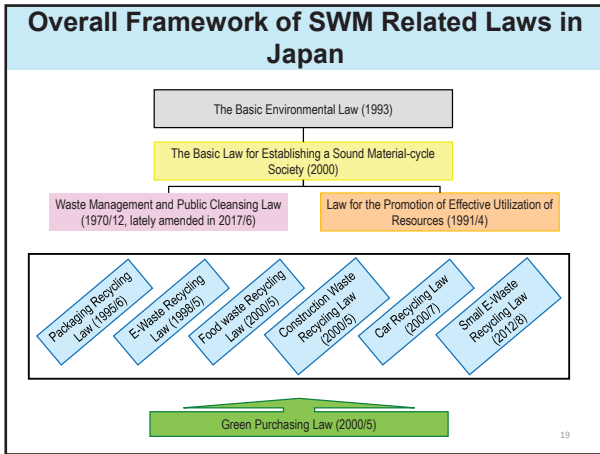


17

Historical Trend of Laws related to SWM

Time frame	Main issues	Main Acts
1960s - 1970s	Necessity of SWM to improve public sanitation	Waste Management Act (1970) Revision of the Waste Management Act (1976)
1980s	Improvement of SW disposal system to protect environment	Wide-area Coastal Environment Development Center Act (1981), Private Sewerage System Act (Johkasoh Law) (1983)
1990s	Commencement of the establishment of 3R system and tackle for DXNs issue	Revision of the Waste Management Act (1991), Act to Promote the Development of Specified, Facilities for the Disposal of Industrial Waste (1992), Japanese Basel Act (1992), Basic Environment Act (1993), Containers and Packaging Recycling Act (1995), Revision of the Waste Management Act (1997), Home Appliance Recycling Act (1998), Act on Special Measures against Dioxins (1999)
2000s	Promotion of 3R system toward circular economy and tackle for illegal dumping and industrial waste management	Basic Act for Establishing a Sound Material-Cycle Society (2000), Food Recycling Act (2000), Revision of the Waste Management Act (2000), Act on Special Measures concerning Promotion of Proper Treatment of PCB Wastes (2001), Automobile Recycling Act (2002), Act on Special Measures concerning Removal of Environmental, Problems Caused by Specified Industrial Wastes (2003), Revision of the Waste Management Act (2003 to 2006, 2010)
2010s from now	Improvement toward circular economy society and marine litter issues	Small Home Appliance and Recycling Act (2013), Plastic Resource Circulation Act (2021)

18



19

Basic Law on Establishing a Sound Material-Cycle Society

Fundamental Policy on resource circulating and appropriate waste management

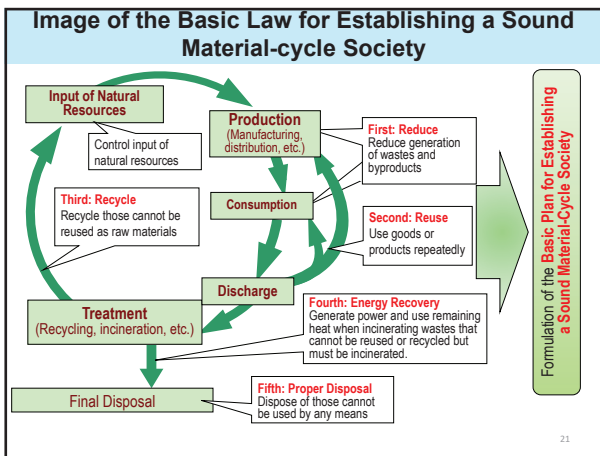
Background:
Aiming to achieve "Sustainable Society" from the aspect of effective material circulating, together with establishing "Low-carbon society" and "Nature harmonizing society".

Objective :

- To promote comprehensively and systematically the policies for the establishment of a Sound Material-Cycle Society
- To help ensure healthy and cultured living for both the present and future generations of the nation, through articulating the basic principles on the establishment of a Sound Material-Cycle Society,
- To Clarifying the responsibilities of the prefecture, local governments, businesses and citizens, and articulating fundamental matters for making policies for the formation of a Sound Material-Cycle society,
- To establish the Basic plan for Establishing a Sound Material-Cycle Society.

<https://www.env.go.jp/recycle/circul/kihonho/law.html> (Japanese)

20



21

Waste Management and Public Cleansing Law

Fundamental Policy on Appropriate Waste Management

Background:

- ✓ Increase in the amount of, and change in of the quality of the waste derived from economic activities, as a result of Japan's high economic growth
- ✓ Responding to environmental conservation measures related to waste management

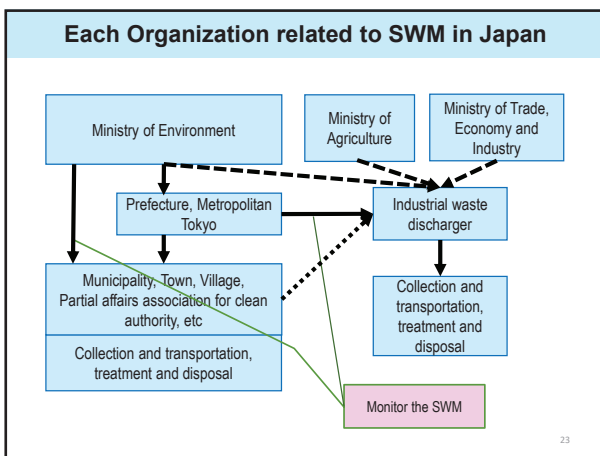
Objective:

This law is enacted for the purpose of preserving the living environment and improving public health through the restriction of waste discharge, appropriate sorting, storage, collection, transport, recycling, disposal, or other handling of waste and conservation of a clean living environment.

https://www.env.go.jp/en/recycle/basel_conv/files/Waste_Management_and_Public_Cleansing.pdf
<https://www.env.go.jp/en/laws/recycle/02.pdf>
<https://www.env.go.jp/en/laws/recycle/03.pdf>

Under this law, Cabinet Order (No. 300, 1971) and Ministerial Ordinance (regulation: No.35, 1971) are also established for more details.

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23

Organization Structure of SWM Divisions in Ministry of Environment in Japan

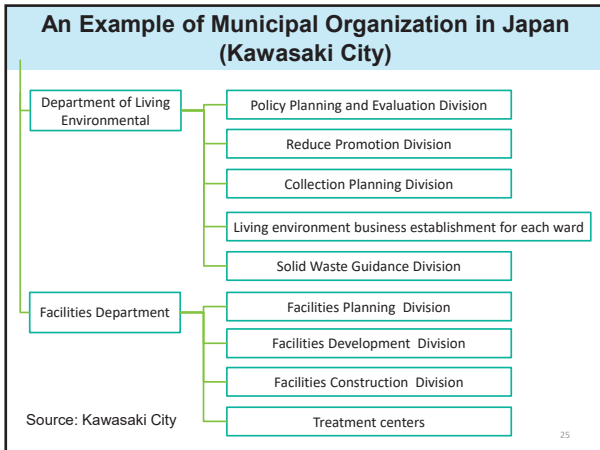
Environmental Regeneration and Material Cycles Bureau

- 24 senior officials and other officials

- Policy and Coordination Division**
 - Policy Planning, System Planning
 - Promotion of Sound Material-Cycle Society
 - Recycling Promotion
- Waste Management Division**
 - Disaster Waste Management
 - Management of Waste Contaminated with Radioactive Materials
 - Promotion of Johkasou
- Industrial Waste Management Division**
 - Restoration from Illegal Dumping
 - Specified Waste Management
 - Environmental Regeneration
 - Cross border movement information

Source: Ministry of Environment

24



25

Summarization of current situation of the Institutional & Regulatory System in Bangladesh

- 1. Law and regulations**
 - Basic law of SWM as SWM rule has been established.
 - Rules regarding E-waste and Medical waste management has been established
 - There is no law and regulation regarding Circular economy / EPR.
 - There is no implementation ordinance or guidelines to implement such rules
- 2. Organization**
 - (1) National Level**
 - The number of officials related to SWM is five persons in Waste & Chemical wing of DOE.
 - SWM section works both in waste management & chemical management
 - (2) LGI level**
 - In DNCC, DSCC, waste management department has been established, which has the responsibilities of planning, development and operation and maintenance of SWM
 - There is no such section in the other LGIs

26

How to improve the Institutional & Regulatory System in Bangladesh?

- How DOE/LGIs can institutionalize and operationalize SWM Rules?
- What are the Strengths and Weaknesses of the SWM rules?
- What support is needed by DOE & LGIs to implement the rules?
- Is it necessary to develop guideline and/or standard for the actual implementation of SWM including EPR?
- Is it necessary to implement subsidy system from national government to promote circular economy and/or EPR?
- Is it necessary to build capacity and allocate resources for the LGIs ?

27

Advisor on Environment Management
in Bangladesh
Interactive Training Workshop on SWM
Preparation of SWM Plan & Annual Report
by LGIs and Facilitation by DOE

21st December 2022

DOE Waste and Chemical Management Wing
/JICA Expert Team

1

Contents

- SWM Plan for LGIs
- SWM Plan for Other Authorities such as Industrial Zone
- Contents of SWM Plan in case of Japan
- Format of Annual Waste Report
- Purpose and Objectives of Annual Waste Report and How to Utilize it

2

Purpose of Formulating of SWM Plan for LGIs (SWM Rules 2021)

- (1) Improve the existing disposal of solid waste
- (2) To examine solid waste segregation, processing and ultimate disposal related functions
- (3) Finalization of new site selection for solid waste segregation, processing and final disposal facilities
- (4) Commencement of segregation, processing and final disposal of solid waste at selected new sites and
- (5) Collective adoption of outline for implementation of the initiative in accordance with the manufacturer's extended responsibility (EPR) guidelines.

3

SWM Plans of Local Government Institutions

Sl.	Activities	Indicator	Unit	Deadline (From Planning)
1	Creating public awareness	Coverage of creating public awareness on segregation (family brought under program)	%	3 months
		Coverage of creating public awareness among local residents & organizations on temporary waste storage	%	4 months
		Training on environmental friendly waste transportation among waste collectors	Number	4 months
		Publicity on Environment friendly waste management	Number	3 months
		Media Campaign on Environment friendly waste management	Number	6 months
2	Conducting regular cleaning drive	Ward/ UP coverage for conducting cleaning drive	%	6 months

4

Sl.	Activities	Indicator	Unit	Deadline (From Planning)
3	Provide physical facilities	Provide separate waste bins based on waste category	Number	6 months
4	Sale center for reusable products	Established sale center of reusable products	Number	1 year
5	Prepare list of waste (vangari) traders or collectors	Ward wise prepared lists	%	6 months
6	Supply of prepared list to recycling organizations (company)	Established market connection (Waste exchange market place) (https://bhangari.com)	Number	8 months

5

Sl.	Activities	Indicator	Unit	Deadline (From Planning)
7	Encourage the establishment of recycling factories	Awareness creation among entrepreneurs	Number	1 year
		Reward / incentives provided		
		Financial or technical assistance provided		
8	Provide training on organic composting with the support of Department of Agriculture Extension	Training conducted	Number	8 months
9	Conduct mobile courts for implementation of rules	Mobile court conducted in every month	Number	Continuous
10	Settlement of complaints on solid waste pollution	Settled complaints	%	6 months

6

SWM Plan in Japan

- According to SWM basic law in Japan, every local authority has to prepare each SWM plan including SWM basic plan as the target year of 10 to 15 years and SWM implementation plan for each year
 - The direction for preparation of SWM basic plan has been prepared.
 - The direction suggested the SWM basic plan should consider the following points
1. Items to be analyzed for planning
 - (1) Profile of Local Authority
 - (2) Current situation of SWM (waste flow, SWM implementation structure, result of SWM, evaluation of SWM)
 - (3) Issues of SWM
 2. Planning
 - (1) Waste generation projection
 - (2) Future vision and target
 - (3) Strategy

7

An Example of Contents of SWM Plans

- 1. Background and Objectives**
 - 1.1 Background, 1.2 Objectives
- 2. Profile of Region**
 - 2.1 Location and natural condition, 2.2 Population, 2.3 Economic profile and Land use)
- 3. Current condition of solid waste management**
 - 3.1 Institutional Arrangement (Legislation, Organization, Finance (Revenue and Expenditure),
 - 3.2 Solid Waste Characterization (Waste Generation and Characterization, Current Waste Flow),
 - 3.3 Technical Aspect (Source Reduction and Discharge, Sweeping, Collection and Transportation, Recycle and/or Recovery, Final Disposal),
 - 3.4 Identified Key Issues
- 4. Future Framework**
 - 4.1 Socio-Economic Framework (Population, Other Socio-economic Situations),
 - 4.2 Projected Waste Generation

8

An Example of Contents of SWM Plans

- 5. Planning Strategy**
 - (5.1 Vision, Goal and Target, 5.2 Strategy to Satisfy the Target, 5.3 Future Waste Flow)
- 6. Technical System for Solid Waste Management**
 - (6.1 Source Reduction, 6.2 Sweeping, 6.3 Collection and Transportation, 6.4 Recycle and/or Recovery, 6.5 Final Disposal)
- 7. Institutional Arrangement for Solid Waste Management**
 - (7.1 Legislation, 7.2 Organization, 7.3 Finance (Revenue and Expenditure), 7.4 Public awareness and environmental education)
- 8. Implementation Plan**
 - (8.1 Implementation Schedule, 8.2 Responsible Organization)
- 9. Cost Estimation and Financial Aspect**
 - (9.1 Initial Cost, 9.2 Operation and Maintenance Cost, 9.3 Cost Recovery (Annual Budget and Expenditure)

9

Format of the Annual Waste Report

- Name of the Local Government Institutions:
- Total Population
- Contact details:
- Amount of solid waste generated (daily): tons
- Amount of solid waste generated (annual) : tons
- Amount of solid waste collected (annual) : tons
- Amount of solid waste illegally dumped (annual): tons
- Amount of solid waste uncollected (annual): tons
- Amount of Hazardous Industrial waste collected (annual): tons

10

- **Amount of waste processed (Public & Private enterprise) (annual)**
 - Organic waste processing/composting : tons
 - Recycling of Inorganic non-degradable waste : tons
 - Waste Incineration : tons
 - Open burning of waste : tons
 - Waste Landfilled : tons

Types of Landfill

- Unmanaged (Shallow /Deep) : tons
- Managed Anaerobic / Semi-aerobic : tons
- Uncategorized solid waste disposal sites : tons

11

Information related to landfill

- (A) Number of landfill sites :
- (B) Total area :
- (C) Whether there is weigh bridge facility :
- (D) Whether there is boundary wall of landfill area:
- (E) Whether there is lighting system in the landfill area:
- (F) If there is Bulldozers, compactors and other similar equipment, Specify:
- (G) Number of manpower deployed at landfill site:
- (H) Whether there is adequate covering material at landfill site:
- (I) Whether there is gas control system at landfill site :
- (J) Whether there is a system of leachate collection:

12

Waste Storage Facility

- Waste collection area :
- Number of houses :
- If NGO or any organization has been hired for house-to-house waste collection, Mention details :
- Bins

Type Size	Number
(A) Cement concrete build-up capacity	
(B) Trolley (capacity)	
(C) Container (for what type of waste or sticker with capacity)	
(D) Dumper placer	
(E) Other (specify)	

- Whether waste is collected everyday from all containers and storage : points :
- Waste is removed from the container physically or mechanically :

13

Waste transportation

Type	Existing	Actual need
(a) Truck		
(b) Truck Tipper		
(c) Tractor Trailer		
(d) Refuse Collector		
(e) Dumper Placer		
(f) Rickshaw van		
(g) Other (if any)		

14

(5) If there is any proposal to improve solid waste management, state it:

(6) If an attempt is made to give the responsibility of solid waste processing to a private person or organization, mention in details:

Name of person or organization	Name of the technology	Processing time and quantity	Name and address

(7) Steps taken to ensure that the following activities are performed in a healthy manner -

- Dairy Farm
- Animal slaughter
- Construction-demolition waste
- Unauthorized occupied of parks, walkways, etc.

(8) Slum:

Total number of slums :
Number of slums having Sanitation Facility:

15

(9) If mobile court is operated.

Total number of cases	Number of convicts	Collected amount of fines	Number of accused sentenced to imprisonment

(10) Medical waste management

- Number of government hospitals or clinics or health centers
- Number of City Corporation or Municipality Hospital or Clinic
- Number of private hospitals or clinics
- Whether the provisions of the Medical Waste (Management and Processing) Rules, 2008 are properly followed in all hospitals or clinics and health centers
- If there is any difficulty in following the provisions of Medical Waste (Management and Processing) Rules, 2008, its details:

16

What are the issues related to Waste Management Plan & Annual Waste Report Preparation

Participants Opinions

- (1)
- (2)
- (3)

17

Issues on SWM Plan & Annual Waste Report Preparation

Important Issues

- Purpose of the Annual report & how to utilize the report
- Data collection method is not clear about the data such as waste generation, collection and disposal quantities (Waste generation & characterization survey, weigh bridge data/ truck load measurement, etc)
- How will the other agencies such as BEZA, BEPZA and other industries follow the same reporting system?



Necessary to develop the guideline for preparation of the report

18

Annual Report of SWM in Japan

- There is description of objectives of the annual report.
- The annual reports are respectively prepared for municipal solid waste and industrial waste
- Annual report of municipal solid waste is summarized by Ministry of Environment
(ex. https://www.env.go.jp/recycle/waste_tech/ippan/r2/data/env_press.pdf)
- The data format (excel file) has been prepared and send to each local authority to submit by them.
- After the preparation of report, it is publicized annually.

19

Data input and analysis for SWM Annual Report in Japan

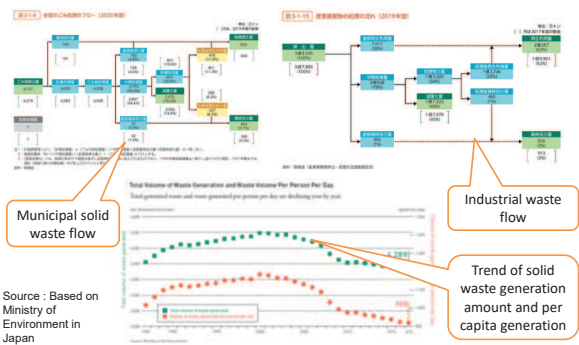
- Prepare the data format of excel sheet
- Input the data from each local authorities
- Analyze the data

Source : Based on Ministry of Environment in Japan

20

Data input and analysis for SWM Annual Report in Japan

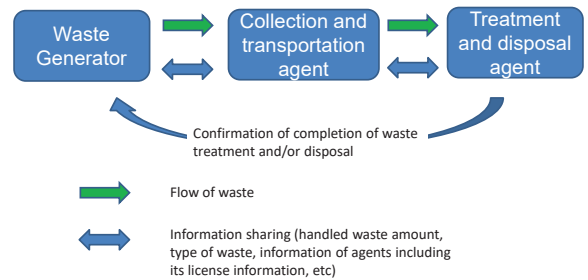
- To prepare waste flow after data input, calculation and analysis
- To prepare the historical trend of the data
- To prepare SWM annual report at national level



21

Daily Monitoring for Annual Report of Industrial Waste in Japan (Previous System)

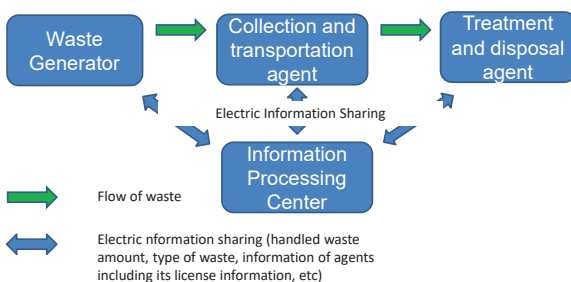
- Manifest system (Paper based)



22

Daily Monitoring for Annual Report of Industrial Waste in Japan (Current System)

- Manifest system (Electronic System)



23

Purpose and Objectives of Annual Waste Report and How to Utilize it

- The purpose of annual report will be to summarize the current situation of SWM in each LGI and to identify the SWM in national level
- The report prepared by LGIs will be utilized to prepare the national status report of solid waste management



- It will be better to prepare the contents of national report.
- It will be necessary that the national status report will be publicized to raise public awareness.

24

Data collection and estimation method

Example of data collection method

- Waste generation Amount : Estimation from unit generation rate and population
- Waste collection amount : Estimation from trip number, loading capacity and estimated loading rate of vehicle
- Waste treatment and disposal amount : loading capacity and estimated loading rate of vehicle through the check in the gate of disposal/ treatment facility



- It will be necessary to prepare the guideline regarding data collection and estimation method

25

Other agencies such as BEZA, BEPZA and other industries follow the same reporting system

- Introduction of monitoring system of industrial waste such as introduction of manifest system
- Data format preparation will be necessary



- It will be necessary to prepare the guideline regarding data collection and estimation method

26

Items of the Consolidated Annual Waste Report need to submit by DOE to National Coordination Committee

- Number of Action Plan submitted by City Corporations:
- Number of Action Plan submitted by Municipalities:
- Number of Action Plan submitted by Other Agencies:
- **SOLID WASTE Management status in Bangladesh**
- Generated (TPD)
- Collected
- Treated
- Landfilled

27

Compliance to SWM Rules (Number/names of LGAs/ Others)

- House-to-house collection
- Segregation
- Storage
- Covered transportation
- Solid Waste processing facilities planned/ installation/operational/non-operational
 - Composting
 - Biogas
 - RDF
 - Waste to Energy

28

- Disposal of solid waste (number/names of LGAs):
 - Landfill sites identified
 - Landfill constructed
 - Landfill under construction
 - Landfill in operation
 - Landfill exhausted
- Monitoring at Waste processing/Landfills sites
 - Surface water
 - Ground water
 - Leachate quality
 - Ambient air
 - Compost quality

29

**Advisor on Environment Management
in Bangladesh**

Interactive Training Workshop on SWM

**Introduction of EPR System of Container
and Packaging waste in Japan and how it
can be introduced in Bangladesh**

21st December 2022

**DOE Waste and Chemical Management Wing
/JICA Expert Team**

1

Contents

- Strategy & Action Plan of Plastic Waste Management in Bangladesh (including Video)
- Present regulatory framework/Directives/ Road Map
- Plastic Recycling scenario in Bangladesh
- Circular Economy (Material Cycle Society) approach in Japan
- Policy & guideline related to Container & Packaging waste in Japan
- How we can prepare EPR guideline in Bangladesh?

[Plastic pollution.mp4](#)

2

Plastic Waste Situation of Urban Areas of Bangladesh

• Out of the 821,250 tons/year waste only 36% is recycled in the urban areas of Bangladesh.

• Out of the total solid waste of 6464 tons/day, 646 Tons/day is plastic, which is 10% of the total waste generated in Dhaka city.

• At present only 37% of plastic waste is recycled from the total plastic waste generated in Dhaka city.

3

MFA of Plastics: 2018-2019

Ref: Waste Concern Study

Total imported plastic waste: 1,470,000 (in the fiscal year 2018-19)

Domestic Consumption: 977,000

Export Plastic: 442,000

Recycled: 388,000

4

FY2019-20

Among eight categories, the sectoral consumption was the highest for packaging with 937,262 metric tons (48% of the total) followed by Bangladesh produced 342,322 metric tons of recycled plastic.

Production: Bangladesh produced 342,322 metric tons of recycled plastic.

Consumption: Bangladesh imported 1,710,296 metric tons. Per capita plastic consumption was 10.13kg.

Waste management: Bangladesh exported 377,702 metric tons of plastics. Per capita plastic generation was 7.9kg.

Courtesy: Dr. M. sujauddin

5

Shayen Siddiki et al., 2022

During the FY 2019-20 the per capita plastic waste generation of Bangladesh was around 7.9 kilograms or around 22 grams per capita per day.

