Knowledge Sharing Workshops in Khulna on
"Excreta Does Matter"
jointly organized by
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Fecal Sludge Management and Decentralized Waste Water Treatment Plants in Khulna

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This presentation addresses

Fecal Sludge Management and Decentralized Waste Water Treatment Systems in Khulna City

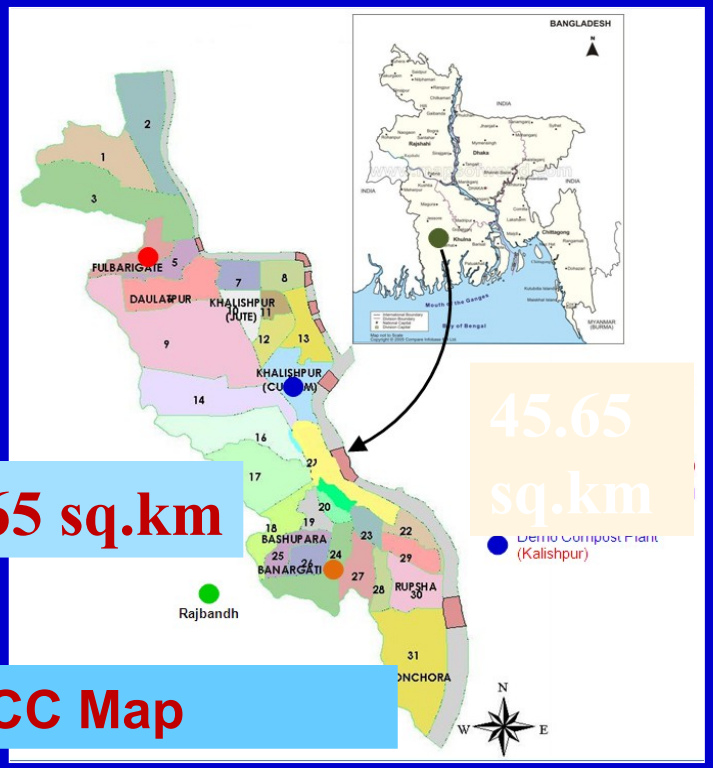
Fecal Sludge refers to undigested or partially digested slurry or solid comes from blackwater or excreta

DEWATS refers to the collection, treatment, and disposal or reuse of wastewater at or near the point of generation.

Khulna City

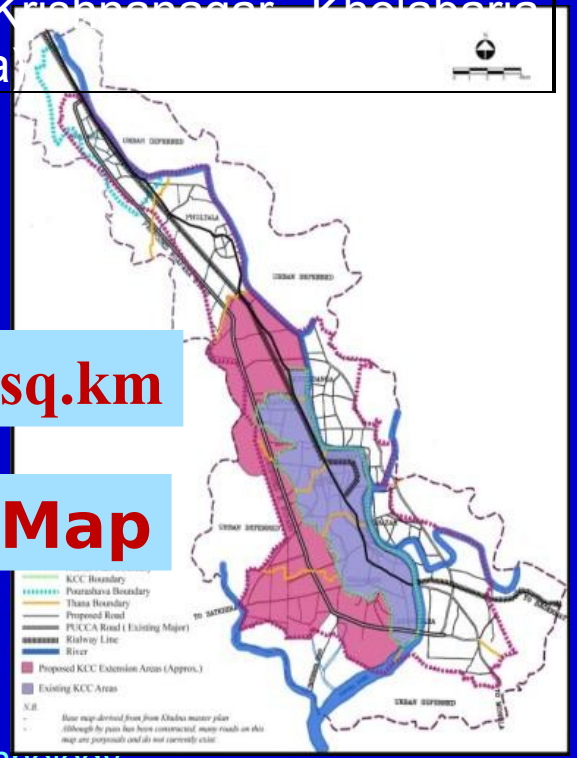
Thana
Khulna Sadar
Sonadanga
Khalishpur
Daulatpur
Khan Jahan Ali

Thana/Unions / mauzas
Existing KCC Area
Aranghata Union
Entire Khan Jahan Ali Thana
Dumuria Thana: Dumuria Union (mauza: Lata Paharpur, Daigram, Bil Pabla, Chak Ashankhali and Chak Mathurabad)
Batiaghata: Jalma Union (mauza: Alutala, Dubi, Harintala, Krishnanagar, Khalaberia and Mathabangha



45.65 sq.km

KCC Map



69.50 sq.km

KCPA Map

Population, Households & Others in KCC

- Population 1.1 million (recent study CDIA 2009). However, KCC claims 1.5 millions since 2004
- Holding : 60,000~60,500
- Family : 1,95,000
- Population Density : 18,000-1,00,0000/sq. km
- Average family size: 5 to 6
- No. of Slums: 745
- Population in Slums: 0.23 millions
- Annual Rainfall (average) : 1700mm
- Elevation: 2.15m above MSL

Sanitation Condition in Khulna

- No sewer network or centralized treatment.
- Only 8% of the septic tanks are connected to a soak well.
- Wastewater even sewage is being discharge only by a pipe to nearby open drain or into the bear ground without any treatment.
- Small scale decentralized wastewater treatment system (DEWATS) was constructed in Khulna to improve this striking situation and hence the performance is