The largest contributor of plastic wastes was the packaging sector, accounting for around 73% of the total wastes generated by all eight sectors. Within that amount, only around 19% or 183,294 metric tons (mostly PET bottles) got collected as scrap, and a staggering 754,038 metric tons of plastic packaging wastes have been disposed openly to the environment during FY 2019-20.

Per capita plastic consumption

Per capita plastic generation

Department of Environment

6

Major Challenges

- Inadequate sectoral/product based research (...sectoral LCA, MFA)
- Inefficient Data Storage and Sharing Mechanisms
- Mainstreaming Informal Sector (.Even If we consider the EPR Implementation)
- Avoiding system loss (....inefficient collection, storage, transportation, recycle/resource recovery)
- Willingness for Product redesign/composition change to promote recycling/resource recovery.
- Avoiding non recyclable products.
- Enabling environment for circular economy (policy and economical instruments.)
- Technical Competency of the Entrepreneur as well as concerned department
- Behavioral status or people's mindset.

7

7

Import Policy order doesn't support plastic waste import (even for recycle/reuse)

Milestones in plastic waste management

- 2002: Notification ban on polystyrene bags through a regulatory order under the 1992 Environment Act
- 2004: Composition of plastic waste and market assessment in Dhaka
- 2005: Mandatory June Packaging Act 2010
- 2008: Medical Waste Management Rules 2008
- 2010: Implementation of plastic incineration in Dhaka and Chittagong
- 2011: Survey on solid packaging waste (SPW)
- 2012: Plastic park project to relocate old plastic factories
- 2013: Baseline study on solid packaging waste (SPW)
- 2014: Clear Dhaka master plan (2010-2032)
- 2015: Formation of technical advisory committee for the sustainable management of plastic waste management
- 2016: National Plastic Industry Development Policy 2016 (7th Draft)
- 2017: Approval granted for Waste-to-energy projects using incineration technology in Narayanganj
- 2018: High Court order to ban of single use plastics
- 2019: Baseline study for Dhaka, Chittagong and Cox's Bazar
- 2020: E-waste Mgt. Rules, 2021
- 2021: Solid Waste Mgt. Rules, 2021
- 2021: DMSA handed over its share to DCC and DCC

8

8

TOWARD A MULTISECTORAL ACTION PLAN FOR SUSTAINABLE PLASTIC MANAGEMENT IN BANGLADESH

- TARGET 1:** Achieve a 50 percent reduction in virgin material consumption in plastic manufacturing by 2030 by facilitating circular material flows from the 2020/21 baseline
- TARGET 2:** Phase out targeted SUP by at least 90 percent by 2030 from the 2020/21 baseline
- TARGET 3:** Reach a 50 percent plastic waste recycling rate by 2025 and an 80 percent plastic recycling rate by 2030 from the 2020/21 baseline
- TARGET 4:** Achieve a 30 percent reduction in annual plastic waste generation by 2030 from the 2020/21 baseline

9

9

Road Map for Plastic Management for Pollution Free Sustainable Development of Bangladesh

- 2021:** Official Launching of Road Map and Action Plan; Program draft Work Plan to stop SUP
- 2023:** Establish a National Coordination Committee on Marine plastic waste
- 2025:** Phase out of targeted SUP
- 2026:** Dissemination and Enforcing Solid waste management rules; Promote bio-degradable bags and packaging alternatives
- 2027:** Target 1: start to work for 50% reduction of virgin materials in plastic production
- 2028:** Standardize labeling of plastic products and materials
- 2029:** Target 2: 30% Reduction of plastic waste generation; RFD into potential to substitute with biodegradable materials
- 2030:** Target 3: 50% reduction of virgin material consumption; Target 4: 80% reduction of annual plastic waste generation

10

10

National Coordination Committee at the Ministry of Environment, Forestry and Climate Change (MoEFCC)

Inter-ministerial committee and **Technical Advisory Committee** report to the **National Coordination Committee**.

Plastic Cell Under the DoE Waste and Chemical Management Wing reports to the National Coordination Committee.

Local Level Implementation Agencies report to the Plastic Cell.

Technology advisory group will be formed with the representation from private sector, NGOs, Research bodies, Associations, university etc. at the Ministry of Environment and Forests to assess the technology for promotion of environment friendly packaging, effective plastic recycling technologies, innovations for circular economy.

Plastic Cell will be constituted within DoE to monitor progress in the implementation of Road Map and Action Plan having multi-level communication. The institutional arrangement for the waste management defined in the Draft Urban Waste Management Handling Rules can be followed.

Local Level Implementation Agencies will be responsible for implementation of the action plan according to the road map and as directed by the Cell.

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11

Plastic Waste Management Institutional Structure

Ministry of Environment, Forest & Climate Change (MEF&CC) is the central authority, with the **Department of Environment (DOE)** and **Waste & Chemical Management wing** (including the **Plastic Cell**) as key units.

Inter-ministerial Committee (Proposed) and **Technical Advisory Committee (Proposed)** are established under the MEF&CC.

National Co-ordination Committee (Proposed) is the central coordinating body, supported by **BPGMEA**, **BPFMEA**, **BIPET**, **Importers/Exporters**, **Manufacturers**, and **Brand owners**.

Local Level Implementation Agencies include **Waste pickers/collectors/PCSP**, **Dealers/ Wholesaler**, **Processors/Recyclers**, **Factory / Industry**, **Consumers**, and **CBOs/NGOs**.

Ministry of Local Government and other ministries (Finance, Industry, Commerce, Housing & Public Works, Energy & Mineral Resource, Shipping, Textile & Jute) are also involved.

12

12

The High Court Directive (January 2020) to the Government of Bangladesh to ban single-use plastic products in coastal areas, hotels, motels and restaurants across the country in one year as they create health and environmental hazards.


In response to the Directive in January 2020, a work plan on SUP was submitted to high court in January 2021.



13

Way forward to Stop Using Single Use Plastic (SUP)


Content	Year	1 st year (2021)		2 nd year (2022)		3 rd year (2023)	
		Jan-June	July-Dec	Jan-Jun	July-Dec	Jan-Jun	July-Dec
One-time cups, glasses, plates and other utensils	Passengers and cargo Ships	Sea Beach area	Hotel / motel / restaurant adjacent to the beach	Hat Bazaar / Bus Stand / Declared Public Place / Upzila Government / Semi-Government Offices / Educational Institutions Adjacent to the Beach	The entire Upzila adjacent to sea beaches	District adjacent to the beach	
Juice straw / Styrofoam food package/ coffee stirrers/Others							
Lolly pop cover, sachet, cigarette filter, cotton buds, Surgical gloves / masks	Solid waste rules Preparation	Creating acceptance on the views of policy makers (Brand owner / traders / Waste manager)	EPR guidelines Preparation	Establishment of environment friendly waste collection and waste disposal facilities in coastal area (Pilot project in Cox's Bazar and Patuakhali)	Providing waste collection and waste disposal training in coastal areas	EPR pilot project implementation in the coastal area.	



14

Way forward to Stop Using Single Use Plastic (SUP)


Considerations	Functions
Policy/Strategy issues	<ul style="list-style-type: none"> Single Use Plastic's Material Flow Analysis and Database Preparation. Single use plastic's present status assessment (Use and Disposal) in Coastal area. Determining the category of single use plastics and year based and item based phase out plans in coastal areas Regulatory framework development (Rules/SRO Preparation) Periodically declare single use plastic free areas (eg: boats, beaches, beach-adjacent hotels-motels, coastal district government offices, public transport, public places, etc.) Preparation guidelines for friendly collection and disposal of single use plastics those don't have any alternatives (eg: surgical gloves, masks)



15

Way forward to Stop Using Single Use Plastic (SUP)

Considerations	Functions
Administrative Issues	<ul style="list-style-type: none"> Requests concerned departments to stop the use of single use plastic in vessels Issuance of Demo-official letter to the Deputy Commissioners (DCs) to prevent the use of single use plastic in coastal areas Exchange of views with concerned stakeholders including hotel / restaurant owners in coastal districts / divisions. Publicity in print and electronic media (TVC preparation) Giving public notice in newspapers Encourage children to prevent plastic contamination through green clubs or nature clubs in coastal schools Spreading awareness through religious institutions/community involvement




16


Extended Producers Responsibility (EPR)

- "Extended Producer Responsibility (EPR)" means environment friendly management of generated from the use of product of importer or manufacturer at consumer at their own responsibility or jointly with the local government authority or with other authorities and shall provide incentive for waste collection at consumer level for reusing, recycling, and proper management of generated waste.

EXTENDED PRODUCER RESPONSIBILITY (EPR)
 Extended Producer Responsibility (EPR) is a common feature amongst many systems:



Producers take physical and/or financial responsibility for the proper treatment or disposal of electrical & electronic products that have reached their end-of-life.

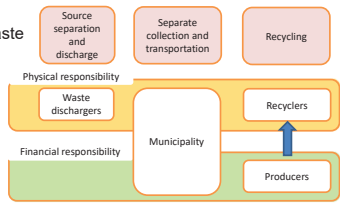



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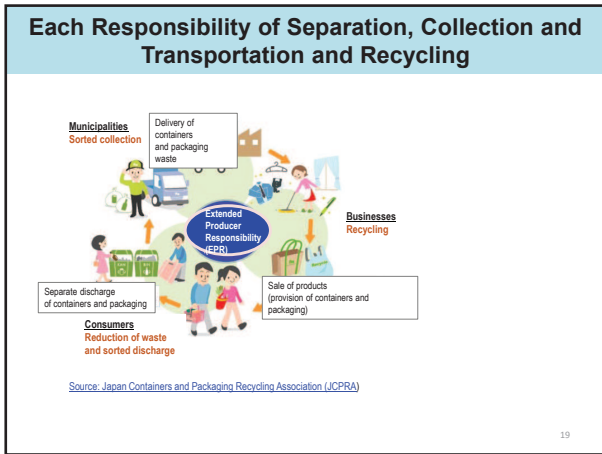
Introduction of Recycling System of Container and Packaging Waste in Japan Considering EPR

Background
 -60% of plastic waste is package waste
 -Container and Packaging Waste has short lifetime and they inevitably become waste

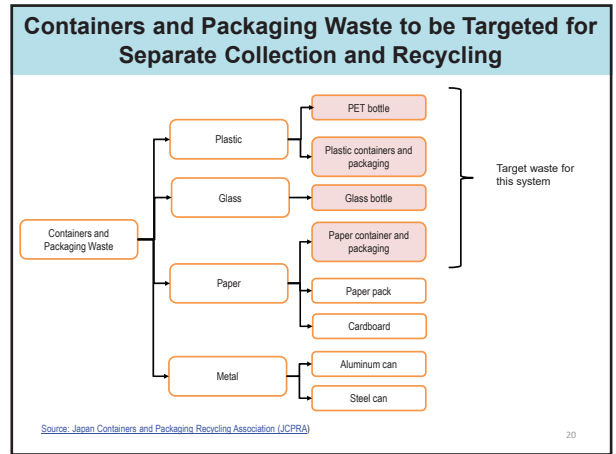
Direction of this System
 -Shifting of physical and/or financial responsibility toward producers and away from municipalities; and
 -Provision of incentives to producers to take environmental considerations into account when designing their products.

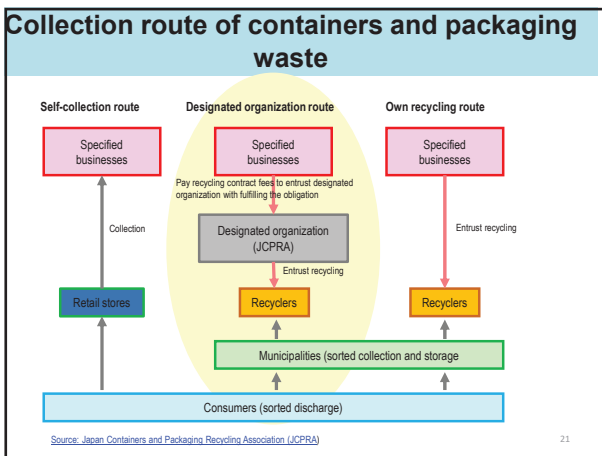
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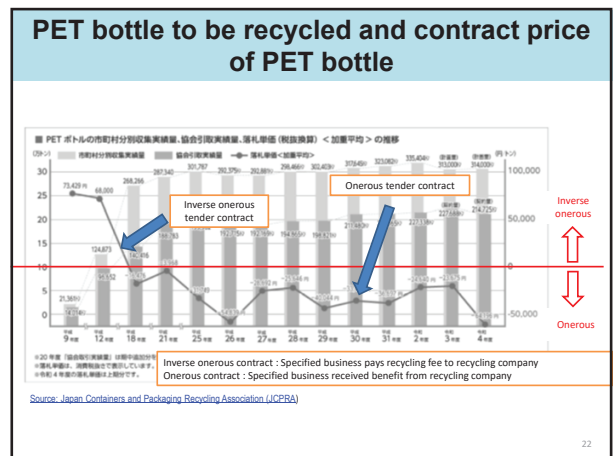
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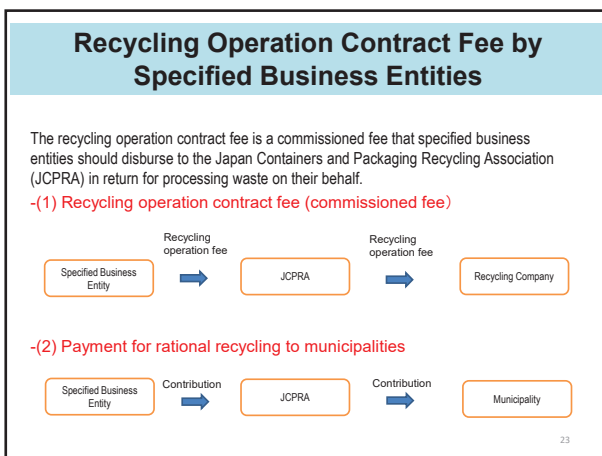
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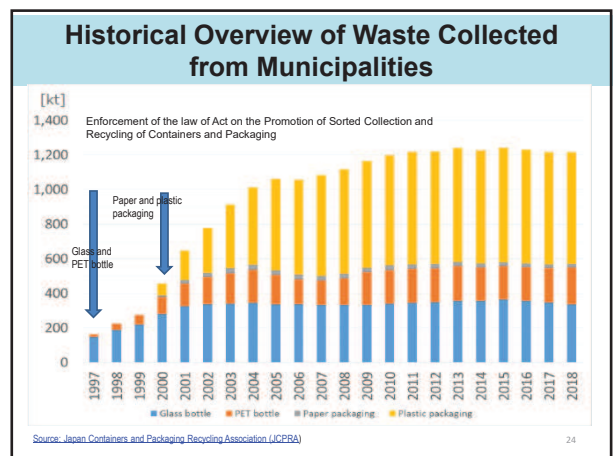
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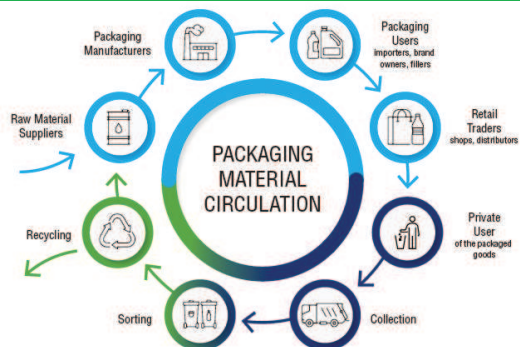
How we can prepare EPR guideline

- Identification of target waste for EPR introduction
- Consultation/coordination with concerned governments and producers/importers/traders association
- Identification of possibilities of recycling market
- Establishment of concept and strategy of the target waste to circulate
- Promotion of utilization of recycled product
- Establishment of coordinating/implementation association of EPR activities.

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25

Circulation of packaging materials



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26

Waste Management System And Recycling Market For Plastic Packaging Waste In Bangladesh

- High-value recyclable packaging is already separated from household waste and transferred to recycling systems
- Low-value packaging and non-recyclables are mostly disposed of and collected together with other municipal waste. So far, there is no systematic separation and recycling of the low-value recyclables.
- The recycling capacities are insufficient and informal

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How to implement EPR in Bangladesh (No.1)

- Put EPR on the political agenda
- Establish a legal framework of a mandatory EPR system and strengthen an institutional framework
- Initiate effective, goal-oriented discussions with all stakeholders involved
- Create an in-depth and aligned understanding of the situation and its associated root-causes
- Alternative regulatory solutions should be explored and improvements in packaging waste management utilized, which would benefit EPR once implemented.
- The establishment of voluntary, industry-driven initiatives to gain country-specific experiences.

28

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How to implement EPR in Bangladesh (No.2)

- To discuss what kinds of monitoring and enforcement mechanism are needed to ensure proper operationalization.
- Clear definition of roles and responsibilities of all stakeholders in the system involved as well as an clear legal framework.
- Establishment of a systematic and reliable institutional structure for management of packaging waste regardless of its value, and the value chain and recycling industry.
- To build on existing initiatives, pilots and programs and to cooperate with businesses

29

29

1

**Advisor on Environment Management
in Bangladesh**

Interactive Training Workshop on SWM

**Capacity Building on the emission monitoring
(land, water & air) for Waste Treatment and Disposal**

21st December 2022
DOE Climate Change & International Convention Wing
/JICA Expert Team

1

2

Contents

- Capacity Building on the Emission Monitoring
- Provision of Environmental Management in SWM Rules
- Puzzle on SWM
- Feedback of this Training Workshop

2

3

**Capacity Building on the Emission Monitoring
under the CBIT Project**

Md. Mahmud Hossain
Deputy Director (Climate Change), DoE &
Project Director, CBIT Project

21 December 2022

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4

Presentation Outline

- Overview of the Project
- Major Outputs of the Project
- National GHG Inventory: Focusing Waste Sector
- Emission Data Monitoring System

4

5

Overview of the Project

Project Title	: Strengthening Capacity for Monitoring Environmental Emissions under the Paris Agreement in Bangladesh (Commonly known as the CBIT project)
Project Duration	: January 2020 to January 2023
Funding Source	: Global Environment Facility (GEF)
Total Budget	: 733.76 lakh (in BDT) [0.86 million US\$]
Implementing Agency	: Department of Environment (DOE)
Development Partner	: Food and Agriculture Organization (FAO)

5

6

Overview of the Project.....Contd.

Background

- Meet **Enhanced Transparency Framework (ETF)** under the Paris Agreement (**Article 13**)
- Strengthen institutional and human capacities** to report on NDCs, especially GHG emissions, mitigation, and adaptation activities (**Article 11**)

6

7 Overview of the Project.....Contd.

Overall Objective

To **strengthen institutional and human capacities** in Bangladesh to meet the Enhanced Transparency Framework (ETF) of the Paris Agreement and **track the progress against priority mitigations and adaptations actions** identified in the NDC focusing on **Energy, IPPU, AFOLU, and Waste** sectors.

7

8 Overview of the Project.....Contd.

Project Components

- Strengthened national institutional arrangements and capacities to enhance MRV transparency in line with NDC activities
- Strengthened technical capacity to assess the emissions and removals, and monitor mitigation activities of NDC
- Strengthened capacity to monitor and report adaptation activities in support of NDC

8

9 Overview of the Project.....Contd.

Project Outcomes

- Institutional arrangements** for data collection and sharing, archiving and reporting strengthened focusing on AFOLU, Energy, IPPU and Waste sectors.
- Monitoring and reporting** the progress of the adaptation actions.
- Best practice ETF reporting process**, information gathering, system infrastructure and module sharing.
- Reporting on inventories** of emissions sources and sinks and monitoring of mitigation activities strengthened.

9

10 Major Activities of the Project

- Establish an online MRV Platform for data collection, data analysis, and UNFCCC reporting
- Institutional arrangement with Key Stakeholders for regular GHG, Adaptation & Mitigation related data collection
- Prepare GHG and Environmental Emission Database System
- Strengthen IT Infrastructure of DoE
- Strengthen GIS Lab of DoE
- Conduct 34 Trainings and 08 Stakeholder Consultations with relevant stakeholders
- Develop ETF Roadmap
- Organize Workshop on BTR Roadmap, Adaptation Monitoring Indicator and Data Collection Template
- Preparation of Communication Materials

10

11 National GHG Inventory

- Energy**
- IPPU (Industrial Process and Product Use)**
- AFOLU (Agriculture, Forestry and Other Land Use)**
- Waste**

11

12 Sector-wise Key Stakeholders

Sector	Stakeholders	Sector	Stakeholders
Agriculture, Forestry and Other Land Use (AFOLU)	1. Department of Agricultural Extension,	Industrial Processes and Product Use (IPPU)	1. Bangladesh Chemical Industries Corporation
	2. Bangladesh Bureau of Statistics		2. Bangladesh Steel & Engineering Corporation
	3. Bangladesh Livestock Research Institute		3. Bangladesh Chemical Manufacturing Association
	4. Department of Livestock Development Institute		4. Bangladesh Agro-Processors' Association
	5. Soil Research		5. Bangladesh Paper Mill Association
	6. Bangladesh Livestock Research Institute		6. Bangladesh Glass Merchant Association
	7. International Rice Research Institute		7. Bangladesh Ceramic Manufacturers & Exporters Association
	8. Forest Department		8. Bangladesh Ceramic Society
	9. Bangladesh Cement Manufacturers Association		

12

13 Sector-wise Key Stakeholders.....contd.

Sector	Stakeholders	Sector	Stakeholders
Power and Energy	1. BPC	Waste	1. Dhaka North City Corporation
	2. Power Cell		2. Dhaka South City Corporation
	3. BPD8		3. Rajshahi City Corporation
	4. Rural Power Company Ltd.		4. Barisal City Corporation
	5. North-West Power Generation Company Ltd.		5. Khulna City Corporation
	6. Electricity Generation Company of Bangladesh		6. Rangpur City Corporation
	7. Ashuganj Power Station Company Ltd.		7. Sylhet City Corporation
	8. Petrobangla		8. Gazipur City Corporation
	9. BAPEX		9. Narayanganj City Corporation
	10. Ittas Gas		10. Chittagong City Corporation
	11. Energy and Mineral Resource Division		11. Comilla City Corporation
			12. Mymensingh City Corporation
			13. Dhaka WASA
	14. Chittagong WASA		

#Total 42 GHG emission and mitigation data providers
#No. of organization will be increased if adaptation actions are considered (private sectors & NGO)

13

14 IPCC Guidelines for National GHG Inventory

14

15 2006 IPCC Guidelines for National GHG Inventory

15

16 IPCC Good Practice Guidance

This report (2000) provides guidance to assist countries in producing inventories that are neither over nor underestimates so far as can be judged, and in which uncertainties are reduced as far as practicable.

16

17 IPCC Methodological Tiers

A tier represents a level of methodological complexity. According to IPCC-

Tier 1:
A simple first order approach that uses spatially coarse default data based on globally available data characterized by large uncertainties and sometimes with methods involving several simplifying assumptions.

Tier 2:
A more accurate approach substituting country or region-specific values for the general defaults and more disaggregated activity data characterized by relatively smaller uncertainties.

Tier 3:
Higher order methods involving detailed modeling and/or inventory measurement systems driven by data at a greater resolution that provide estimates with lower uncertainties than the previous two methods.

17

18 List of Greenhouse Gases (GHGs)

Greenhouse gases are covered in the IPCC 2006 guideline

Carbon Dioxide (CO ₂)	Obligated to Report
Methane (CH ₄)	
Nitrous Oxide (N ₂ O)	
Hydrofluorocarbons (HFCs)	Encourage to Provide
Perfluorocarbons (PFCs)	
Sulphur hexafluoride (SF ₆)	
Nitrogen Trifluoride (NF ₃)	
Trifluoromethyl Sulphur Pentafluoride (SF ₅ CF ₃)	
Halogenated Ethers	
Other Halocarbons	

18

19 Emission Sources from Waste Sector

Methane (CH4) emission
from municipal solid waste (MSW) disposal

Methane emission
from domestic waste-water

Methane emission
Emission from Industrial waste-water

Nitrous Oxide (N2O)
Emissions from Domestic waste-water

Emission Sources from Waste Sector

19

20 Reporting Table: National GHG Inventory

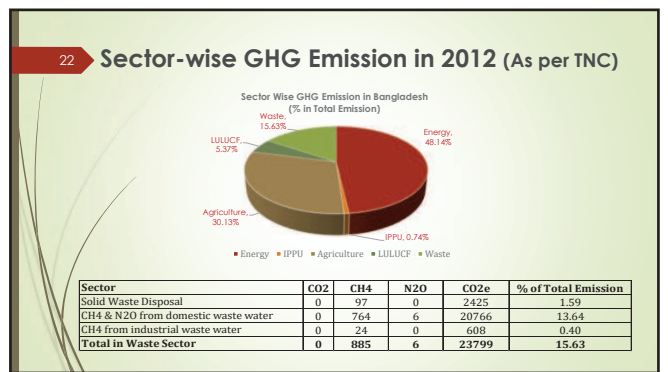
Greenhouse gas source and sink categories	Emissions (Gg)		
	CO ₂ Emissions (Gg)	CH ₄ Emission	N ₂ O Emission
Total National Emissions and Removals			
1 - Energy	69867.27	93.18	3.60
1.A - Fuel Combustion Activities	69867.27	93.18	3.60
A - Electricity Generation	29130.01	0.57	0.08
B - Manufacturing Industries and Construction	30018.41	1.35	0.20
C - Transport	8441.99	89.87	3.35
D - Other Sectors	12276.85	1.40	0.06
2 - Industrial Processes and Product Use	1121.13		
2.A - Mineral Industry	674.61		
A - Cement production	674.61		
2.B - Chemical Industry	446.51		
A - Ammonia Production	446.51		
3 - Agriculture		536.86	
A - Enteric Fermentation		536.86	
B - Manure Management		123.04	17.14
C - Rice Cultivation		603.55	
D - Direct Nitrous Oxide (N ₂ O) from Fertilizer application			17.62
E - Indirect Nitrous Oxide (N ₂ O) emissions from N based fertilizer			5.73

20

21 Reporting Table: National GHG Inventory

Greenhouse gas source and sink categories	Emissions (Gg)		
	CO ₂ Emissions (Gg)	CH ₄ Emission	N ₂ O Emission
F - Total Indirect N₂O Emissions - Volatilization			5.79
G - Total Indirect N₂O Emissions - Leaching/Runoff			1.67
3.B - Land-use Change and Forestry			
A - CO ₂ emission from soil	3247		
B - Conversion of forest land to other land use	561.53		
C - CO ₂ emission due to fuel wood removal for consumption	4,368		
A - Waste		97	
A - Solid Waste Disposal		97	
B - Methane emission from domestic waste water		764	
C - Nitrous Oxide Emission from Domestic wastewater			5.59
D - Methane emission from industrial waste water		24.31	
Memo Items (M)			
International Bankers	601.05	0.006	0.037
A - International Aviation (International Bankers)	577.68	0.004	0.037
B - International water borne navigation (International Bankers)	23.37	0.002	0.001
Memo Items			
CO ₂ from Biomass burning for Energy purpose	53837.92		
Total CO₂e emission from all sources in Gt/annum	152269		
Total CO₂e emission from all sources in Million Tons	152.27		
Total Aboveground Biomass Carbon Stock in Million Tons as per Major National Land Use Categories (NLUC)	-378.98		

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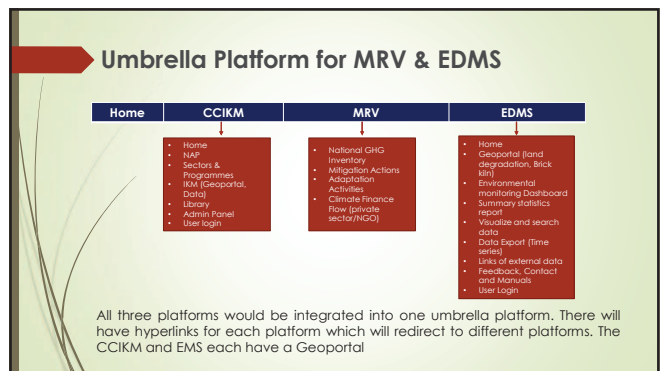


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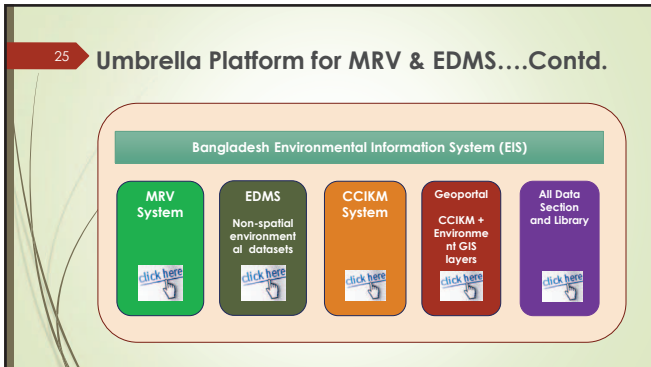
23 Waste Sector Data Collection Template

EA - Solid Waste Regional Data (EWRS) for	Category code	Activity data	Unit	Activity description
Name of the category as indicated in the 2006 IPCC Guidelines		Mass of the waste/stockpile of a business activity/industry or government/semi-government/other public/private activity		Any additional information and definition that would help data providers to deliver correct data
Solid Waste Disposal (CH4)	4A1, 4A2, 4A3	Mass of waste deposited	Gg	If data is not available for a waste sector, it can be estimated based on total population and a waste per capita rate. It is necessary to include and sign the amount of waste deposited into managed (M), unmanaged (UM), and unsegregated (US) sites. In addition, it is necessary to know the percentage of waste which are managed, unmanaged, and/or unsegregated, as per their respective. The IPCC method B1C (unmanaged) requires data on solid waste deposited (unmanaged and unsegregated) that have been estimated for the past 10 years.

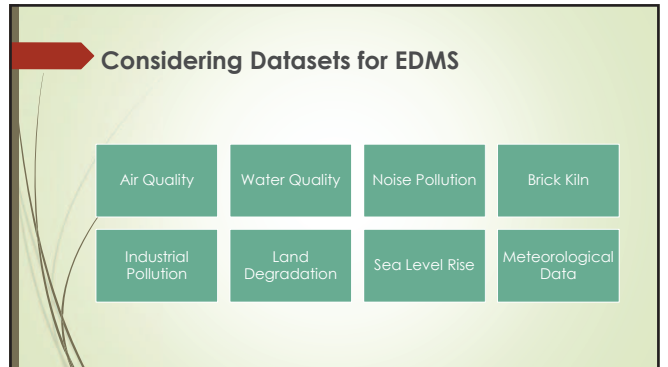
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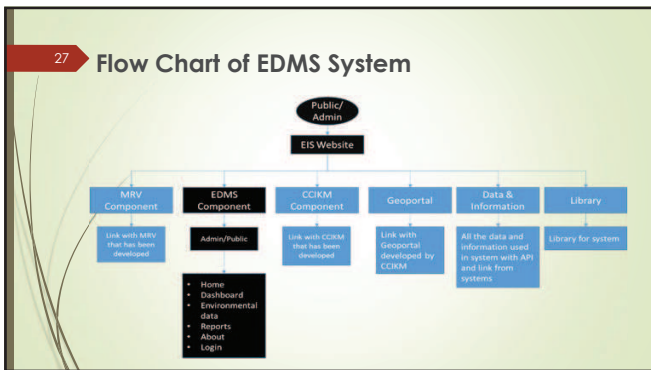
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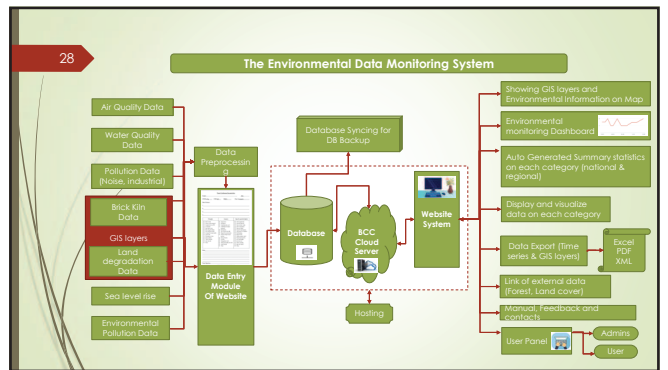
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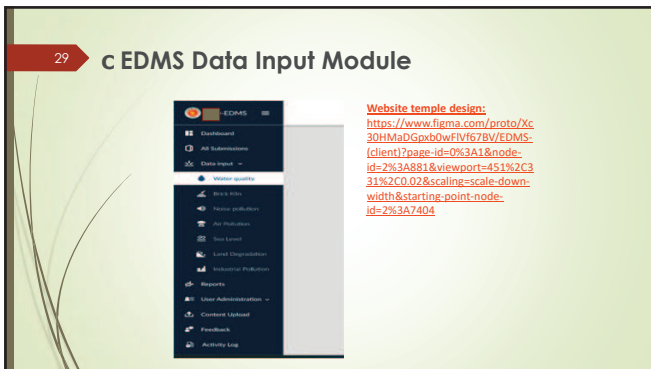
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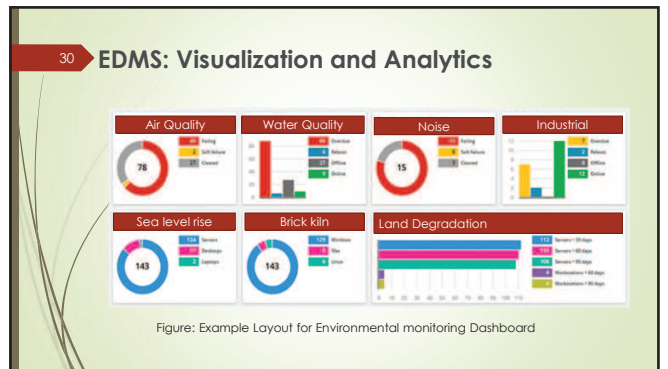
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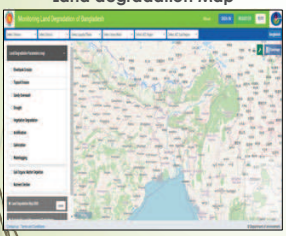
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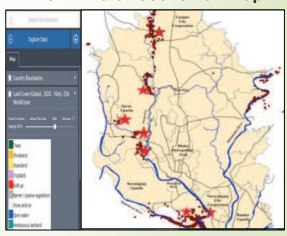
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31 **EDMS: Visualization and Analytics**

Land degradation Map



Bricklin Data Location on Map



31

32 **Features of EDMS System**

- Auto Generated Summary statistics on each category (national & regional)
- Display and visualize data
- Downloadable data (time series and geospatial) with different format
- Link with external data (Forest, Land cover) any all related data and links
- Manual, Feedback and FAQ will also be integrated
- GIS Layers and Environmental Data/Information
- Environmental Monitoring Dashboard
- User Panel Access

32

33

Provision of Environmental Management in SWM Rules

33

34 **EIA Requirement**

- Solid waste management facility such landfill site and/or Waste to Energy facility is red category as per ECR 1997
- IEE/EIA must be done
- Based on IEE, prepare the ToR for EIA – Get site clearance
- Prepare EIA or ESIA
- Prepare EMP and Environmental Monitoring Plan
- Get EIA approval and Environmental Clearance
- EC renewal/Implement EMP/Environmental Monitoring Plan

34

35 **Environmental Monitoring**

Issue	Description
Site selection	(A) Environmentally Critical Areas (ECA), Protected Areas, Sanctuary, Declared Environmentally Sensitive Areas and Flood Land shall not be allowed for landfill project (B) Life span of landfill should be at least 20-25 years and can be used phase by phase by making "landfill cells". (C) Solid waste processing & disposal site should have capacity of more than 5 tons, buffer zone should be kept around the waste area where no development activities can be undertaken
Distance	(A) Landfill shall be more than 200 meters from rivers, wetlands, ponds. (B) 250 meters from the residential development project. (C) 500 meters from national highways, residential areas, public parks and water supply wells. (D) 3 km from the airport and airbase

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36

Issue	Description
Environmental pollution control	(A) Storm water drain should be constructed and surface water contamination should be prevented. (B) Non-permeable lining system shall be placed in the side and bottom of the disposal area. By placing 1.5 mm thick HDPE geo-membrane or geo-synthetic liner or equivalent liner and over 90 cm thick soil (mud or modified soil) or composite liner with permeability co-efficient of less than 1×10^{-7} cm/sec. (C) Ground water level shall be at least 2 m below the level of mud or modified soil barrier. (D) There should have leachate collection and treatment system, leachate cannot be discharged into the open environment
Water quality	(A) The quality of ground water in the area should be collected and monitoring data should be stored as a baseline reference before landfill is set up. Within 50 meters of the periphery of the landfill area, the quality of groundwater should be routinely monitored for different seasons of the year; summer, monsoon and post-monsoon. Such monitoring should ensure that groundwater is not contaminated by landfill activities.

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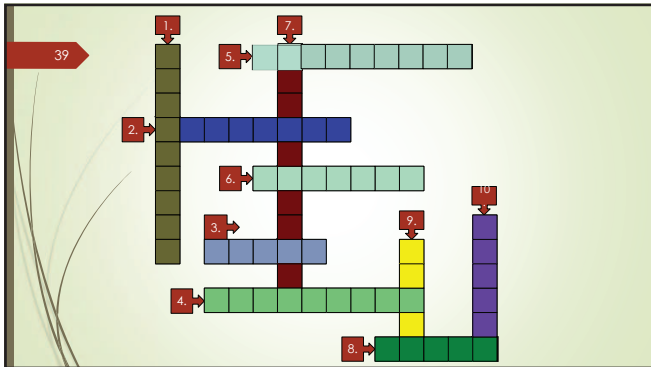
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Issue	Description
Air quality	<p>(1) Gas control system including collection of gas shall be installed at the landfill site to reduce the emission odor in the landfill, to prevent the spread of gas</p> <p>(2) The concentration of methane gas produced from landfill shall not exceed 25% of the minimum combustible level in any case.</p> <p>(3) Landfill gas shall be used in thermal process or power generation on the basis of facilities. Otherwise the landfill gas must be burned and it cannot be exposed directly to the air or trapped illegally.</p> <p>(4) The quality of the ambient air in the landfill and its surroundings should be monitored regularly.</p>

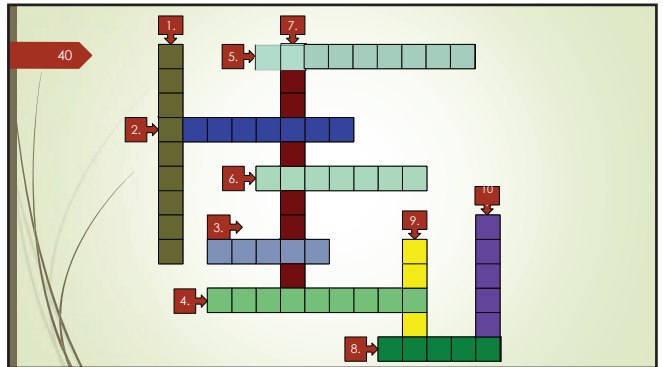
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- PUZZLE
- 38
- (1) The material which spoils our Environment, we need to control it before discharge (9), Starts with P
 - (2) The ultimate place where we deposit our wastes (8), Starts with L
 - (3) We use it in our daily life and has a recyclable value, if we reduce the use we can save our trees (3), Starts with P
 - (4) It is a household hazardous material, we use it in our mobile phones, clocks, cameras etc. It contains heavy metal, please do not throw it with general waste (9), Starts with B
 - (5) It is limited, we need to be judicious in using it (9), Starts with R
 - (6) We can make it from waste and can use it (7), Starts with C
 - (7) Where we live, we need to protect it (11), Starts with E
 - (8) Think before discharge, We can save our resources, if we use it again and again (5), Starts with R
 - (9) By throwing, **We Are Spoiling The Environment. Wise Approach to Sustainability through Technological Excellence** (5), Starts with W
 - (10) Choosing to use thing with care and thus generate less waste (6), Starts with R

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**Thank You
for
Your Active Participation**

41

Appendix 4

Materials for 2nd Solid Waste Management Workshop

**Agenda of 2nd Interactive Training Workshop on SWM in
“JICA Advisor on Environmental Management in Bangladesh”**

Time: 9:30 am

Date: 20th, July 2023

Venue: DoE head office (a hybrid of a face-to-face meeting in the 2nd-floor auditorium room of DoE and a remote meeting by Zoom)

1. Background

The first training workshop discussed the issues and possible solutions of SWM in Bangladesh, including the details of SWM Rules 2021. Through the discussion, it has been identified that the actual implementation of SWM Rule (2021) such as SWM plan and annual report to be prepared by each local government authorities is significant. Therefore, in this second training workshop, the preparation of SWM plan and its implementation and will be discussed. In addition, the annual reporting process, the data generation and data compilation will be advised.

2. Objectives

The main objectives of the workshop are as follows;

- I. To share the knowledge and experience of preparation of Solid Waste Management Plan and its implementation process with the concerned governmental officers through interactive discussion, and
- II. To share how to prepare the annual report and the data generation for reporting including data compilation through this training.

3. Draft Agenda of the Training Program

Time	Content	Speaker	Time expected
9.30-10:00	Registration		30 min
10:00 - 10:05	Welcome speech by DOE	Director, WCM of DOE	5 min.
10:05 - 10.10	Welcome speech by JICA	JICA Representative, JICA Bangladesh Office	5 min.
10.10 -10.25	Project Brief and Summary of the identified issues by JET	Kengo Naganuma, Chief Advisor, JICA Expert Team	15 min.
10:25-10:35	Summary of Previous Training Workshop and Purpose of Training Workshop	Satoshi Higashinakagawa, Solid Waste Management Expert, JICA Expert Team	10 min.
10.35 -10.55	Snacks Break		20 min
10:55-11:05	Explanation of Solid Waste Management Plan and Annual Report required by SWM Rule (2021)	Dr. Mamun WCM, DOE	10 min.
11:05- 11:15	Guide to Solid Waste Management	Satoshi	10 min.

Time	Content	Speaker	Time expected
	Planning and Annual Reporting based on Japan Experience	Higashinakagawa, Solid Waste Management Expert, JICA Expert Team	
11:15 - 11:35	Explanation of preparation of DNCC/DSCC SWM M/P and its implementation	Mr. Abul Hasnat Md. Ashrafal Alam, Superintending Engineer, DNCC	20 min.
11:35 - 12:15	Group discussion about (1) how to prepare SWM Plan and (2) how to prepare annual report, the data management and reporting system	2 groups discussion separately for all participants (MC by Dr Tariq, JICA Expert Team & Mr Maruf , Asst. Director, DOE)	40 min.
12:15- 12:25	Presentation from the Group on preparation of SWM plan & Annual Reporting including summarization	Representatives of group of (1),	10 min.
12:25 - 12:35	Presentation from the Group on preparation of SWM Plan & Annual Reporting including summarization.	Representatives of group of (2)	10 min.
12:35 - 12:55	Presentation on the new proposals based on the identified issues (by JET)	Kengo Naganuma, Chief Advisor, JICA Expert Team	20 min
12:55 - 13:05	Proposal for further assistance from international donor	Dr. Mamun WCM, DOE	10 min.
13:05 - 13:15	Open discussion on the new proposals (by JET and DoE)	JET and DoE	10 min
13:15 - 13:25	Remarks from JICA Representative	JICA Representative, JICA Head Quarter	10 min.
13:25 - 13:35	Remarks from Chief Guest	Secretary, MOEF&CC	10 min.
13:45 - 13:55	Closing Remarks	Director General, DOE	10 min.
13:55-	Lunch	All participants	

4. Participants

I. Bangladesh Side

The tentatively expected participants are described in Attachment-1.

II. Japanese Side

JICA Headquarter, JICA Senior Advisor, JICA Bangladesh Office, JICA Expert Team

Attachment-1

Expected Participants:

Main Target participant

DOE (Waste & Chemical Management wing)- 5, DOE (Natural Resource Management Wing)- 1 or 2, DOE (Monitoring & Enforcement wing)-1, DoE (Planning Wing)- 1, DoE (Climate Change and International Convention Wing) - 1, DoE (Air Quality Management) –2, DOE (Dhaka Metropolitan)-2, DOE (Dhaka District)-1, DOE (Chattogram Metropolitan)-2, DOE

(Chattogram district)-1, Narayangonj DOE/NCC- 1+1, Gazipur DOE/GCC-1+1, Munshigonj DOE/
Paurashava- 1+1, Narshindi DOE/ Paurashava 1+1,ManikganjiDOE/ Paurashava 1+1,
DNCC/DSCC -1+1, CCC-1, Cumila DoE/CuCC – 1+1.
Ministry of Environment, Forest & Climate Change (MOEF&CC) -1, Local Government Division
(LGD)-1, Local Government Engineering Department (LGED)-1, Department of Public Health
Engineering (DPHE)-1,
Representatives from WB, ADB and GIZ

End of Document

**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Solid Waste Management (SWM)

Session 1: Project Brief and Summary of the Identified Issues by JET

20th July 2023

JICA Expert Team

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1. Background, Project Outcomes and Period

Background

- MOEFCC requested JICA to conduct capacity development for the Department of Environment (DoE) in water environmental management and solid waste management sectors in April 2021.
- JICA appointed an expert team to commence the technical assistance (TA) named "Advisor on Environment Management in Bangladesh".

Objective

- Output 1: To identify priority issues to be addressed on environmental management** of (i) water pollution control and (ii) SWM, and
- Output 2: To identify the expected actions for environmental management capacity development by DoE** on (i) water pollution control and (ii) SWM, related to (a) legislative enforcement, (b) institutional capacity development, and (c) cooperation with relevant organizations.

Project Period November 2021 to November 2023

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2

2. DoE Managers and JICA Expert Team

(1) DoE

Position	Name, Section and Position etc.
DG of DoE	Dr. Abdul Hamid
ADG of DoE	Mr. Kazi Abu Taher
Project Director (Focal Person)	Ms. Syeda Masuma Khanam, Director of Natural Resource Management Wing
Relevant managers participating in the Project in HQ of DoE	Mr. Mohammed Solaiman Haider, Director of Planning Wing Mr. Md. Hasan Hasibur Rahman, DD of Planning Wing Ms. Razinara Begum, Director of Waste and Chemical Management Wing Dr. Abduljabbar Mamun, DD of Waste and Chemical Management Wing Mr. A.K.M. Rafiqul Islam, DD of Natural Resource Management Wing Mr. Mohammad Masud Hasan Palwari, Director of Enforcement and Monitoring Wing Mr. Syed Ahmmed Kabir, DD of Enforcement and Monitoring Wing Mr. Masud Iqbal Md. Shameem, Director of Env. Clearance and Certificate Wing
Chattogram DoE	Mr. Hillol Biswas, Director, Chattogram Metropolitan Ms. Nasim Farhana Shirki, Director, Chattogram Laboratory Mr. Kamrul Hasan, Deputy Director, Chattogram Lab.

(2) JET

Position	Name
Team Leader / Environmental Management	Mr. Kengo Nagayama
Water Pollution Control	Mr. Shinji Tanaka
Solid Waste Management	Mr. Satoshi Higashinakagawa
Local Experts	Mr. ABM Sadique Rahman Dr. Tang Bin Yousef Mr. Md. Al Musabbir Hossen

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3. Output-1: Implemented Activities

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4(1). Contents of 1st Workshop on Water Pollution Control (1st February 2023)

Name of Session	Contents
Session 1 General concept of the wastewater treatment	- Presented biological action in the water, nitrogen cycle, sources of water pollution - Discussed about the Coordination system in Japan, DoE inspection procedure for pollution control and challenges
Session 2 Basics of a wastewater treatment (ETP) technique 1 – Screen/Physical Treatment	- Design checking system in DoE is only during EIA - ETP operational issue: during inspection it is checked whether ETP in operation or not, dosing etc.
Session 3 Basics of a wastewater treatment (ETP) technique 2 – Biological treatment	- Explained biological treatment: aerobic and anaerobic, nitrogen cycle, aeration tank, HRT, activated sludge process, MBBR, MBR, SBR, etc. - Latest technology like MBBR, MBR, SBR are also currently using in Bangladesh and DoE is aware about those technology - Observed condition through inspection by DoE - Environmental Clearance Certificate on design of ETP
Session 4 Introduction of the emitter registration system in Japan	- Discussed for comparison of Japanese and Bangladesh environmental protection legal system - In Japan, equal or more than 50m ³ /day of wastewater are responsible to maintain their treatment facilities, but in Bangladesh, not based on capacity of industry but on types and category - Licensed Environmental expert should be assigned as environmental manager for each industry in Japan, but Bangladesh does not have this system - Limitation in Bangladesh is mainly weakness of mechanism for reflecting policy, high population density, less human resource and logistic in DoE, lack of awareness on environmental issues

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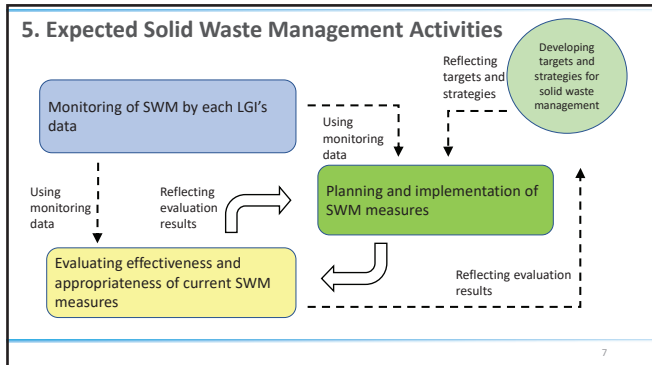
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4(2). Contents of 1st Workshop on Solid Waste Management (21st December 2022)

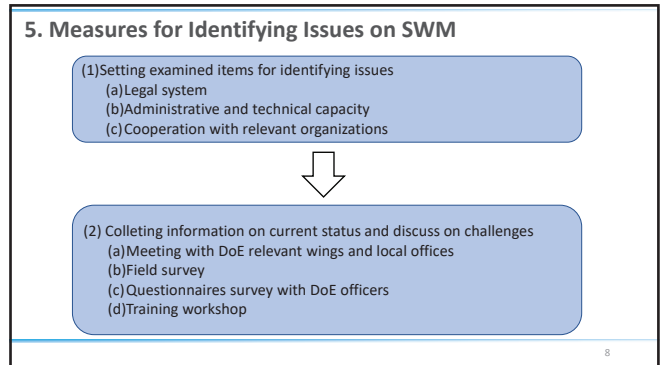
Name of Session	Contents
Session 1 General concept of the SWM and Introduction of the current situation in Bangladesh (including the brief introduction of SWM Rule)	- Understand the general concept of SWM - Share the information of current situation of SWM in Bangladesh
Session 2 Introduction of policy & institutional system of SWM in Bangladesh & Japan	- Explanation of SWM Rule [2021] - Law and regulation system of each type of waste in Japan
Session 3 Preparation of SWM plan and annual report by LGI and facilitation by DOE	- Discussion on necessity of SWM plan and annual report by LGI, and brief explanation of the case of Japan
Session 4 Introduction of EPR system of container and packaging waste in Japan and how it can be introduced in Bangladesh	- Explanation of current plastic waste flow - Introduction of EPR system of packaging waste in Japan
Session 5 Capacity building on the emission monitoring (land, water & air) for waste treatment and disposal and feedback of all the session	- Capacity building emission monitoring - Necessary survey for monitoring

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6. Identified Issues (1) – Legal System

Item	Current Status	Challenges
Municipal Solid Waste Management	- Solid Waste Management Rule (2021) has been formulated	<ul style="list-style-type: none"> To improve the SWM rule at suitable timing. To prepare guidelines of solid waste management planning for implementation of the SWM rule. To prepare guidelines of annual report of SWM for implementation of the SWM rule. To prepare the technical guidelines for collection, transportation, treatment and disposal related to solid waste management
Industrial Waste Management	- Environmental Conservation Act indicate polluter pay principals - Hazardous Waste (E-waste) Management Rules (2021) has been established - Medical Waste Management and Handling Rules (2008) has been established	<ul style="list-style-type: none"> To prepare law and regulations for each type of waste with consideration of EPR and/or polluters pays principal approach

9

6. Identified Issues (2) – Administrative and Technical Capacity

Item	Current Status	Challenges
Municipal Solid Waste Management	<ul style="list-style-type: none"> Difficulty of collecting the data of SWM National 3R Strategy has been formulated but there is no SWM plan at national level 	<ul style="list-style-type: none"> To improve the inadequate monitoring system To develop solid waste management plan at national level To develop the implementation system for actualizing an action plan of plastic waste management
Industrial Waste Management	<ul style="list-style-type: none"> Difficulty of monitoring of industrial waste There are rules of e-waste and hazardous waste 	<ul style="list-style-type: none"> To develop the efficient monitoring system To develop the treatment and disposal facilities for hazardous waste To develop the system of medical waste management

10

6. Identified Issues (3) – Cooperation with Relevant Organizations

Item	Current Status	Challenges
Municipal Solid Waste Management	<ul style="list-style-type: none"> DOE has five staff members in charge of SWM DOE is regulatory body of SWM Implementation body is Local Government Institutions (LGIs) with technical assistance of LGD, DPHE and LGED 	<ul style="list-style-type: none"> Lack of staff in charge in SWM in DOE Necessary of collaboration between DOE and LGD, LGED, DPHE as well as LGIs
Industrial Waste Management	<ul style="list-style-type: none"> There is no department specialized in the management and monitoring of hazardous waste No implementation system of E-waste management 	<ul style="list-style-type: none"> To develop monitoring and implementation system of industrial waste from each source through the cooperation with LGIs.

11

- ### 7. Items to be discussed
- ✓ Is there any other serious issues to be raised for improvement of solid waste management capacity of DoE?
 - ✓ Among the identified issues, which ones are considered as priority ones and how do you set the timeline of the proposed activities?

12

8. On-going and Further Activities in the Project (Tentative)

Month	On-going and Planed Activities (Tentative)
Jul. and Aug. 2023	<ul style="list-style-type: none"> • To hold two Workshops for discussing on the expected actions by DoE for enhancement on water pollution control and solid waste management. <ul style="list-style-type: none"> (a) WS on water pollution control by DoE officers and JET (b) WS on SWM by DoE officers and JET with Dhaka North and South City Cooperation (Note) With main objectives, in the WS on SWM, Dhaka city SWM MP will be disseminated. • To hold a Coordination Meeting to conclude the expected actions by DoE with DoE Managers and JET.
Sep. 2023	<ul style="list-style-type: none"> • To hold a Final Seminar to disseminate the expected actions by DoE to MOEFCC, JICA, and relevant organizations.
Nov. 2023	<ul style="list-style-type: none"> • To prepare a Project Completion Report for recording the Project outcomes.

13

**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Solid Waste Management

Session 2: Summary of Previous Training Workshop
and Purpose of 2nd Training Workshop


20th July 2023

JICA Expert Team

1

Contents of Program of Previous Workshop

- Session 1 General Concept of the SWM and Introduction of the current situation in Bangladesh (including the brief introduction of SWM Rule)
- Session 2 Introduction of policy & institutional system of SWM in Bangladesh & Japan.
- Session 3 Preparation of SWM plan and annual report by LGI and facilitation by DOE
- Session 4 Introduction of EPR system of container and packaging waste in Japan and how it can be introduced in Bangladesh
- Session 5 Capacity Building on the emission monitoring (land, water & air) for Waste Treatment and Disposal and feedback of all the session.



2

Session-1

General Concept of the SWM and Introduction of the current situation in Bangladesh (including the brief introduction of SWM Rule)

- 1. What is Solid Waste Management (SWM)?**
 - Explain the necessity of SWM from waste generation discharge minimization to 3R and final disposal
 - Explain the waste hierarchy of reduce, reuse, recycle, recovery, disposal
 - Explain the importance of waste minimization and segregation at source
- 2. What is the situation of SWM in Bangladesh?**
 - Basic law of solid waste management has been stipulated.
 - Review the current situation of solid waste management in Bangladesh
- 3. How to improve the situation of SWM in Bangladesh after presentation of Japanese cases**
 - Explain the historical trend and current situation of solid waste management in Japan
 - Discussion about the methods of collection, transportation, intermediate treatment and disposal

3

Session-2

Introduction of policy & institutional system of SWM in Bangladesh & Japan

- 1. Explain SWM Rules 2021 as basic solid waste management law in Bangladesh**
 - Explanation of roles of DOE, LGD, National Coordination Committee, LGIs and other organizations, public
 - Necessary activities to implement the rule including the preparation of SWM plan and annual report and to formulate EPR and to establish circular economy
- 2. Explain the Current Institutional System of SWM in Bangladesh**
 - Relation of the organization related to SWM including the national government such as DOE, LGD, LGED, MOH, etc and LGIs, etc
- 3. Explain the Historical Trend and Current Institutional System in Japan**
- 4. Discussed how to improve the Institutional & Regulatory System in Bangladesh**
 - Introduction of extended producer's responsibilities
 - Empowering conservancy inspectors for illegal activities of waste

4

Session-3

Preparation of SWM plan and annual report by LGI and facilitation by DOE

- 1. Solid Waste Management Plan required by SWM Rule (2021)**
 - Explanation of SWM Plan for LGIs described in SWM Rule (2021)
 - Introduction of contents of SWM Plan in case of Japan
- 2. Annual Waste Report required by SWM Rule (2021)**
 - Explanation of Annual Report required by SWM Rule (2021)
 - Brief introduction of contents of the annual report as case of Japan
- 3. Discussed How to implement the preparation of plan and annual report by LGIs and to summarize the report as national level**

5

Session-4

Introduction of EPR system of container and packaging waste in Japan and how it can be introduced in Bangladesh

- 1. Explain the system of plastic waste management system being prepared in Bangladesh**
 - Explanation of estimated current plastic waste flow
 - Necessary challenges and explanation of road map
- 2. Introduction of container and packaging waste system, especially plastic waste in Japan**
 - Explanation of stakeholders such as waste dischargers, collectors, recyclers and producers
 - Explanation of activities of each stakeholder in recycling flow in container packaging
- 3. Discussed how to implement plastic waste management by reflecting EPR concept in Bangladesh after the above explanation**

6

Session-5

Capacity Building on the emission monitoring (land, water & air) for Waste Treatment and Disposal and feedback of all the session.

1. Capacity Building on the Emission Monitoring

- Emission monitoring from solid waste management activities
- Calculation method, especially focused on GHG emission

2. Provision of Environmental Management in SWM Rules

- EIA requirement for Solid Waste Management Project
- Preparation of Environmental Management and Monitoring Plan

7

7

Summarize of the 1st Training Workshop and Objectives of 2nd Training Workshop

Summary of the 1st Training Workshop

- Current situation and various issues of current SWM situation in Bangladesh has been presented
- After the stipulation of SWM Rule (2021), necessary activities for its implementation has been discussed
- To share how to prepare the annual report and the data generation for reporting including data compilation through this training.

Main Objectives of the 2nd Training Workshop

- To share the knowledge and experience of preparation of Solid Waste Management Plan and its implementation process with the concerned governmental officers through interactive discussion
- To share how to prepare the annual monitoring report and to implement the data collection for reporting including data compilation.
- To consider the future actions to improve the Solid Waste Management in national level

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**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Solid Waste Management

Session 3: Guide to Solid Waste Management Planning and Annual Reporting

20th July 2023

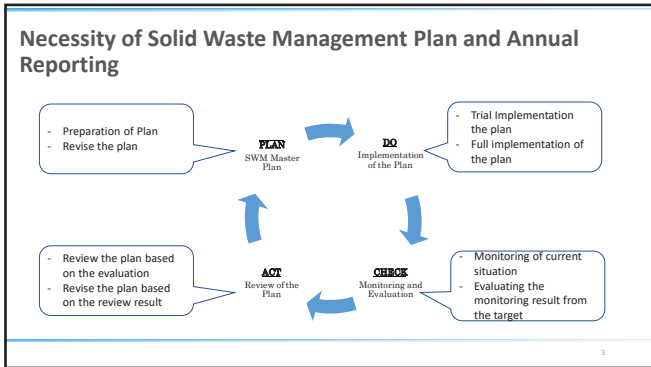
JICA Expert Team

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Why it is necessary of preparation of planning and monitoring report of Solid Waste Management?

1. Planning
 - To Examine the current situation and identify the issues
 - To set the goal and vision for improve the situation of waste management
 - To estimation of future projection
 - To prepare the strategy and plan
 - To prepare implementation schedule and organization, budget, etc
2. Periodical Monitoring
 - To examine the current situation
 - To analyze the gap between current situation and plan
 - To revise the plan after the gap analysis

2



3

Why SWM Plan in Necessary? (Objectives)

SWM Plan shall be prepared satisfying the following objectives

- To clearly identify the issues / problems in current situation;
- To deeply consider and find the solution for those issues;
- To understand the goal and target commonly among concerned stakeholders;
- To clarify the strategic approach to attain the goal;
- To determine the effective actions, their timeline and milestone, necessary resource;
- To clarify the evaluation and monitoring procedure of the itemized actions to understand the progress.

4

What is the contents of SWM Plan?

- Title of SWM Plan;
- Background of SWM Plan;
- Identified Issues / Problems and their causes;
- Possible measures to solve above mentioned issues
- Related upper policy, law, regulation and upper / related plans;
- Concerned stakeholders;
- Goal to be achieved;
- Actions of solid waste management with concerned organization;
- Required duration and implementation schedule;
- Required budget and expenditure if any;
- Monitoring method

5

Solid Waste Management (SWM) Plan in Japan

- According to SWM basic law in Japan, every local authority has to prepare each SWM plan including SWM basic plan as the target year of 10 to 15 years and SWM implementation plan for each year.
- The direction for preparation of SWM basic plan has been prepared.
- The direction suggested the SWM basic plan should consider the following points
 1. Items to be analyzed for planning
 - (1) Profile of Local Authority
 - (2) Current situation of SWM (waste flow, SWM implementation structure, result of SWM, evaluation of SWM)
 - (3) Issues of SWM
 2. Planning
 - (1) Waste generation projection
 - (2) Future vision and target
 - (3) Strategy

6

Solid Waste Management (SWM) Plan in Japan

Contents of the Plan of Solid Waste Management

1. Introduction (Background, Objective)
2. General condition of local authority (demographic trend, Industry trend, Other Plan)
3. Current Situation of Waste Management (Waste flow, Waste disposal system, Waste Disposal Result and evaluation, Issue Identification)
4. Waste management plan (Waste generation and disposal amount estimation, countermeasure for waste minimization, Types and classification of waste to be collected separately, waste treatment and its responsibilities, development of waste treatment and disposal facility, others)

7

Recommendation on direction of SWM plan

National SWM Strategy / National SWM Plan

Enhance the target, policy and strategy of national level for LGI's SWM plan

← Enhance the current situation and future target of SWM and share the information of good practice in each plan

LGI's SWM Plan

LGI's SWM Plan

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LGI's SWM Plan

LGI's SWM Plan

LGI's SWM Plan

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Annual Report of SWM in Japan

- There is description of objectives of the annual report.
- The annual reports are respectively prepared for municipal solid waste and industrial waste
- Annual report of municipal solid waste is summarized by Ministry of Environment (ex. https://www.env.go.jp/recycle/waste_tech/ippan/r2/data/env_press.pdf)
- The data format (excel file) has been prepared and send to each local authority to be submitted by them.
- After the collection of the data from each local authority, the data of every local authority is summarized as annual report.
- After the preparation of report, it is publicized annually.

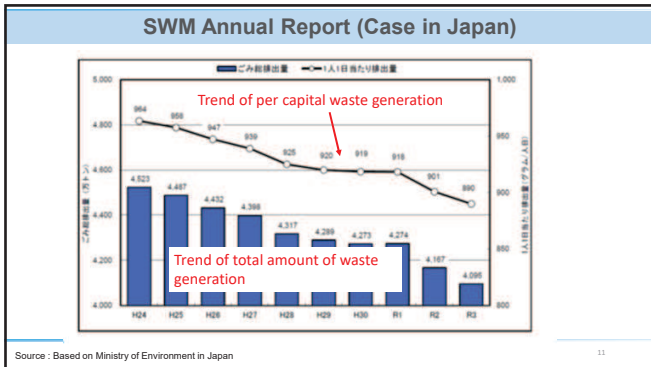
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Data input and analysis for SWM Annual Report in Japan

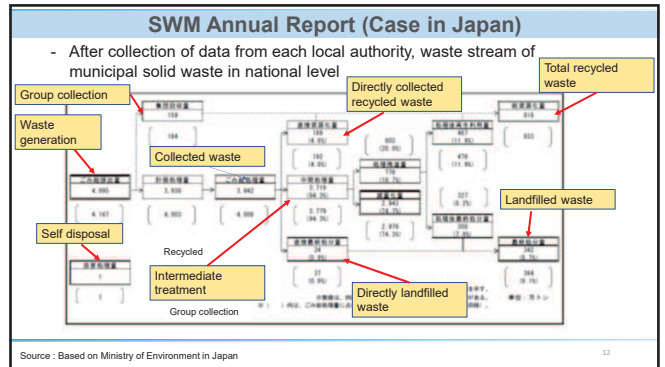
- Prepare the data format of excel sheet
- Input the data from each local authorities
- Analyze the data

Source : Based on Ministry of Environment in Japan

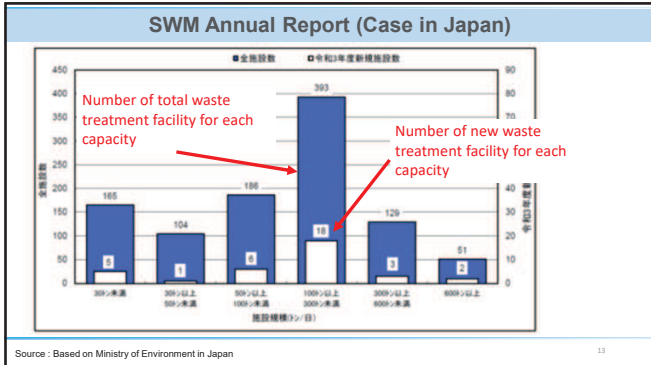
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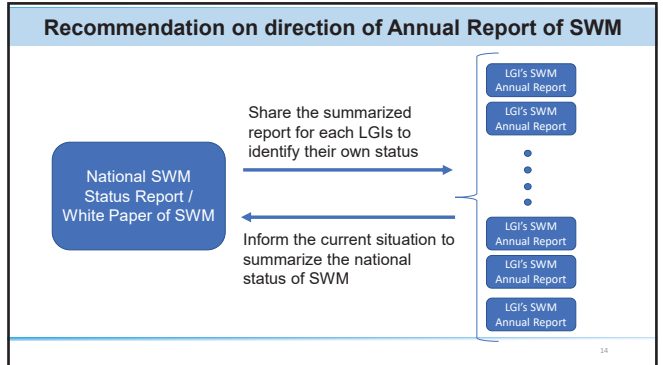
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Session 4

Project for Strengthening of Solid Waste Management in Dhaka North City, Dhaka South City, and Chittagong City

NEW CLEAN DHAKA MASTER PLANS 2018-2032

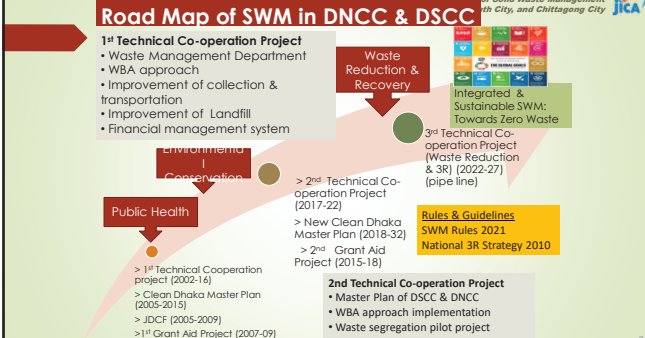


Dhaka South City Corporation (DNCC) Dhaka North City Corporation (DNCC)

23 February 2020
JICA Project Team

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Road Map of SWM in DNCC & DSCC



- 1st Technical Co-operation Project**
 - Waste Management Department
 - WBA approach
 - Improvement of collection & transportation
 - Improvement of Landfill
 - Financial management system
- 2nd Technical Co-operation Project (2017-22)**
 - New Clean Dhaka Master Plan (2018-32)
 - Grant Aid Project (2015-18)
- 3rd Technical Co-operation Project (Waste Reduction & 3R) (2022-27)**
 - Integrated & Sustainable SWM: Towards Zero Waste
 - pipe line
- Rules & Guidelines SWM Rules 2021 National 3R Strategy 2010**
- 2nd Technical Co-operation Project**
 - Master Plan of DSCC & DNCC
 - WBA approach implementation
 - Waste segregation pilot project

2

Experience from Clean Dhaka Master Plan

- Capacity Building
- Planning of Waste Management
- Decentralized SWM system (WBA, CUWG, PCSPs)
- Waste survey & Reporting System
- Operational & Maintenance capacity
- Weighbridge Data Management
- Financial Management system
- Landfill management
- Emission monitoring for waste treatment & disposal facility
- Collection & Transfer
 - Community participation & S/S pilot project
 - Improvement of waste transfer interface (Functionality, Capacity & working condition)
 - Outsourcing of street sweeping & transportation system

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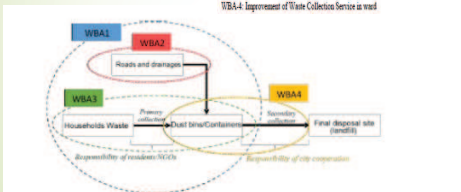
Waste Reduction & Recycling

- PR Activities
- Recycling value chain analysis
- Formal & Informal sector integration
- Private financing including PPP business model
- Institutional**
 - Establishment of SWM Department
 - Enhance community engagement
 - Environmental education & public awareness program
 - Health & Safety of waste workers

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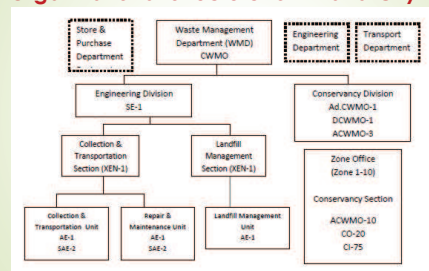
Ward Based SWM Approach

WBA-1: Construction & Management of Ward Office
 WBA-2: Safety Education for Citizens & establishment of safety and sanitation committee
 WBA-3: Public awareness raising
 WBA-4: Improvement of Waste Collection Service in ward



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Waste Management Department Organizational Structure for Dhaka City

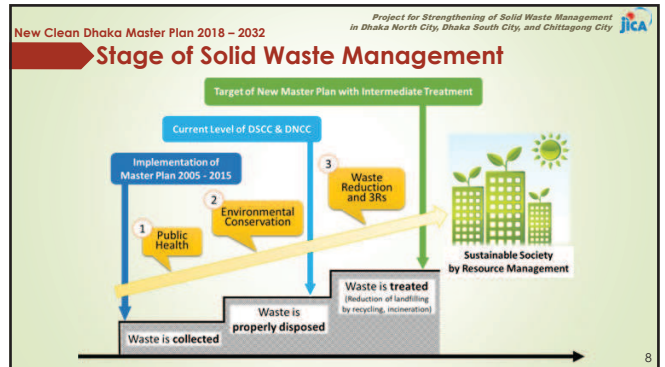


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Project for Strengthening of Solid Waste Management
in Dhaka North City, Dhaka South City, and Chittagong City

New Clean Dhaka Master Plan 2018 – 2032

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Project for Strengthening of Solid Waste Management
in Dhaka North City, Dhaka South City, and Chittagong City

New Clean Dhaka Master Plan 2018 – 2032

Present Condition

	DNCC	DSCC	Total
Waste generation	3,663 tons/day	2,847 tons/day	6,510 tons/day
Waste collection	2,930 tons/day	2,533 tons/day	5,463 tons/day (84 %)
Recycling	10 %	10 %	–
Intermediate treatment	Not yet introduced by City Corporations		
Landfill site	Amin Bazar LFS	Matuail FLS	–
Landfill disposal	73 %	80 %	–

9

Project for Strengthening of Solid Waste Management
in Dhaka North City, Dhaka South City, and Chittagong City

New Clean Dhaka Master Plan 2018 – 2032

Master Plan Targets by 2032

	Present	Target by 2032
Waste Collection	The extension area is not covered	100 % area coverage
Waste Reduction	0 % (No action)	12 – 13 %
Recycling	10 %	44 – 48 %
Landfill Disposal	73 – 80 %	29 – 33 %

10

Project for Strengthening of Solid Waste Management
in Dhaka North City, Dhaka South City, and Chittagong City

New Clean Dhaka Master Plan 2018 – 2032

Future Solid Waste Management in 2032

	Current	By 2032
Waste generation	6,510 tons/day	8,498 tons/day (DNCC: 4,763 tons/day, DSCC: 3,735 tons /day)
Waste collection	5,463 tons/day	7,649 tons/day
Landfill site	DNCC: Amin Bazar LFS DSCC: Matuail LFS	DNCC: New Amin Bazar LFS & New LFS at Nasirabad DSCC: New Matuail LFS
Intermediate treatment	None	Waste-to-Energy Plant, Recycling Plants etc.
Organization	Waste Management Department (WMD)	WMD Expansion with new sections (Intermediate treatment, PR, W&A)
Collection equipment	Various types (trucks, compactor etc.)	Mostly compactors

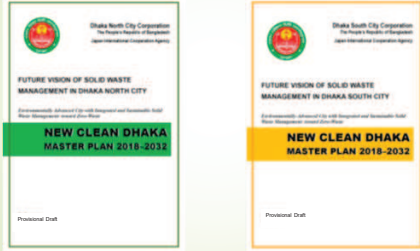
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- Project for Strengthening of Solid Waste Management
in Dhaka North City, Dhaka South City, and Chittagong City
- ### New Clean Dhaka Master Plan 2018 – 2032
- ## Actions:
- Public awareness and community involvement
 - Mechanized street sweeping and drain cleaning
 - Modernized waste treatment
 - Intermediate treatment (Waste-to-Energy) and resource recovery
- ### Challenges

 - WMD staff shortage (vacancy posts)
 - Intermediate treatment plant operation, management organizational setup
 - Landfill site DPPs & Waste collection DPPs

12

Handing the Draft Master Plan to Hon. Minister



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Thank you for your attention.

14

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Session 5

Title: Prepare a Solid Waste Management Plan and Annual Reporting System

Group Work: 40 minutes Group presentation: 10 minutes (3/5 ppt slides)

This case study examines the development and implementation of a comprehensive solid waste management plan in a hypothetical city, referred to as City X. The aim is to showcase the key considerations, strategies, and actions involved in designing an effective waste management plan and also develop a annual reporting system of the activities.

City X is a medium-sized urban area (Municipality Class I) with a population of approximately 500,000 residents. The city has been facing significant challenges in waste management, including inadequate waste collection systems, limited recycling infrastructure, and improper disposal practices leading to environmental pollution. In response to these issues, the municipality has planned to develop a sustainable solid waste management plan. The waste management plan comprises a range of strategies and interventions to achieve the defined goals. These include:

a. Waste Minimization: Encouraging waste reduction practices such as source segregation, composting, and promoting the use of reusable products through awareness campaigns and incentives.

b. Recycling and Resource Recovery: Enhancing recycling infrastructure, establishing recycling centers, implementing segregated waste collection systems, and collaborating with recycling industries to promote resource recovery.

c. Waste Collection and Transportation: Improving waste collection services through fleet management, and the introduction of modern collection equipment.

d. Waste Treatment and Disposal: Developing waste treatment facilities such as composting plants, anaerobic digestion units, and waste-to-energy plants to minimize the amount of waste sent to landfills. Ensuring proper landfill management, including landfill site selection, containment systems, and leachate management, landfill gas capture to mitigate environmental impacts.

e. Public Awareness and Education: Implementing educational campaigns, workshops, and community outreach programs to raise public awareness about waste management practices, waste segregation, and the importance of recycling

1. f. Implementation and Monitoring: The waste management plan has to be implemented in phases, with clear timelines and responsibilities assigned to different departments and agencies. Regular monitoring and evaluation has to be carried out to assess the plan's effectiveness, measure progress towards the

defined goals, and identify areas for improvement. Key performance indicators such as waste diversion rates, recycling rates, and citizen satisfaction surveys have to be carried out to track the plan's success.

2.

g. Results and Outcomes: The implementation of the solid waste management plan in City X yields significant positive outcomes. The city experiences a notable reduction in waste generation due to increased public awareness and waste minimization efforts. Recycling rates significantly improves as a result of enhanced infrastructure and efficient collection systems. The city's landfill usage decreases substantially, with a greater emphasis on waste treatment and resource recovery. Furthermore, the plan's success led to improved environmental conditions, reduced pollution, and enhanced overall quality of life for City X residents.

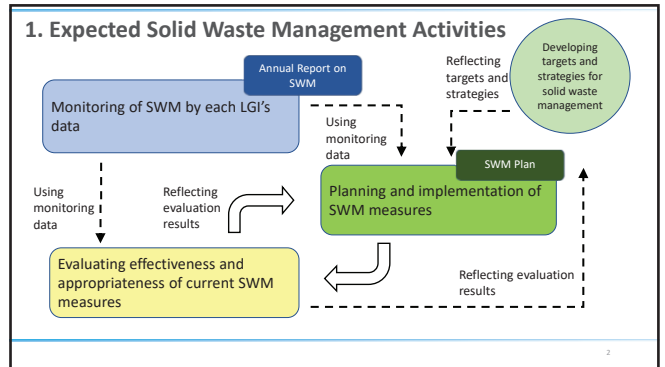
**Advisor on Environment Management
in Bangladesh**

2nd Interactive Training Workshop on Solid Waste Management (SWM)

**Session 6: Proposal on Expected Activities
based on the Identified Issues**

20th July 2023
JICA Expert Team

1



2

2. Proposed Activities (1) – Legal System

Item	Challenges	Possible Proposed Activities
Municipal Solid Waste Management	<ul style="list-style-type: none"> To improve SWM rule (2021) such as description of waste definition To guide preparation of SWM plans and annual reports by LGIs To guide suitable SWM from technical viewpoints 	<ul style="list-style-type: none"> To prepare guidelines of SWM planning for operation of the SWM rule To prepare guidelines for preparation of SWM annual report of SWM for operation of the SWM rule. To prepare technical guidelines for collection, transportation, treatment and disposal To revise the SWM rule as necessary based on the experiences obtained
Industrial Waste Management	<ul style="list-style-type: none"> To develop institutional systems for each type of industrial waste management To enhance EPR described in the SWM rule To adopt polluter pays principal approach 	<ul style="list-style-type: none"> To prepare law and regulations for each type of industrial waste with consideration of EPR and/or polluters pays principal

3

2. Proposed Activities (2) – Administrative and Technical Capacity

Item	Challenges	Possible Proposed Activities
Municipal Solid Waste Management	<ul style="list-style-type: none"> To improve insufficient monitoring systems To develop an SWM plan at national level To develop an administrative systems for operation of the action plan of plastic waste management 	<ul style="list-style-type: none"> To prepare guidelines for SWM planning in LGI level with setting national level goals and targets for SWM in Bangladesh, considering each LGI condition To establish administrative system for operation of plastic waste management action plan
Industrial Waste Management	<ul style="list-style-type: none"> To develop efficient monitoring systems To develop treatment and disposal facilities for hazardous waste To develop systems of medical waste management 	<ul style="list-style-type: none"> To consider suitable monitoring system such as manifest system to identify the generation source for examining proper treatment and disposal ways To prepare guidelines to construct hazardous and medical waste treatment and disposal facilities

4

2. Proposed Activities (3) – Cooperation with Relevant Organizations

Item	Challenges	Possible Proposed Activities
Municipal Solid Waste Management	<ul style="list-style-type: none"> Lack of staffs in charge of SWM in DOE Necessary of collaboration between DOE, LGD, LGED, and DPHE 	<ul style="list-style-type: none"> To develop materials for the national coordination committee. To strength cooperation among related ministries and agencies
Industrial Waste Management	<ul style="list-style-type: none"> To develop monitoring systems of industrial waste from each source. To examine the ways of enhancing local pollution sources control capacities by cooperating with local administrative bodies. 	<ul style="list-style-type: none"> To establish monitoring systems of industrial waste such as manifest or on-site monitoring with cooperation of LGIs To coordinates among DoE., the relevant ministries and LGIs through National Coordination Committee

5

3. Items to be discussed

- ✓ Is there any other activities to be conducted for improvement of SWM capacity of DoE and LGI?
- ✓ How do you set the timeline for implementing the proposed activities?
- ✓ What kinds of external support do you need?

6

Appendix 5

Materials for Final Seminar

**Agenda of Final Seminar for
“Advisor on Environmental Management in Bangladesh”**

Time: 9:30 am

Date: 21st November 2023

Venue: DoE head office (a hybrid meeting with a face-to-face meeting in the 2nd-floor auditorium room of DoE and a remote meeting by Zoom)

1. Background

The JICA technical cooperation project named “Advisor on Environmental Management in Bangladesh” (the Project) will be completed at November 2023. Under the Project, a series of training workshops has been implemented, and the issues and solution for environmental management capacity development for DoE have been discussed. As per the schedule in the remaining period of the Project we have discussed, we plan to have an interactive seminar for presenting the findings obtained by co-work between DoE and JICA Expert Team through the Project and sharing the planned actions by DoE with relevant organizations for environmental management in water pollution control and solid waste management sectors.

2. Objectives

The main objectives of the workshop are as follows;

- (1) To share the activities of this advisory work including identified issues on water pollution control and solid waste management sectors, and
- (2) To discuss on expected actions by DoE in future for enhancing environmental management in water pollution control and solid waste management sectors

3. Draft Agenda of the Training Program

Time	Content	Speaker	Time expected
9:30 - 10:00	Registration and Snacks		30 min
10:00 - 10:05	Welcome speech by DoE	Director NRM	5 min.
10:05 - 10:10	Speech by DoE	Director WCM	5 min.
10:10 - 10:15	Speech by MoEFCC	Addl. Secretary	5 min.
10:15 - 10:20	Welcome speech by JICA	Representative from JICA Bangladesh Office	5 min.
10:20 - 10:35	Summary of activities in this advisory work by JET	Kengo Naganuma, Chief Advisor, JICA Expert Team	15 min.
10:35 - 10:50	Findings & recommendations from JET (Water pollution Control and Solid Waste Management)	Shinji Tanaka and Satoshi Higashinakagawa, JICA Expert Team	15 min.
10:50 - 11:05	Way Forward for Enhancement of Environmental Management by DoE	Representative of DOE	15 min.
11:05 - 11:35	Open discussion	-	30 min.
11:35 - 11:40	Remarks by JICA Representative	JICA Representative	5 min.
11:40 - 11:50	Closing Remarks	Director General, DOE	10 min.

4. Participants

(1) Bangladesh Side

The tentatively expected participants are described in Attachment-1.

(2) Japanese Side

Representatives of JICA

**Attachment-1: Expected Participants from Bangladesh Side for the Final
Seminar for the Project**

1. Secretary or additional Secretary of Development Wing, Ministry of Environment, Forest & Climate Change (MOEFCC)
2. Director General, DoE
3. Secretary Local Government Division, LGD (As a Chief Guest)
4. Director or Deputy Director, NRM Wing, DoE
5. Director or Deputy Director, WCM Wing, DoE
6. Director or Deputy Director, Monitoring and Enforcement Wing, DoE
7. Director or Deputy Director, Planning Wing, DoE
8. Director or Deputy Director, ECC Wing, DoE
9. Director or Deputy Director, Administration Wing, DoE
10. Director or Deputy Director, Dhaka Metropolitan, DoE
11. Director or Deputy Director, Dhaka Region, DoE
12. Director or Deputy Director, Dhaka Laboratory, DoE
13. Director or Deputy Director, Chattogram Metropolitan, DoE
14. Director or Deputy Director, Chattogram Laboratory, DoE
15. Representative of DoE district office (Chattogram District, Gazipur District, Narayanganj District, Munshiganj District, Narsingdi District, Manikganj District,
16. Representative of City Cooperations (Dhaka North City, Dhaka South City, Chattogram City, Gazipur City, and Narayanganj City)
17. Representative of LGED
18. Representative of DPHE
19. Representative of Pourashava (Munshiganj, Narsingdi, and Manikganj)
20. Representative of donors (WB, ADB, and GIZ)
21. Representative of Municipal Association of Bangladesh (MAB)
22. Representative of Business community (such as FBCCI)
23. Representative of Corporate agencies (such as Unilever)

End of Document

Advisor on Environment Management in Bangladesh

Final seminar

Findings & recommendation -1 & Feedbacks from DoE-1 (Water pollution Control)


21st November 2023

1

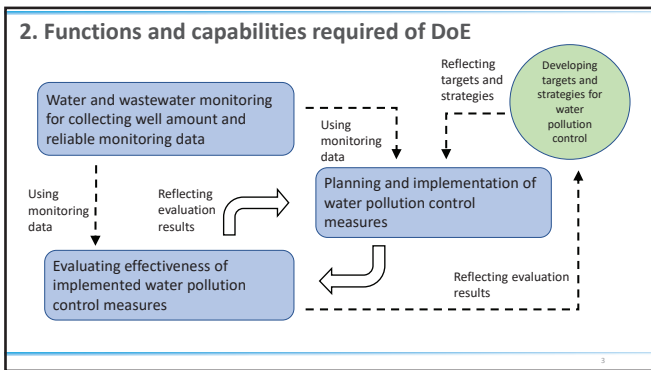
1. Environmental pollution phenomena and causes

- Water pollution is the discharge of **toxic substances** and **organic matter** into rivers, lakes, ponds, oceans, etc. due to human activities and industrial development.
- Sources include domestic wastewater, industrial wastewater, agricultural/pastoral wastewater.

Category	Detailed sector	Major pollutant
Multiple effluent in urban area	Domestic wastewater form Households, Commercial, Hotels, Schools, Hospitals and Restaurants	Organic matter(Organic Carbon, N, P)
Industrial effluent	Industrial park, Factories, Power plants	Heavy metals, Acidic /alkaline effluent, Organic matter, Oils
Agricultural wastewater	Irrigation farmland, Poultry farm, Livestock farm	Organic matter(C, N, P)
Others	Ship transportation, Dumping site, Construction site	Heavy metals, Acidic /alkaline effluent, Organic matter, Oils



2



3

3. Identified Issues (1) – legal System

Item	Current Status/Issues	Recommendations
Water Pollution Control	- Bangladesh Environment Conservation Act (ECA) 1995, 2010 revision - Environmental Conservation Rules (ECR), 2023	• To monitor newly regulated parameters, e.g. nutrients and heavy metals • To guide pollution control with severer standard values on N (nitrogen) and P (phosphorous)
On-site Inspection	- On-site inspections is conducted in accordance with ECR. - Environmental Court Act (2000, 2002 and 2010 revisions)	• To enhance capacity on administrative guidance for improvement of ETP inspections and enforcement
EIA	Currently being revised EIA Guidelines for Industries (1997)	• To enhance capacity for issue and update ECC based on ECR 2023
River, Lake and Watershed Management	- Water Act (2013) - Water Resource Planning Act (1992) - National Water Policy (1999) - Bangladesh Water Rules (2018) - WARPO Guidelines (2020)	• To enhance capacity to manage water resource with adopting watershed management concept

4

3. Identified Issues (2) – Administrative and Technical Capacity

Item	Current Status/Issues	Recommendations
Water Pollution Control	DoE only focuses on managing the industrial sector and does not care about domestic wastewater or wastewater from the agricultural sector	• To grasp impact on water pollution load by wastewater discharged from various sectors, e.g. domestic sector, agriculture sector, etc.)
On-site Inspection	DoE is responsible for onsite inspection in nationwide with limited number of staffs. DoE laboratories analytical capacities are insufficient and has no their accredited system.	• To develop a system for identifying priority targets to be inspected and controlled. • To enhance DoE laboratories capacities for improving credibility of wastewater analysis for granting fines based on the analytical results under ECR2023. • To adopt laboratory accrediting system for DoE laboratories
EIA	DoE conducts EIA and issue ECC in accordance with ECA and ECR2023.	• To enhance capacity of DoE officers (especially local staffs) for assessing validity of ETP at the timing of EIA review and renewal of ECC.
River, Lake and Watershed Management	Preparation of plans for river environment restoration are being considered.	• To enhance capacity for planning water pollution control in watershed level

5

3. Identified Issues (3) – Cooperation with Relevant Organizations

Item	Current Status/Issues	Recommendations
Water Pollution Control	The meetings are held on an irregular basis with related ministries and agencies responsible for water resource management (BWDB), sanitation (DPHE), sewerage development and operation (WASA) etc.	• To strengthen necessary cooperation with related ministries, agencies and bureaus for comprehensive wastewater management.
On-site Inspection	- Local industrial pollution source control is conducted by limited DoE local officers, such as dispatched one DD, one or two AD, with several inspectors only in each DoE local office.	• To examine the way of enhancing local pollution source control capacities by cooperating with local government, especially at the cities/areas having large number of industrial wastewater sources to be controlled.
River, Lake and Watershed Management	- BWDB emphasizes water resource management as watershed level with planning to increase the number of monitoring sites from 18 to 357 for .	• To enhance water monitoring data sharing mechanism with relevant ministries and agencies • To improve water quality monitoring capacity of relevant ministries and agencies with solving existing issues such as lack of equipment and reagents

6

4. What should DoE prioritize?

	Legal System What is the prioritized legal systems?	Administrative and Technical Capacity What is the prioritized technical capacity?	Cooperation with Relevant Organizations What is the prioritized cooperative activities with other ministries?
Multi sector Pollution Control	<ul style="list-style-type: none"> Enhancement of the supplemental documents of ECR 2023 (Preparation of Guidelines) 	<ul style="list-style-type: none"> Capacity development to estimate water pollution load from each sector (Preparation of Technical guideline) 	<ul style="list-style-type: none"> To strengthen necessary cooperation with related ministries on water pollution control
On-site Inspection & Enforcement	<ul style="list-style-type: none"> Enforcement of On-site inspections and enforcement systems (Preparation of Guidelines) 	<ul style="list-style-type: none"> Estimate priority emission sources and strengthen inspection capacity Enhancement of DoE laboratories capacities 	<ul style="list-style-type: none"> To examine the way of enhancing local pollution source control capacities by cooperating with local government
ECC(EIA) Process	<ul style="list-style-type: none"> Enhancement of ECC process supplemental documents (Preparation of Guidelines) 	<ul style="list-style-type: none"> Capacity development to evaluate ETP capabilities and capacity 	-
River, Lake and Watershed Management	<ul style="list-style-type: none"> Enhancement of legal systems for watershed monitoring (Methodology for monitoring) 	<ul style="list-style-type: none"> To enhance capacity for planning water pollution control in watershed level 	<ul style="list-style-type: none"> To enhance water monitoring data sharing mechanism with relevant ministries and agencies

**Advisor on Environment Management
in Bangladesh**

Final Seminar

**Finding and Recommendation - 2:
(Solid Waste Management)
by JICA Expert Team**

21 November 2023

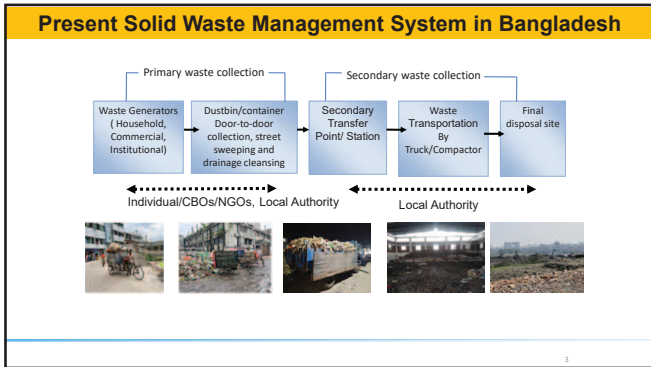
Department of Environment & JICA Expert Team

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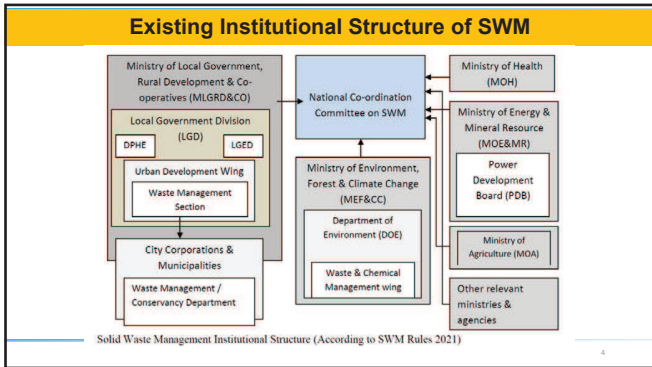
Today's Explanation

1. Review of existing situation of SWM
2. Finding and Recommendation
 - 2.1 Finding (Legal System, Administrative and technical capacity, Organization (Cooperation with relevant organizations))
 - 2.2 Recommendation
3. Recommended Image of Road Map
4. Image of Recommendation

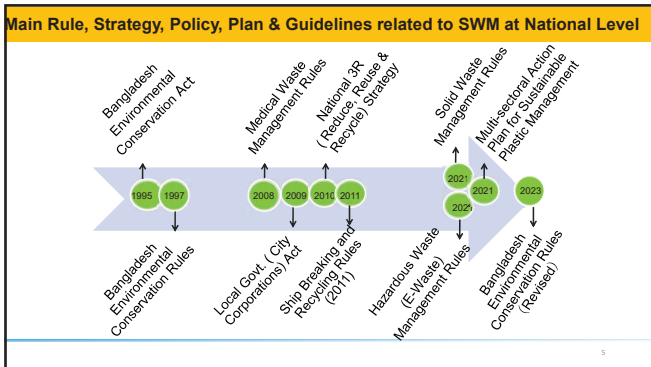
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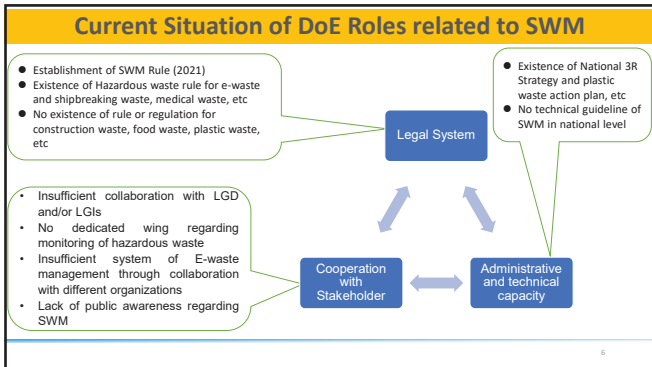
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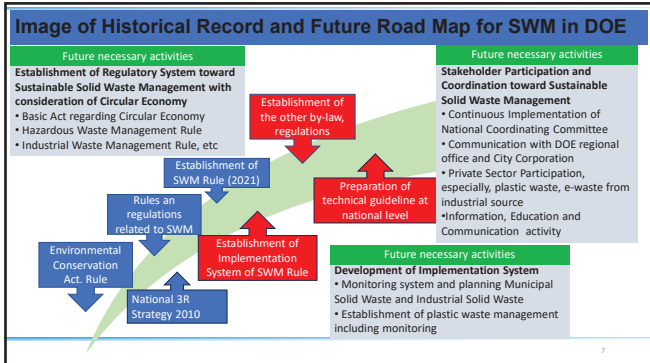
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3. Identified Issues (1) – Legal System

Item	Current Status /Issues	Recommendation
Municipal Solid Waste Management (Municipal SWM)	<ul style="list-style-type: none"> Solid Waste Management Rule (2021) has been formulated but necessary to consider the implementation However, the other acts are not adoptable to Solid Waste Management Rule (2021) such that Upazila Act does not specify the responsibilities of SWM 	<ul style="list-style-type: none"> To improve the SWM rule at suitable timing. To revise the other acts in line with SWM rule To prepare guidelines for implementation of SWM planning for implementation of the SWM rule. To prepare guidelines of annual report of SWM for implementation of the SWM rule.
Non Municipal Solid Waste Management (Non municipal SWM) like Industrial and Medical Waste Management	<ul style="list-style-type: none"> Environmental Conservation Act indicate polluter pay principals Hazardous Waste (E-waste) Management Rules (2021) has been established but only focused on E-waste Medical Waste Management and Handling Rules (2008) has been established 	<ul style="list-style-type: none"> To prepare comprehensive industrial hazardous waste rules To prepare rules and/or regulations for each type of waste such as construction waste, food waste, packaging waste, used automobile waste, etc with consideration of EPR and/or polluters pays principal approach

8

3. Identified Issues (2) – Administrative and Technical Capacity

Item	Current Status /Issues	Recommendation
Municipal Solid Waste Management (Municipal SWM)	<ul style="list-style-type: none"> Difficulty of collecting the data of SWM National 3R Strategy has been formulated but there is no SWM plan at national level An action plan of plastic waste management is prepared but there is no implementation system There is no technical guidelines in national level 	<ul style="list-style-type: none"> To improve the inadequate monitoring system To develop solid waste management plan at national level To develop the implementation system for actualizing an action plan of plastic waste management To prepare the technical guidelines for collection, transportation, treatment and disposal related to solid waste management
Non Municipal Solid Waste Management (Non municipal SWM) like Industrial and Medical Waste Management	<ul style="list-style-type: none"> Difficulty of monitoring of industrial waste including plastic waste There are rules of hazardous waste for e-waste but no treatment and disposal facilities for it Medical Waste Management and Handling Rules (2008) has been established but no sufficient system for medical waste management 	<ul style="list-style-type: none"> To develop the efficient monitoring system like manifest for industrial waste To prepare the guidelines for plastic waste from industrial source To develop the treatment and disposal facilities for hazardous waste To develop the system of medical waste management

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3. Identified Issues (3) – Cooperation with Relevant Organizations

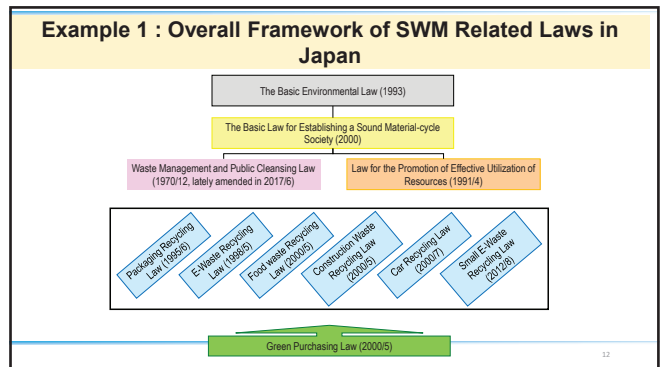
Item	Current Status /Issues	Recommendation
Municipal Solid Waste Management (Municipal SWM)	<ul style="list-style-type: none"> DOE is regulatory body of SWM and has only five personals in charge of SWM Implementation body is Local Government Institutions (LGIs) with technical assistance of LGD, DPHE and LGED 	<ul style="list-style-type: none"> Increase number of personnels and development of their capacity in charge in SWM in DOE Improve the collaboration manner between DOE and LGD, LGED, DPHE as well as LGIs
Non Municipal Solid Waste Management (Non municipal SWM) like Industrial and Medical Waste Management	<ul style="list-style-type: none"> There is no dedicated wing / section specialized in the management and monitoring of hazardous waste Insufficient system of E-waste management through collaboration with different organizations 	<ul style="list-style-type: none"> To develop monitoring and implementation system of industrial waste from each source (e.g. manifest system) through the cooperation with relevant organizations. To develop E-waste management system through collaboration with relevant organizations such as Producers Responsible Organizations, etc.

10

4. Recommendation → How to prioritize?

Legal System	Technical Capacity	Cooperation with Relevant Organizations
<ul style="list-style-type: none"> To improve the SWM rule at suitable timing. To revise the other acts in line with SWM rule To prepare guidelines for SWM planning and annual report preparation of the SWM rule. Establishment of Comprehensive industrial hazardous waste rules To prepare by-law and regulations for each type of waste with consideration of EPR and/or polluters pays principal approach 	<ul style="list-style-type: none"> To improve the inadequate monitoring system To develop solid waste management plan at national level To develop the implementation system for actualizing an action plan of plastic waste management To prepare the technical guidelines related to solid waste management To develop the efficient monitoring system like manifest for industrial waste To prepare the guidelines for plastic waste from industrial source To develop the treatment and disposal facilities for hazardous waste To develop the system of medical waste management 	<ul style="list-style-type: none"> Increase staffs and development of their capacity in charge in SWM in DOE Improve the collaboration manner between DOE and LGD, LGED, DPHE as well as LGIs To develop monitoring and implementation system of industrial waste from each source (e.g. manifest system) through the cooperation with relevant organizations. To develop E-waste management system through collaboration with relevant organizations

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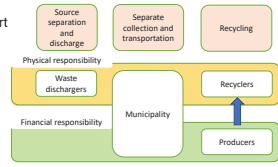
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Example 2 : Introduction of Recycling System of Container and Packaging Waste in Japan Considering EPR

- 60% of plastic waste is package waste
- Container and Packaging Waste has short lifetime and they inevitably become waste

Direction of this System

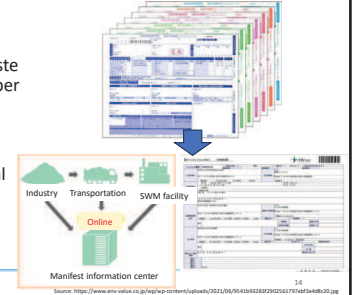
- Shifting of physical and/or financial responsibility toward producers and away from municipalities; and
- Provision of incentives to producers to take environmental considerations into account when designing their products.



13

Example 3 : Monitoring System of Industrial Waste (Manifest / WDS System)

- Japan has a WDS system and a **manifest system** for industrial waste treatment which are used for proper manner.
- **Manifest** is applied on the actual handover and treatment stage to secure the traceability of industrial waste.
- We had already implemented the **digital manifest system**.



Source: <http://www.ema.vkeva.co.jp/ky/wp-content/uploads/2012/05/PS4101010102005619-0013-484c20.pdf>




JICA Technical Assistance on Environmental Advisor
in Bangladesh

**Way Forward for Enhancement
of Environmental Management
by DoE**

21 Nov. 2023

1




Vision of Department of Environment

To ensure sustainable environmental
governance for achieving high
quality of life for the present and
future generations.

2




Mission of DoE

To help secure a clean and healthy environment
for the benefit of present and future generation:

- ☛ Through the fair and consistent application of
environmental rules and regulations;
- ☛ Through guiding, training, and promoting
awareness of environmental issues; and
- ☛ Through sustainable action on critical
environment problems that demonstrate
solution and that galvanize public support and
involvement.

3




Vision of Department of Environment



To ensure sustainable environmental
governance for achieving high
quality of life for the present and
future generations.

4




**Priority Activities for Enhancement of
Environmental Management in
Water Pollution Control Sector**


5

Capacity Building of Laboratories

- ☛ Quality Control/Quality Assurance for lab work
- ☛ Calibration
- ☛ ETP inspection & sampling
- ☛ water quality & Air quality modeling
- ☛ Stack/Point source emission monitoring
- ☛ Laboratory Safety
- ☛ Laboratory Audit etc.



6

Environmental Clearance (EIA, ETP, Air Treatment Facility and Sludge Management)

- ETP drawing and design, evaluation and performance monitoring.
- Advanced treatment process and zero discharge system for liquid waste.
- sludge management system.

7

Direction on Water Pollution Control

- Arrangement of laboratories (WB)
- Draft Inspection manual of ETP (GIZ)
- Draft Enforcement manual
- Laboratory accrediting process (JICA, GIZ)

- Watersheds management including wastewater other than industrial sector, such as
- Strengthen relationships with other ministries

ECR2023

Long-term Goal

Short-term Goal

Proper implementation of ECR2023
Adequate monitoring of the industrial wastewater


8




Priority support for short-term goals

	Legal System	Administrative and Technical Capacity	Cooperation with Relevant Organizations
First Priority	<ul style="list-style-type: none"> Enforcement of On-site inspections and enforcement systems (Preparation of Guidelines) 	<ul style="list-style-type: none"> Estimate priority emission sources and strengthen inspection capacity Enhancement of DoE laboratories capacities 	<ul style="list-style-type: none"> To examine the way of enhancing local pollution source control capacities by cooperating with local government
Second Priority	<ul style="list-style-type: none"> Enhancement of ECC process supplemental documents (Preparation of Guidelines) 	<ul style="list-style-type: none"> Capacity development to evaluate ETP capabilities and capacity 	-

9

Priority support for long-term goals

	Legal System	Administrative and Technical Capacity	Cooperation with Relevant Organizations
3rd Priority	<ul style="list-style-type: none"> Enhancement of the supplemental documents of ECR 2023 (Preparation of Guidelines) 	<ul style="list-style-type: none"> Capacity development to estimate water pollution load from each sector (Preparation of Technical guideline) 	<ul style="list-style-type: none"> To strengthen necessary cooperation with related ministries on water pollution control
4th Priority	<ul style="list-style-type: none"> Enhancement of legal systems for watershed monitoring (Methodology for monitoring) 	<ul style="list-style-type: none"> To enhance capacity for planning water pollution control in watershed level 	<ul style="list-style-type: none"> To enhance water monitoring data sharing mechanism with relevant ministries and agencies

10




Priority Activities for Enhancement of Environmental Management in Solid Waste Management Sector

11




Concern on Solid Waste Management

- Solid Waste: Problem and Prospect.
- Management Polices and Technologies.
- Implementation of 3-R Strategies: Reduce, Reuse and Recycle.

12

Priority Activities by DOE

Legal System	Technical Capacity	Cooperation with Relevant Organizations
<ul style="list-style-type: none"> To improve the SWM rule at suitable timing. To revise the other acts in line with SWM rule To prepare guidelines for SWM planning and annual report preparation of SWM for implementation of the SWM rule. Establishment of Comprehensive industrial hazardous waste rules To prepare by-law and regulations for each type of waste with consideration of EPR and/or polluters pays principal approach 	<ul style="list-style-type: none"> To improve the inadequate monitoring system To develop solid waste management plan at national level To develop the implementation system for actualizing an action plan of plastic waste management To prepare the technical guidelines related to solid waste management To develop the efficient monitoring system like manifest for industrial waste To prepare the guidelines for plastic waste from industrial source To develop the treatment and disposal facilities for hazardous waste To develop the system of medical waste management 	<ul style="list-style-type: none"> Increase staffs and development of their capacity in charge in SWM in DOE Improve the collaboration manner between DOE and LGD, LGED, DPHE as well as LGIs To develop monitoring and implementation system of industrial waste from each source (e.g. manifest system) through the cooperation with relevant organizations. To develop E-waste management system through collaboration with relevant organizations

13

Ideas on Expansion of Waste and Chemical Management Wing Structure

The wing's ultimate goal is to manage waste in an environmentally responsible and sustainable manner, which includes waste reduction, recycling, safe disposal, and public education.

The wing has the responsibilities of Municipal Solid Waste and Industrial Waste are big concerns in Bangladesh to implement the Solid Waste Management Rules, E-waste Management Rules, Ship-breaking (hazardous) waste recycling Rules.

There is a need of reformation & strengthen the existing waste and chemical management wing of DOE.

14

Ideas on Coordination among other agencies for Solid Waste Management

-Setting working groups for some specific issues regarding SWM

- After the session in the working group, they will make presentation in the committee for the approval, etc

15

Thank You

Burigonga River, Farashgonj, Dhaka, Photo: AKM Rafiqul Islam

16

Appendix 6

Working Paper for National Coordination Committee on Waste Management

Working Paper for National Coordination Committee on Waste Management

Background of the SWM Rules:

Due to rapid urbanization and economic growth, the generation of solid wastes is increasing day by day. According to 8th Five Year Plan (2020-2025), the cities will be generating around 47,000 tons per day by 2025. Due to limitation of resources and infrastructures, the Local Government Institutions could collect 44-76% of the generated wastes. Rest of the wastes are indiscriminately dumped into drains, low lands and rivers bring the environment and public health at risks. Waste reduction and recycling are rarely practiced. Single Use Plastic (SUP) and the Multiple Layer Plastic (MLP) are not reused or recycled, finds its way to water bodies or landfilled. Medical wastes are not collected and treated in an environmentally sound manner. To improve the solid waste management situation and to streamline the solid waste system including waste transfer, treatment and disposal; Ministry of Environment, Forest & Climate Change (MoEF & CC) has formulated Solid Waste Management Rules in its authority under Section 20 of the Bangladesh Environmental Conservation Act, 1995 and the rules is enacted on 9th December 2021.

The Government, in pursuance of the purpose of these rules, constitutes a 21 members National Coordinating Committee on Solid Waste Management comprising of the following members, namely: -

(A) Secretary, Ministry of Environment, Forests and Climate Change	Chairperson
(B) At least one officer not below the rank of Joint Secretary of the Department of Finance	Member
(c) At least one officer not below the rank of Joint Secretary of the Local Government Division	Member
(D) At least one officer not below the rank of Joint Secretary of the Ministry of Environment, Forests and Climate Change	Member
(E) At least one officer not below the rank of Joint Secretary of the Department of Legislative and Parliamentary Affairs.	Member
(F) At least one officer not below the rank of Joint Secretary of the Ministry of Housing and Public Works	Member
(G) At least one officer not below the rank of Joint Secretary of Health Services Department	Member
(H) At least one officer not below the rank of Joint Secretary of the Ministry of Agriculture	Member
(I) At least one officer not below the rank of Joint Secretary of the Ministry of Industry	Member
(J) At least one officer not below the rank of Joint Secretary of the Ministry of Water Resources	Member

(K) At least one officer not below the rank of Joint Secretary of Power Department	Member
(L) At least one officer not below the rank of Joint Secretary of the Ministry of Chittagong Hill Tracts	Member
(M) At least one officer not below the rank of Joint Secretary of the Ministry of Shipping	Member
(N) Director General, Department of Environment	Member
(O) Chairman, Bangladesh Inland Water Transport Authority	Member
(P) Chief Executive Officer, City Corporation (All)	Member
(Q) An expert representative on waste management nominated by the Government	Member
(R) A representative of a non-governmental organization (NGO) nominated by the government	Member
(S) A representative of the Federation of Bangladesh Chambers of Commerce and Industry (FBCCI)	Member
(T) A representative member of a plastic manufacturer or importer	Member
(U) Director, Department of Environment	Member-Secretary

Functions of the Committee:

The functions of the Committee shall be as follows:

- (A) Monitor the waste management activities that includes waste segregation, collection, intermediate treatment and recycling and sound disposal without polluting the soil, water and air through leaching or burning.
- (B) Review and monitor the activities described in the annual reports submitted by the local government authorities or other authorities and provide instruction for improvement if any
- (C) Provide necessary instructions to prepare manuals/guidelines for the introduction and application of new technologies or methods for waste segregation, processing, reusing and final disposal
- (D) Provide directives on waste segregation, reuse and final disposal
- (E) Approve solid waste management plans submitted by local government authorities
- (F) Call for clarification or provide necessary instructions from the concerned local government authorities and other authorities if irregularities or proper procedures are not followed in waste management
- (H) Issue instructions to stop or limit the use of hazardous waste materials that pollute the environment
- (I) Provide necessary recommendations on the Extended Producers Responsibility (EPR) guidelines

Challenges to implement SWM Rules:

- Absence of roadmap or guideline to implement SWM Rules
- Gap in inter-organizational and inter-departmental communication & information sharing
- Lack of institutional capacity (resource & manpower) of the Local Government Authorities
- Inadequate budget allocation for solid waste management service
- Low awareness of the people regarding waste management specially source-segregation
- Lack of private sector engagement in existing waste management system
- Technical guidelines to implement and monitor source-segregation, segregated collection, intermediate treatment & disposal is yet to develop
- Absence of incentives for waste reduction & recycling
- Circular Economy & EPR is a new concept in Bangladesh to adopt and implement

Discussion issues:

- Local Government Institutions (LGIs) should carry out solid waste management activities in an environmentally friendly and hygienic manner and should prepare a comprehensive plan following national strategies and guidelines on solid waste management including waste reduction, reuse and recycling and after taking approval from Local Government Division (LGD) and submit it to the National Co-ordination Committee.
- Local Government Institutions (LGIs) should promote source reduction, source segregation, segregated collection, transportation and proper treatment and final disposal of waste
- Waste should be segregated into three categories and deposited in three different color bins Green (Wet), Yellow (Dry) and household hazardous waste (Red) depending on the situation of the LGIs.
- Inclusion of Public relation, education and behavioural change activities and encourage community engagement to create awareness among the people about reduction and segregation of waste at source
- LGIs should prepare work plan for proper management of solid waste including waste segregation, processing and final disposal.
- LGIs should prepare baseline data (waste generation & composition, collection, recycle and disposal)
- Identify the institutional, policy and infrastructure gap in the Local Government Institutions and do necessary institutional reformation (Technical, Managerial and Financial) including capacity building
- LGIs should prepare Annual Waste Report based on the prescribed format (Table-2) and submit it by 30 September

- Explore invest opportunities in waste management sector and develop SWM business model to attract private sector and Public Private Partnership (PPP) opportunities
- Medical Waste should be managed according to the provisions stipulated in Medical Waste (Management and Processing) Rules 2008
- The producers/ manufacturer should take responsibility of management and disposal of non-degradable materials such as Single use plastic (SUP) and the Multiple Layer Plastic (MLP) through adopting Extended Producers Responsibility (EPR) guideline
- Establishment of Circular Economy and develop waste exchange marketplace

Desired Actions/outputs:

1. Clear instruction should be given to the LGIs for implementation of SWM Rules
2. LGIs should develop institutional capacity and infrastructure and follow the provisions in the rules. LGD should provide support to the LGIs.
3. DOE should communicate with the LGIs and the other stakeholders like LGD, LGED, DPHE including the private sector for implementing the rules
4. DOE & LGIs should take initiatives to raise awareness among the waste generators
5. DOE & LGIs should prepare manuals and guideline (solid waste management planning & operation & Annual Report Preparation) for waste management if necessary.
6. To prevent the misunderstanding of waste segregation category, DOE should prepare the guideline of waste segregation
7. No medical waste is mixed up with domestic waste. Medical waste should be collected & treated separately.
8. DOE should promote Circular Economy and prepare EPR guideline to phase out Single Use Plastic (SUP) & Multiple Layer Plastic (MLP).

Appendix 7

Report on Accreditation Procedure for Chattogram DoE Environmental Analysis Laboratory

JICA Technical Assistance Project

“Capacity Building on Laboratory Management and Accreditation
for DOE Laboratory, Chattagram”

Under the Project Advisor on Environmental Management in Bangladesh

**Report on Gap Assessment of DOE Laboratory Management
System on the requirement of ISO 17025 standards**

June 2023

Table of Contents

Chapter – 1: The Assignment	2
1.1 Preamble	2
1.2 Objective of the Assignment.....	2
1.3 Methodology.....	2
1.4 Scope of Activities	3
Chapter – 2: Findings of ISO / IEC 17025 Assessment	4
Chapter – 3: Scope and preparation for Accreditation.....	17
A. Scope of Analytical Parameters to be Accredited.....	17
B. Preparation for Accreditation (technical requirements):	18
C. Training Needs	18
Chapter – 4: Plan of Action for getting accreditation (Future project).....	19
Chapter – 6: Feedback from the Laboratory Personnel.....	22
Annex – 1: Current facilities of DOE Lab, Chattagram	24

Chapter – 1: The Assignment

1.1 Preamble

The Laboratory of Department of Environment (DoE) was assigned by the Director General, DoE for the testing of environmental quality parameters for the monitoring of Environmental Conservation Rule (ECR-97) and the Environmental Clearance related issues as per the authority given by Environmental Conservation Act (ECA)-1995. Laboratory capacity development is the very important component to ensure the compliance of current national Environmental Conservation Rule. But DoE laboratory should increase its capacity making accreditation by Bangladesh Accreditation Board (BAB) and standards procedure followed by ISO 17025 and other international Standard Operating Procedure (SOP) for testing some specific parameters. DoE laboratory, Chattagram has not been accredited till now and necessary documentation along with required SOP has to be developed for the most tested parameters particularly for water quality parameters. In this regard a gap analysis was required to assess the current state of the laboratory documentation process in line with ISO 17025, the laboratory management standard. In addition a training session was needed covering the basic accreditation procedure and its benefits in order to create awareness about the necessity of laboratory management system. The requirements and the standard format of the Standard Operating Procedures (SOP) for laboratory activities were also planned to discuss in the training program.

1.2 Objective of the Assignment

The main objective of the assignment was to build capacity of DOE Laboratory, Chattagram in order to achieve accreditation by Bangladesh Accreditation Board (BAB). In this regard, the following specific objectives were considered for this assignment.

1. Identify the level of the laboratory capacity and assess the gap of the management system
2. Improve the knowledge of the laboratory personnel about the ISO standard through an orientation
3. Prepare work plan and a time frame to get accreditation
4. Prepare a template to develop Standard Operating Procedures (SOP) for specific parameter of testing

1.3 Methodology

The assessment of DOE Laboratory, Chattagram followed the principles of management system auditing specified in ISO 19011:2018, Guidelines for auditing management systems. Using a combination of remote data review, onsite verification, staff interviews and analytical method witnessing, JICA Assessment Team evaluated the laboratory's establishment and implementation of a quality management system to govern and control its testing services. The assessment was conducted in two parts; a remote document review followed by an onsite verification by the Assessment Team.

Remote data review of the laboratory's documented quality system was conducted to confirm the availability of procedures and records required by the standard, identify any missing requirements, and facilitate understanding of laboratory management expectations for laboratory function based on the documents.

Onsite implementation verification of laboratory mandate, internal policies, and process, as well as the expectation level of ISO 17025 - accreditation was conducted to determine strengths and weaknesses. To gauge competency of staff to conduct environmental quality testing, the team interviewed the laboratory staffs from field (Sampler & Field Tester) and within the laboratory personnel and observed the execution of an experiment (COD analysis), to confirm understanding of internal processes as well as principals of good laboratory practices. A checklist form was also used to assess the fulfillment of the requirements of the ISO 17025 standard. Finally a brief session was conducted along with a short training to share the gaps of the laboratory and the requirements to be fulfilled by the laboratory.

1.4 Scope of Activities

A laboratory gap analysis was conducted to identify the current status of DOE Chattagram Laboratory management system in line with new ISO 17025:2017 standard. The following chronological activities were done.

1. Preliminary meeting with laboratory management staff to understand them about the basic requirement of accreditation and how the gap analysis of laboratory would be conducted.
2. Review the existing facility and documents of the laboratory
3. Visit the DOE laboratory at Chattagram
4. Meeting with Director (acting) and Deputy Director and sharing the objectives of the visit.
5. Introductory meeting with laboratory staff and brief on the process of gap analysis
6. Laboratory visit to see the existing facilities and equipment of the lab
7. Method witnessing - Sampling and Field testing through field visit
8. Method witnessing - Laboratory Analysis
9. Assessment of existing documentation process
10. The immediate findings along with corrective action measures were shared with the laboratory staff during the assessment
11. The assessment findings were briefed to the laboratory staff and the management
12. A template on the preparation of SOP were described to the lab staff for preparing necessary SOPs for them
13. The laboratory staff were briefed on the process of accreditation by BAB as part of a training
14. Finally, the major gaps in the laboratory activities were discussed and shared the importance of getting accreditation to the laboratory staff.

Chapter – 2: Findings of ISO / IEC 17025 Assessment

This section of the gap assessment report provides objective observations of the laboratory's compliance with the requirements of ISO 17025 and internal policies and procedures.

A. Adherence with ISO 17025 Standard Requirements

In its current state, the laboratory follows the general procedures of sampling and testing of environmental parameters and does not comply with the all the requirements of the ISO standard. The assessment team observed several deficiencies as well as several opportunities for improvement in order to fulfill the requirements of ISO standard.

B. Overall Compliance (summary findings)

The staff and management personnel interviewed and observed during assessment were knowledgeable of their assigned tasks and provided consistent verbal descriptions of laboratory practices and control mechanisms. Written objective evidence was not sufficient to confirm compliance with the assessment criteria based on the ISO 17025 standard. Many of the observation/nonconformities witnessed stemmed from a lack of proper documentation of policies and procedures and lack of a comprehensive calibration program to cover equipment and equipment standards. The laboratory will need to procure certified reference standard, establish a process of regular equipment calibration and updated training on current practices. Despite the challenges faced by Laboratory, both management and laboratory staff are committed to improve their quality management system and to obtain ISO 17025 accreditation.

The laboratory management has decided to get accreditation on specific parameters of water quality and the scopes have been outlined in Chapter-3.

C. Assessment of the requirements of ISO 17025:2017 Details

The gap assessments of the DOE laboratory based on the requirements of ISO 17025:2017 are described in the following table. The table describes the requirement of the ISO standard and the findings in place and also describe the opportunity for improvement.

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
4.	General Requirements		
4.1	Impartiality	As per government laboratory, its impartiality and confidentiality policies have been reflecting from the gadget notification of staff employment and appointment rules. However, the laboratory needs to prepare a Quality Manual (QM) for the description of overall operational procedures. In QM, for this general requirements, it should be clearly defined the Code for Confidentiality, Impartiality and Conflict of interest as evidence of adhering to its policy.	DOE Laboratory should ensure consistent understanding of the differences between conflict of interest, impartiality, and confidentiality and prepare relevant forms accordingly.
4.2	<i>Clause 4 of the standard relates to the overall way of laboratory activities are to be conducted; objectively and confidentially. This clause requires the managing body of a testing laboratory to ensure activities are undertaken objectively and information be maintained confidentially.</i>		
5.	Structural Requirements		
5.1	Organization & Management Structure <i>Clause 5 of the standard requires the laboratory to be a legal entity, document the activities governed by the quality system, roles and responsibilities of staff and operational and management structure.</i>	As a governmental organization, located at a permanent premise, the laboratory fulfills the requirements of the clause. The Deputy Director, who irrespective of other responsibilities, has the authority and resources needed to carry out his duties according to the clause 5.6 of the standard.	In Quality Manual, an organogram for laboratory staff need to be shown to define their management structure.
6.	Resource Requirements		
6.2	Personnel <i>The laboratory shall document its policy for addressing human resource requirements and shall establish a procedure to provide instructions on how it will adhere to its policy.</i>	Nine staffs have been engaged with laboratory for sampling, testing and reporting the tested results. Records for individual job description, training and personnel competencies have not been documented.	The management of the laboratory should document the roles and responsibilities of individual lab staff. The staff competence requirements shall be defined particularly the requirements for education, qualification, training, technical knowledge, skills and experience.
6.3	Facilities and Environmental Conditions <i>The laboratory shall document its policy for addressing facility and environmental maintenance and establish procedure to provide instructions on how it will adhere to its policy.</i>	In general, the laboratory areas were clean and well organized with adequate space to conduct testing in a safe manner.	Temperature criteria are to be provided in SOPs or on data collection forms used for recording daily results as required by the testing parameters. The thermometers are to be routinely calibrated and have the capability to provide a minimum and maximum reading for a given time frame.

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
<p>6.4</p> <p>Equipment</p> <p><i>The laboratory shall document its policy for addressing equipment calibration and maintenance and establish procedure to provide instructions on how it will adhere to its policy and maintain regular records as evidence of adhering to its policy and procedures.</i></p> <p><i>The laboratory shall have a procedure for handling, transport, storage, use and planned maintenance of equipment in order to ensure proper functioning and to prevent contamination or deterioration</i></p>	<p>The DOE laboratory has the basic equipment needed to perform both field and lab based chemical testing of environmental parameters. During the assessment, available equipment was confirmed against the provided equipment inventory. The available equipment for both field and lab testing are listed in Annex-3. The equipment calibration records have not been documented. The Analytical Balance is not calibrated and no standard mass is available for calibration and monitoring of the balance.</p>	<p>The laboratory equipment is brought to a current state of calibration using qualified service providers followed by training of laboratory staff to perform general maintenance and routine calibration. Additionally, the valid calibration standard (either CRM or traceable standard) should be readily available for all equipment used in both field and the lab. Documented procedure and records of regular maintenance and calibration of analytical instruments need to be established in the lab.</p> <p>The field equipment (particularly the multi-parameter meter) shall be calibrated before starting the testing every day and the calibrated data should be retained.</p> <p>It is also recommended that the laboratory has two of each type of equipment particularly for the field to reduce downtime and risk of not having equipment available to perform requested testing.</p> <p>A set of standard mass need to be procured and a calibration plan of analytical balance should be in place.</p>	<p>The certified reference materials (CRM) with stated metrological traceability to the international System of Units (SI) should be procured and for all the parameters under scope. The equipment need to be calibrated by the CRM or to be used as check standard or quality control standard to establish the metrological traceability of the measurement results.</p> <p>The metrological traceability related to mass, volume of glassware and measuring device need to be considered to establish the uncertainty of the test results.</p>
<p>6.5</p> <p>Metrological traceability</p> <p><i>The laboratory shall establish and maintain metrological traceability of its measurement results by means of a documented unbroken chain of calibrations, each contributing to the measurement uncertainty, linking them to an appropriate reference.</i></p>	<p>The laboratory has reference materials with certificates from the producer for the metal standards. However, there is no procedure to establish measurement results are traceable to SI units.</p>	<p>The laboratory has reference materials with stated metrological traceability to the international System of Units (SI) should be procured and for all the parameters under scope. The equipment need to be calibrated by the CRM or to be used as check standard or quality control standard to establish the metrological traceability of the measurement results.</p> <p>The metrological traceability related to mass, volume of glassware and measuring device need to be considered to establish the uncertainty of the test results.</p>	<p>The certified reference materials (CRM) with stated metrological traceability to the international System of Units (SI) should be procured and for all the parameters under scope. The equipment need to be calibrated by the CRM or to be used as check standard or quality control standard to establish the metrological traceability of the measurement results.</p> <p>The metrological traceability related to mass, volume of glassware and measuring device need to be considered to establish the uncertainty of the test results.</p>

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
6.6	<p>Externally provided products and services</p> <p><i>The laboratory shall ensure that only suitable externally provided products and services that affect laboratory activities are used, when such products and services a) are intended for incorporation into the laboratory's own activities, b) are provided, in part or in full, directly to the customer by the laboratory, as received from the external provider; c) are used to support the operation of the laboratory</i></p>	<p>Generally the procurements of laboratory supplies are maintained by the local office as per government procurement rule.</p>	<p>In order to routinely calibrate the analytical balance and daily monitoring of performance of analytical balance the laboratory should procure a set of standard mass or calibrated mass. If only standard mass is procured, it should be calibrated from the National Metrological Institute or any other calibration Laboratory.</p> <p>A calibrated thermometer needs to be procured and use for checking environmental condition where appropriate.</p> <p>The volumetric devices (volumetric flask, pipette burette etc.) need to be calibrated at least twice in a year.</p> <p>The in-house calibration procedure needs to be prepared by the laboratory.</p>
7.	<p>Process Requirements</p>		<p>The laboratory procurement authority will follow the government procurement rule for purchasing quality reagents, standards from authentic sources and lab accessories from quality vendors. Purchasing services and supplies and the ordering procedures should be maintained as such to ensure quality supplies.</p>
7.1	<p>Review of requests, tenders and contracts</p> <p><i>The laboratory shall have a procedure for the review of requests, tenders and contracts.</i></p>	<p>DOE Laboratory has procedures according to the government rule. The statement of conformity of the test results are adequately defined according to the Environmental Conservation Rule 1997/2017. All records are adequately retained.</p>	

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
<p>7.2</p> <p>Selection, verification and validation of methods</p> <p><i>The laboratory shall use appropriate methods and procedures for all laboratory activities and, where appropriate, for evaluation of the measurement uncertainty as well as statistical techniques for analysis of data.</i></p> <p><i>The laboratory shall ensure that it uses the latest valid version of a method unless it is not appropriate or possible to do so.</i></p> <p><i>Methods published either in international, regional or national standards, or by reputable technical organizations, or in relevant texts or journals, or as specified by the manufacturer of the equipment, are recommended. Laboratory-developed or modified methods can also be used.</i></p> <p><i>Procedures and records shall be kept up to date and shall be made readily available to personnel.</i></p>	<p>The DOE laboratory follows the analytical methods from various sources as and when appropriate as per its available resources. For water and wastewater quality parameter testing, the DOE laboratory has US APHA Standard Methods for the examination water and wastewater, 22nd edition. But the current APHA method is 24th Edition. For some WQ parameters, e.g COD & BOD, the laboratory follows the analytical methods supplied by the equipment manual. For COD analysis, when the reagent kit is finished, the laboratory personnel prepare the reagent (potassium dichromate) in-house. There was no verification data for comparing both the methods based on supplier's reagent and in-house reagent. The method validation procedures for analytical parameters have not also been prepared.</p>	<p>The Laboratory needs to prepare the procedure of Analytical Method Validation and keep records of method validation data for all the parameters under scope. The lab personnel need training on Analytical Method Validation procedure and how to keep and maintain validation data.</p> <p>It is also needed to prepare and document the Standard Operating Procedures (SOP) of all analytical parameters under the scope. All validation data and SOP should be available to the lab personnel.</p>	
<p>7.3</p> <p>Sampling</p> <p><i>The laboratory shall have a sampling plan and method when it carries out sampling of substances, materials or products for subsequent testing.</i></p> <p><i>The laboratory shall retain records of sampling data that forms part of the testing that is undertaken.</i></p>	<p>DOE laboratory undertakes sampling of environmental samples after getting requisition from its clients. Besides, samples of selected sites are also collected as a part of environmental monitoring program. The laboratory has dedicated staffs that perform the sampling. The field staff keeps the records of field testing results and sample information for Lab tests in a pre-formatted "Sample Collection and Analysis Sheet". Note that this sheet is common for all environmental samples e.g. water, air and sound. According to the clause 7.3.3 of ISO 17025:2017, the records of sampling data are partly covered in the data collection sheet of DOE. However, the</p>	<p>The laboratory needs procedures of sampling plan and methods for specific environmental parameters. The designated sample collector will collect sample according to the plan and procedure and keep all relevant records in a controlled format / checklist. The sampling procedure should describes but not limited to:</p> <ul style="list-style-type: none"> a) selection of samples or sites; b) sampling plan i.e. how the samples are collected (grab / composite) and which parameters need to be tested during collection c) for which testing parameters in the lab, the sample is collected d) how much (amount/volume) sample to be collected 	

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
		format is not controlled and approved.	<p>e) what types of sample containers are required (acid cleaned / sterile etc.)</p> <p>f) any preparation and treatment of samples are required for subsequent testing in the lab (like acid preservation for metals or chemically fixing of the analyte i.e. for DO and sulfide analysis in the lab)</p> <p>g) sample coding format for unique identification of samples</p> <p>The following additional information should include into the sample collection and field testing sheet which is currently used:</p> <p>a) identification of the equipment used for field testing</p> <p>b) calibration status of field equipment</p> <p>c) environmental or transport conditions</p> <p>d) Identification of sample location (diagrams / maps / GPS coordinates etc.)</p> <p>e) deviations, additions to or exclusions from the sampling method and sampling plan</p>
7.4	<p>Handling of test items</p> <p><i>The laboratory shall have a procedure for the transportation, receipt, handling, protection, storage, retention, and disposal or return of test items, including all provisions necessary to protect the integrity of the test item, and to protect the interests of the laboratory and the customer. Precautions shall be taken to avoid deterioration, contamination, loss or damage to the item during handling, transporting, storing/waiting, and preparation for testing.</i></p>	<p>The sampling record data is retained in different record formats like: sample receiving register log book, Coding register log book etc. before going to lab analysis. All sampling information including field test reports are uploaded online as a part of Laboratory Information Management System (LIMS). The register logbooks are kept in the assigned cabinet. Samples are kept in a refrigerator if the testing is delayed. There was no facility to check the temperature of the refrigerator at which samples are to be preserved. No procedure was developed for retaining samples after testing for a definite period.</p>	<p>According to the standard, a written procedure is needed for the handling of test items, before going to the lab analysis. All data collection format (the existing logbooks plus any new format) should be controlled and approved. All samples should be preserved under certain condition, depending on the sample criteria, if the testing is delayed or for the retention samples after testing. The lab should have available storage facility e.g. refrigerator, for both samples, before and after test, to avoid deterioration, loss or damage to the test item. When samples are to be stored under specified environmental conditions, these conditions are maintained, monitored and recorded in a log book.</p>
7.5	Technical records	This is in general practice by the lab to keep all types of information, related to the test item.	The standard requires that all lab technical records should contain:

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
	<p>The laboratory shall ensure that technical records for each laboratory activity contain the results, report and sufficient information to facilitate, if possible, identification of factors affecting the measurement result and its associated measurement uncertainty and enable the repetition of the laboratory activity under conditions as close as possible to the original. The technical records shall include the date and the identity of personnel responsible for each laboratory activity and for checking data and results. Original observations, data and calculations shall be recorded at the time they are made and shall be identifiable with the specific task.</p>	<p>Generally, the printed copies are kept in a file and notes and calculations are kept in a notebook.</p>	<p>a) the date and identity of personnel responsible for each activity b) report of results c) suitable information to assist with determining aspects that affect measurement uncertainty and to allow for repetition of activities under conditions replicating the original (as far as possible) d) clear records and traceability of any amendments from original observations or versions, including the person responsible for the amendments, the date, and what changes were made.</p> <p>These conditions will be reflected in the Record Control Procedure, which is a mandatory document as mentioned in clause 8.4 of the ISO standard.</p>
7.6	<p>Evaluation of measurement uncertainty</p> <p><i>A statistical depiction of measurement uncertainty is the degree of uncertainty surrounding any measurement's findings. In order to determine whether a method is appropriate, the standard discusses the significance of measurement uncertainty. This leads to test measurements that are suitable for the intended use.</i></p> <p><i>According to the standard, each testing laboratory must determine the degree of uncertainty associated with a method at a given level of confidence (for example, 95% confidence). This represents the statistical certainty that the true result lies within the stated margin.</i></p>	<p>The laboratory has not yet documented its policy for evaluating and calculating uncertainty of measurement and has not established any procedure to provide instructions on how it will adhere to its policy.</p>	<p>The laboratory should evaluate or, at least, estimate measurement uncertainty by identifying contributions to measurement uncertainty and considering all significant contributions including those arising from sampling and using appropriate methods of analysis. Where detailed measurement uncertainty evaluation is not possible due to the nature of the test method, the measurement uncertainty may be estimated based on principles of the techniques or practical experience of the performance of the method. The laboratory should prepare a procedure on evaluation of uncertainty of measurement for testing methods and measuring equipment.</p> <p>The laboratory staffs need practical training on the quantitation and evaluation of measurement uncertainty of test results and the internal calibration of equipment.</p>
7.7	<p>Ensuring the validity of results</p>	<p>The laboratory has not documented its policy for ensuring the validity of results. The Internal or</p>	<p>The internal quality control procedure need to be prepared and to be implemented for monitoring</p>

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
	<p>The standard requires laboratories to ensure that the results are valid through a process of internal and external quality controls. The purpose of internal quality control is to provide assurance that the current test procedure (a run or batch of samples) achieves the validated method performance.</p> <p>The standard also requires laboratories to monitor method performance externally, by comparing results and performance to other laboratories. The purpose of this external assurance is to identify any possible bias.</p>	<p>external quality control procedure for test measurement was not in place.</p>	<p>analytical testing performance.</p> <p>The external quality control policy needs to be documented. For each method in the accredited scope of work, either enrollment in proficiency testing program participation is required, or participation in other inter-laboratory comparisons. For both internal and external quality control approaches, laboratories are required to:</p> <ul style="list-style-type: none"> • record data in a manner such that trends are detectable • apply suitable statistical techniques to review the results(when practical) • analyze data from the monitoring to identify necessary controls to improve performance of activities • take appropriate action if trends are detected or results are outside of pre-defined limits / criteria • prevent reporting of erroneous results <p>Laboratory personnel need training on Lab Internal Quality Control Process and Laboratory Quality Assurance Process.</p>
7.8	<p>Reporting of results</p> <p>As testing reports are legal documents, being the final output of a contracted test measurement for a client. Laboratories must determine which requirements are applicable to service-general requirements (7.8.1), common requirements (7.8.2), specific requirements for test reports (7.8.3), requirements for reporting sampling (7.8.5), reporting statements of conformity (7.8.6), reporting opinions and interpretations (7.8.7), and requirements for amendments (7.8.8).</p>	<p>DOE laboratory has a reporting format, which fulfill the general requirements and almost all common requirements of ISO standards clause 7.8.1 and 7.8.2 respectively. The format is not a controlled form that meets the requirements of document control and record control as described in the clauses 8.3 and 8.4 of the ISO standard respectively.</p>	<p>The laboratory are required to provide results in a report, unless a simplified form is agreed to</p> <ul style="list-style-type: none"> • meet the content requirements of the appropriates clauses (7.8.2 to 7.8.8) • identify the method used • place a disclaimer on the report if customer-supplied information could affect the result validity • specify that results apply to the specific sample received (“as received”) when the laboratory was not responsible for sampling • include any decision rule on any issued conformity statement, along with specific

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
7.9	<p>Complaints</p> <p><i>The laboratory shall have a documented process to receive, evaluate and make decisions on complaints.</i></p>	<p>DOE Laboratory has a general complaints handling process. The documentation process is not controlled according to the requirements of ISO standard. No procedures and controlled record format were established for handling the complaints.</p>	<p>content listed in the standard in clause 7.8.6.2</p> <ul style="list-style-type: none"> • clearly mark any expressed interpretations and/or opinions reported that are associated with the tested item results • clearly identify any re-issued, changed, or amended reports and identify any changed information; if a totally new report is issued, include a reference to the original report <p>Laboratories issuing test reports must also include all the information / data needed for test result interpretation. This includes any specific test conditions (e.g., environmental) and measurement uncertainty (where applicable).</p> <p>The laboratory needs a procedure and recording format to handle the complaints from its clients. According to the requirements, the laboratory should:</p> <ul style="list-style-type: none"> • have a complaints handling process that is documented with an available description if requested by any involved party • take responsibility for the receipt of a complaint, verifying the validity, evaluation of information, and decisions to address complaints • acknowledge to the complainant, wherever possible, the complaint receipt, as well as supply progress reports, the outcome, and notice of the closure of the complaint handling • assign an independent person, who was not involved directly in the activity subject to complaint, to review, approve, or communicate the outcome to the complainant <p>The handling of complaints is directly interrelated with clause 8.5, <i>Actions to address risks and opportunities</i> and addressing nonconforming work -</p>

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for improvement
7.10	<p>Nonconforming work</p> <p><i>The requirement for nonconforming work is that laboratories must implement a procedure when any part of its results or activities do not comply with either ISO 17025, its own laboratory procedures, or customer requirements.</i></p>	<p>The implementation of non-conforming work generally do not document as required by ISO standard.</p>	<p>clauses 7.10 <i>Nonconforming work and 8.7 Corrective actions.</i></p> <p>A mandatory procedure and retained records are required, detailing</p> <ul style="list-style-type: none"> ● assigned authority and responsibilities, including for the resumption of work ● the evaluation process and implication (significance) of the nonconformance ● decisions made on the halting or acceptability of work ● the impact assessment to analyze any risk to the validity of previous results ● how actions are based on identified risk levels ● notification of customers, if necessary, if work is recalled <p>the need to implement corrective actions if there is uncertainty regarding compliance with laboratory policies and procedures, or if evaluation indicates the possibility of reoccurrence of nonconforming work</p>
7.11	<p>Control of data and information management</p> <p><i>The laboratory shall have access to the data and information needed to perform laboratory activities. The laboratory information management system(s) (both computerized and non-computerized) used for the collection, processing, recording, reporting, storage or retrieval of data shall be validated for functionality, including the proper functioning of interfaces within the laboratory information management system(s) by the laboratory before introduction. Whenever there are any changes, including laboratory software configuration or modifications to</i></p>	<p>The DOE laboratory information management system is followed both non-computerized and computerized systems. In the laboratory, all information is recorded as paper based. The test report is produced both paper-based and online. However, all data and information need to be controlled according to the requirements of ISO standard.</p>	<p>As data and information are primary inputs and outputs for all ISO 17025 activities, there is a need for clear management of these valuable resources. In this clause, the standard applies requirements to both computerized and non-computerized system data and information. The laboratory should:</p> <ul style="list-style-type: none"> ● have the necessary access to information and data, including instructions and manuals, to support the laboratory activities ● validate Laboratory Information Management Systems(LIMS), including interfaces for functionality ● authorize, document, and validate changes before implementation ● operate the LIMS according to laboratory

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
8.	<p>Management system requirements</p> <p>8.2 Management system documentation</p> <p>8.3 Control of management system documents</p> <p>8.4 Control of records</p> <p>8.5 Actions to address risks and opportunities</p> <p>8.6 Improvement</p> <p>8.7 Corrective actions</p> <p>8.8 Internal audits</p> <p>8.9 Management reviews</p>		<p>specifications to safeguard integrity of data and information</p> <ul style="list-style-type: none"> • protect the system from unauthorized access • provide safeguards against tampering or loss • check data transfers and calculations in an appropriate and systematic manner • ensure that any operator or external service provider of any off-site LIMS activities complies with appropriate ISO 17025 requirements
			<p>ISO standard specifies the overall (overarching) requirement for management system documentation. It is important for laboratories to see this requirement as a process, not a once-off or once-in-a-while activity. This requirement should be met with a process approach with dynamic linking of activities as inputs and outputs, not simply cross-references.</p> <p>Laboratories must (dynamically and effectively):</p> <ul style="list-style-type: none"> • Create, document, implement, and support policies and objectives that address consistent laboratory operations, competence, and impartiality • ensure that the personnel throughout the organization acknowledge and uphold the policies and laboratory objectives • show evidence of the continual improvement of the established system • link, reference, or include all documentation, systems, processes, and records in the management system • provide access to applicable parts of the management system to personnel, dependent on their responsibilities <p>In this regard, the DOE laboratory should establish its management system according to the</p>

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
			<p>requirements of ISO standard stated in the clauses 8.2 to 8.9. The summary of this management system requirements are as follows:</p> <ol style="list-style-type: none"> 1) Establish quality policy and quality objectives of the laboratory activities and approved by the top management and ensure that the policies and objectives are acknowledged and implemented at all levels of the laboratory organization (8.2) 2) The laboratory shall control all the documents (internal and external) that relate to the fulfillment of the requirements (8.3). The document control procedure need to be prepared. 3) The laboratory shall establish and retain legible records to demonstrate fulfillment of the requirements (8.4) 4) The standard requires laboratories to consider, plan, evaluate, and take action to address risks and opportunities (8.5). The purpose is to ensure that a risk-based approach is managed effectively. 5) The laboratory shall identify and select opportunities for improvement and implement any necessary actions (8.6). Opportunities for improvement can be identified through the review of the operational procedures, the use of the policies, overall objectives, audit results, corrective actions, management review, suggestions from personnel, risk assessment, analysis of data, and proficiency testing results. The laboratory shall seek feedback, both positive and negative, from its customers. The feedback shall be analyzed and used to improve the management system, laboratory activities and customer service.

Clause	ISO 17025:2017 Requirements	Assessment findings	Opportunities for Improvement
			<p>6) The standard requires laboratories to address nonconformities through a sequence of specified steps, take appropriate actions based on the effects of the non conformity, and retain appropriate records using a corrective action procedure (8.7). Handling of complaints, clause 7.9, is directly associated with this process. Furthermore, as corrective actions need to be based on the impact of the nonconformity, this process is directly interrelated with Addressing risk and opportunities, clause 8.5.</p> <p>7) ISO 17025 requires that laboratories establish an internal audit program / schedule, perform internal audits (with defined scope and criteria) at pre-planned intervals, communicate the results of audits, implement appropriate corrective actions, and retain records (8.8). The purpose is to obtain information to evaluate if the management system complies with ISO 17025 and the requirements of the laboratory.</p> <p>8) The standard requires that laboratories review their management system at suitable pre-planned intervals to ensure its ongoing applicability, capacity, and performance capability (8.9).</p>

Chapter – 3: Scope and preparation for Accreditation

Quality testing of the physical chemical attributes of environmental specimens requires equipment and knowledge to perform specific tests. Provided DOE Chattagram Laboratory can obtain the necessary resources outlined in this report, the following table outlines a proposed flexible scope of accreditation in water quality parameters. A flexible scope would provide international recognition that DOE Lab has the quality system and technical competence to provide accurate and reliable results to inform regulatory decisions on environmental parameters.

A. Scope of Analytical Parameters to be Accredited

SN	Scope of parameter to be accredited	Existing Reference Standard with date of Expiry	Instrumentation / Methods of analysis	Comments
1.	p ^H	pH 7 (Oct 2023) pH 4 (Oct 2025) pH 10 (Sep 2023)	pH Meter / Multi-meter	Bench Top / Portable
2.	Dissolved Oxygen (DO)		Winkler Test / DO Meter/ Multi-meter	Lab procedure / Bench Top / Portable
3.	Chemical Oxygen Demand (COD)	Jun 2027	COD reactor with Colorimetric testing	The reflux method followed by titrimetric method can be developed at laboratory scale to validate the colorimetric testing
4.	Biological Oxygen Demand (BOD)	N (Jul 2023) KOH (Jun 2025)	Automatic BOD Analyzer	CRM of BOD Cal standard to be procured
5.	Total Dissolved Solids (TDS)	KCl (Aug 2026)	EC Meter / Multi-meter	Bench Top / Portable
6.	Electrical Conductivity (EC)	KCl (Aug 2026)	EC Meter / Multi-meter	Bench Top / Portable
7.	Temperature	--	Multi-meter	Calibrated Thermometer to be available
8.	Coliform	--	Membrane Filtration	CRM to be procured
9.	Nitrate (NO ₃ ⁻)	--	Colorimetric	CRM to be procured
10.	Phosphate (PO ₄ ³⁻)	--	Colorimetric	CRM to be procured
11.	Phenol	--	Colorimetric	CRM to be procured
12.	Chromium (Cr)	Expired	AAS (Flame & GF)	CRM to be procured
13.	Cadmium (Cd)	Expired	AAS (GF)	CRM to be procured
14.	Iron (Fe)	Expired	AAS (Flame)	CRM to be procured
15.	Arsenic (As) – Kit	Sep 2024	Gutzeit Method AAS (Hydride Generator)	CRM to be procured Method of AAS to be developed
16.	Suspended Solid (SS)	--	UV Spectrophotometry	CRM to be procured
17.	Oil & Grease	--	Gravimetric method	CRM to be procured
18.	Ammonium Nitrogen (NH ₄ -N)	--	UV Spectrophotometry	CRM to be procured
19.	Chloride (Cl ⁻)	--	Argentometric Titration	CRM to be procured
20.	Hardness	--	Titration	CRM to be procured

B. Preparation for Accreditation (technical requirements):

In order to ensure the quality analysis of the proposed parameters as well as to fulfill the requirements of accreditation the DOE Ctg laboratory should undertake the following internal program.

1. The Laboratory requires making available all the certified reference standards / materials for the testing parameters.
2. The standard operating procedure (SOP) need to be prepared and approved by the laboratory personnel. Prototype SOPs for COD and BOD analysis are given in the Annex 6.
3. The testing methods of all parameters should be validated according to the approved processes / SOPs and record of the validation data need to be retained appropriately. The following validation data should be recorded
 - a. Linear range of parameters,
 - b. Limit of Detection (LOD) and Limit of Quantitation (LOQ),
 - c. Accuracy of the method,
 - d. Precision of the method
 - e. Recovery of the analyte
 - f. Evaluation of measurement uncertainty etc.

These validated parameters are mandatory for submitting the application to BAB.

4. Establishing quality control method and performance monitoring of the testing methods
5. Training on each testing methods to the laboratory personnel
6. Authorization of testing parameters within the laboratory personnel
7. Laboratory personnel should prepare themselves to participate in Proficiency Testing Program / Inter-laboratory comparison practices to evaluate the competence of the analyst.

C. Training Needs

According to the assessment of laboratory personnel, it has been emphasized that capacity building of lab personnel in terms of technical courses is essential in order to get laboratory accreditation. The capacity building will be classified as two segments. In one segment, the knowledge on sampling, analytical skill and quality control process will be developed for all laboratory staff. The other segment includes the knowledge development on quality management system and accreditation process for selected laboratory staff. The topics of training / capacity building program are listed in the following table.

Segment - 1	Segment – 2
1. Environmental sampling technique	1. Basic requirements of ISO 17025:2017
2. Analytical methods of testing parameters	2. Management Procedures
3. Method Validation and verification process of testing parameters	3. Quality assurance and control
4. Internal quality control of test report / validity of test results	4. Evaluation of measurement uncertainty of analytical results
5. Calibration of measuring devices (Balances / volume / thermometer etc.)	5. Instrument Calibration and Metrological traceability

Chapter – 4: Plan of Action for getting accreditation (Future project)

A plan of action is suggested to enhance the readiness of DOE Laboratory, Chattagram for submitting its application for ISO/IEC 17025:2017 accreditation to Bangladesh Accreditation Board.

A. ISO 17025:2017 standard Implementation Steps:

Steps	Activities	Responsibility*	Expected Timeline**
1.	Establish a Quality Policy and Quality Objectives for the fulfillment of laboratory requirement to obtain the accreditation. In this regard two separate statements need to be documented for policy and objectives from the higher management and circulate to the personnel related to the laboratory management. The policy and objective can be displayed in different places where the laboratory staff and the customer have access.	Director & Deputy Director	1 week
2.	Prepare Management System Documents in order to fulfill the requirements of all the clauses mentioned in the ISO standard. A list of Mandatory Documents to be prepared is shown below Table-1 of Annex-2. A list of technical documents (not mandatory but essential for lab activities) to be prepared is shown in Table-2 of Annex-2.	Deputy Director & Senior Chemist	04 Months
3.	Prepare Quality System Forms in order to keep all types of records, generated from the management, field and laboratory activities as described in the clauses 5.1 to 8.9 of ISO standard. A list of quality forms to be developed is shown in Table-3 of Annex-2.		
4.	Prepare Quality Manual for Laboratory activities (not mandatory for ISO standard but a requirement by BAB)		
5.	Prepare Standard Operating Procedures (SOP) for Instrument Operation and Testing of parameters under the scope of accreditation. As DOE laboratory has decided to include 20 parameters, as mentioned in Chapter-3, for getting accreditation, the SOP of these should be completed.	Senior Chemist & Junior Chemist	04 Months
6.	The method validation of each parameter needs to be performed simultaneously during preparation of SOPs. The method validation data will be retained in the laboratory for future used.	Senior Chemist & Junior Chemist	04 Months
7.	Procurement of necessary supplies like reference standards, CRMs, set of standard mass, thermometer etc.	Deputy Director	02 Months
8.	Calibration of measuring equipment and analytical instruments & keeping records	Senior Chemist & Junior Chemist	02 Months
9.	Need based Staff Training to be arranged both by	Deputy Director	Regular

Steps	Activities	Responsibility*	Expected Timeline**
	external and internal resources		
10.	Monitoring of Environmental parameters, analytical QC data, control charts etc., performance monitoring of lab staff, proficiency testing / ILC etc.	Senior Chemist	Regular
11.	Conduct Internal Audit and prepare the audit report	Deputy Director	02 Weeks
12.	Conduct Management Review meeting and prepare the meeting minutes	Director Deputy Director	01 Week
13.	Prepare the Application Form for submitting to BAB	Deputy Director	02 Weeks
14.	Submission of Application Form including Quality Manual and Audit Report, to BAB	Deputy Director	

* This is proposed by the consultant but the responsible people for specific task can be selected by the top management of the laboratory.

** The expected timeline is tight schedule if the staffs are dedicated to implement the tasks. Finally the Laboratory Management will decide the timeline.

B. Implementation timeline

The implementation timeline of the proposed major activities, mentioned in the above table, is shown in the following Gantt chart.

SN	Activities	Months										
		1	2	3	4	5	6	7	8	9	10	
1	Establish a Quality Policy and Quality Objectives	█										
2	Prepare Management System Documents	█	█	█								
3	Prepare Quality System Forms	█	█	█								
4	Procurement of necessary supplies		█	█								
5	Prepare Standard Operating Procedures				█	█	█	█				
6	Method validation of analytical parameters				█	█	█					
7	Calibration						█	█				
8	Staff Training		█		█		█		█		█	
9	Monitoring						█	█	█	█	█	
10	Prepare Quality Manual										█	
11	Internal Audit										█	
12	Management Review meeting											█
13	Prepare the Application Form											█
14	Submission of Application Form											█

C. Proposed Budget

Item #	Item Description	Quantity	Unit Price (Taka)	Total Price (Taka)
A.	Procurement of laboratory supplies			
1	Calibration and Maintenance of Analytical Instruments (yearly)	20 Instruments	40,000.00	8,00,000.00
2	Calibration of Measuring Devices (yearly) Analytical Balance / Microbalance /Thermometer	05 Devices	20,000.00	100,000.00
3	Spare parts of Analytical Instruments (electrodes, cuvette, etc.) (yearly)		Lump sum	6,00,000.00
4	Certified Reference Standards (CRM)	20 parameters	10,000.00	2,00,000.00
5	Analytical Reagents (yearly)		Lump Sum	5,00,000.00
	<i>Approximate cost of laboratory supplies</i>			22,00,000.00
B.	Capacity Building Training			
1	Segment – 1 (Chapter-3 C)	05 topics	50,000.00	2,50,000.00
2	Segment – 2 (Chapter-3 C)	05 topics	50,000.00	2,50,000.00
	<i>Approximate cost of capacity building program</i>			5,00,000.00
C.	External Support (consultant, vendor etc.)			
1	Hiring consultant for capacity building of laboratory staff	25 days	40,000.00	10,00,000.00
2	Vendor's support for equipment refurbish, repairing etc. (yearly)	25 days	20,000.00	5,00,000.00
	<i>Approximate cost of external support</i>			15,00,000.00
D.	Accreditation Cost			
	Pre-assessment cost		Approximate	2,00,000.00
	Assessment cost (including Auditor's TA/DA)		Approximate	4,00,000.00
	Surveillance assessment cost		Approximate	3,00,000.00
	<i>Approximate cost of assessment for accreditation</i>			7,00,000.00
	<i>Total approximate cost</i>			50,00,000.00

Chapter – 6: Feedback from the Laboratory Personnel

As a feedback of the orientation on accreditation gap analysis, the opinion of laboratory staff (9 persons) regarding the significant issues in Day 1 and Day 2 are summarized in the following table. The % respondent is shown in the square bracket [].

1. Please select the most important learning in day 1 about the sampling and field testing.	
[33 %]	The laboratory personnel follow the procedures of sampling and field testing according to the requirements of ISO 17025 standards.
[11%]	The laboratory personnel take information about sampling and field testing data in a standard Chain of Custody (COC) form, which is sufficient to fulfill the requirement of the ISO standard.
[22%]	The COC form need to be revised according to the requirement of ISO standard
[22 %]	The laboratory personnel follow the Standard Operating Procedures (SOP) for sampling and field testing parameters
[44 %]	The SOP for sampling and field testing parameters need to be prepared and followed
[44 %]	The field staff will take more precaution about personnel protection methods during sampling
[78%]	Laboratory personnel will be able to prepare all relevant documents that will be necessary for sampling and field analysis
[56%]	Laboratory personnel need assistance to prepare all relevant documents that will be necessary for sampling and field analysis

2. Please select the most important learning in day 2 about the laboratory testing and documentation.	
[22%]	The laboratory has SOPs for all instrument and analytical methods and keep all records in prescribed formats
[78%]	It needs to prepare SOPs and record keeping system for analytical methods and data management
[0 %]	The laboratory has own data recording system and sufficient for fulfill the requirement of ISO 17025
[67%]	The laboratory need to fit the documentation and record keeping system in accordance with the requirement of ISO 17025

3. Please select the most important learning in day 2 about the laboratory management system in order to fulfill the requirements of ISO 17025 accreditation process?	
[0%]	The laboratory is well equipped with instrumentation and has full documentation system and is ready for accreditation
[67%]	The laboratory is well equipped with instrumentation but has partial documentation system and need a certain preparation to get accreditation
[11%]	The laboratory has insufficient analytical instruments to get accreditation and need to procure a more instruments and develop or renovate the laboratory facilities
[56%]	The laboratory can proceed for accreditation based on its current facilities and equipment and improve its management system through a continual improvement process

4. Please select the most important concerns that related to the current status for preparation of accreditation process of Chattogram Laboratory.				
(a) To get accreditation, the management system documents and SOPs, in accordance with ISO 17025 are	[0%] ready	[67%] partially ready	[0%] not ready	[22%] just started
(b) The required laboratory management documents can be prepared by:	[11%] own resources	[56%] partially by own resources	[11%] external support	
(c) For the preparation of getting accreditation, the knowledge and experience of laboratory personnel are:	[11%] enough	[11%] not enough	[67%] need to be improved	
(d) To enrich the knowledge gap, the laboratory personnel needs	[0%] Hands-on training at lab premises	[11%] Training from in-house resources	[67%] Training from external resources	

5. What are the most important items for accreditation that Chattogram laboratory already have? The un-marked items will be considered as further developments are needed.	
[78%] Own laboratory establishment	[44%] Available environmental facilities
[56%] Analytical equipment	[11%] Equipment calibration (at some interval)
[11%] Method validation process	[67%] Testing parameters for water quality
[44%] Testing parameters for air quality	[0%] Testing parameters for noise / sound quality
[0%] Full documents and records	[89%] Partial documents and records
[78%] Educational qualification of existing staff	[0%] Sufficient training on sampling and testing
[11%] Quality Control procedure in place	[11%] Reference standards
[56%] Management support	[67%] Willingness of laboratory staff
[0%] Management System documents	[11%] Internal Audit of the testing and management
[22%] Sufficient resources	[0%] Handling of non-conforming works
[0%] Proficiency Testing /Inter-lab study	[11%] Follow risk-based approach for management

6. Please select the topics of the training need for your lab personnel to achieve accreditation	
[33%]	Analytical methods of water quality testing parameters
[33%]	Analytical methods of air quality testing parameters
[11%]	Analytical methods of sound quality testing parameters
[78%]	Method Validation and verification process of testing parameters
[56%]	Internal quality control of test report / validity of test results
[67%]	Evaluation of measurement uncertainty of analytical results
[89%]	Instrument Calibration and Metrological traceability
[67%]	Internal Audit of laboratory management
[89%]	Basic requirements of ISO 17025:2017
[67%]	Management Procedures

Annex - 1: Current facilities of DOE Lab, Chattagram

Table-1: List of analytical parameters and frequency of analysis

Serial No	Parameters	Frequency of Analysis	Comments
Water Analysis:			
1	pH	Daily	Field Analysis
2	DO	Daily	Field Analysis
3	TDS	Daily	Field Analysis
4	BOD	Daily	Lab Analysis
5	COD	Daily	Lab Analysis
6	SS	Daily	Lab Analysis
7	Oil & Grease	Daily	Lab Analysis
8	Coliform	Daily	Lab Analysis
9	EC	Daily	Field Analysis
10	Iron	Daily	Lab Analysis
11	Arsenic	Daily	Lab Analysis
12	Turbidity	Daily	Lab Analysis
13	Heavy Metals(Cr, As, Pb, Fe etc)	As per requirements	
Air analysis:			
1	SPM	Daily	Field Analysis
2	SO ₂	Daily	Field Analysis
3	NO _x	Daily	Field Analysis
4	PM ₁₀	Daily	Field Analysis
5	PM _{2.5}	Daily	Field Analysis
Sound Analysis:			
1	Sound Measurement	Daily	During Sampling
2	Sound Measurement	Routine Monitoring	Different Locations of the city
3	Sound Measurement	Upon Request from DoE Ctg Metro and Ctg District Office	Different Locations
4	Sound Measurement	During Mobile Court	Routine Work

Table-2: List of Field equipment and sampling facility

Sampling Equipment (Consumables)	List of Field Based Equipment (Number)
1. Glass Bottles	1. Multi meter (1) Functional
2. Ice Box	2. Sound Meter (1) Functional
3. Ice Tube	3. Dust Meter (1) Functional
4. Gloves, Mask	4. Low Volume Air Sampler (1) Functional
5. Plastic Bottles	5. High Volume Air Sampler (1) Functional

Table-3: List Analytical Instrument

Sl. No.	Equipment Description	Source	Model	#of Unit	Status	Comments
1	Micro Balance	Japan	BM 22, A& D Company Ltd,	2	Active	
2	AAS [Combined and Flame] Mono Chromatic Lamp(Continuum Radiation Source Xenon Short-Arc Lamp) for Analytikjena Contra A700.	Germany	Contra 700, Analytikjena	1	Active	
3	BOD unit	Germany	BD 600 & TC135S, Tinometer GmbH	1	Active	
4	COD unit	Germany	RD125 and MD100, Tinometer GmbH	1	Inactive	Under repairing
5	Laboratory Incubator	Spain	Incudigit, JP selecta	1	Active	
6	Drying Oven	Spain	Digitheat, JP selecta	1	Active	
7	Digital Analytical Balance	Japan	HR250AZ , A& D Company Ltd ,	1	Active	
8	Water Distillation Plant	UK	WSC004, Fistream	1	Active	
9	ION Chromatographs	Germany	IONUS, Membrapure	1	Inactive	Need an extensive servicing. Column is required. IC Standards such as Chloride, Phosphate, Sulfate and Nitrate are required.
10	UV-VIS Spectrophotometer	Germany	Specord 200 Plus, Analytikjena	1	Active	
11	GCMS/MS system with Capillary column and three detector FID,ECD, FTD	USA	TSQ Duo, Thermoscientific	1	Active	Helium Gas is required. DDT and other important standards are required. UPS 10KVA is required.
12	TOC Analyzer	Germany	Multi N/C, Analytikjena	1	Active	Oxygen Gas is required. UPS

Sl. No.	Equipment Description	Source	Model	#of Unit	Status	Comments
						3KVA is required.
13	Ultrasonic Bath	Spain	Ultrasons HD, JP selecta	1	Inactive	
14	Sieve Shaker	Germany	Analysette 3 pro, Fritsch	1	Active	
15	Compound Microscope(optical)	Italy	B 192, Optika	1	Inactive	
16	Fume Hoods	Korea	Jeiotech	1	Active	
17	Bio-safety Cabinet	Spain	BIO II Advance 4, Telster	1	Active	
18	Muffle Furnace	Germany	Thermconcept	1	Active	
19	Microwave digester	Germany	Topwave, Analytikjena	1	Active	
20	PH meter	Romania	HI 2211, Hanna Instruments	1	Active	
21	Temperature Controlled Rotary Shakers	Germany	3017, GFL	1	Active	
22	Ultra –pure Water purification system	Spain	QRP180UV, Chmlab Group	1	Active	
23	Hot Plate with Magnetic Stirrer	USA	MS7-H550-Pro, SCIOGEX	1	Active	
24	Triple Quadruple UPLC-MS/MS system with accessories	USA	TSQ Quantum Access Max, Thermoscientific	1	Active	LC System active but MS system is not working. UPS 10KVA for LC-MS/MS is required.
25	FTIR Spectroscopy	USA	Nicolet iS5, Thermoscientific	1	Inactive	ID7 ATR detector for FTIR machine. DTGS Detector for FTIR machine
26	Water quality Checker/sampler	Japan	U-52, Horiba	1	Inactive	
27	Solid phase Extraction system	Italy	ChromaliaSrl	1	Active	
28	Vacuum Rotary Evaporator	Italy	EV311, Labtech	1	Active	
29	Filtration unit with vacuum pump	Spain	FR3x500, ChmLab Group	1	Active	
30	Bench Top Centrifuge Machine	Germany	Z 306, Hermle	1	Active	
31	Homogenizer	USA	D 160, SCIOGEX	1	Active	
32	Vortex Mixture	USA	MX-S, SCIOGEX	1	Active	
33	Digital Micro pipette	France	Gilson	1	Active	

Capacity Building on Laboratory Management and Accreditation for DOE Laboratory, Chattagram

Sl. No.	Equipment Description	Source	Model	#of Unit	Status	Comments
34	Digital Milk Analyzer	Germany	Lactostar, Funke Gerber	1	Active	
35	Autoclave	Japan	ES-315, Tomy Digital	1	Active	
36	High Volume Sampler	India		1	Active	
37	Dehumidifier	Local (Media Brand)	Local (Media Brand)	9	Active-5 Inactive-4	
38	Multi sensor based Air Quality monitors [for Sox, Nox, CO, HC]		New Zealand	1	Active	
39	Air sampler for SPM		UK	1	Active	
40	SPME Air Sampler (for Volatile Organic Compound):		USA	1	Inactive	
41	Refrigerator	Rangs	Thailand	1	Active	
42	Multi meter	Hach HQ 40D	USA	1	Active	
43	Opacity Meter/Smoke Meter		India	1	Active	
44	Stack Emission Sampler	PEM SMS4	India	1	Active	
45	UV Spectrophotometer	Hach DR-1900	USA	1	Inactive	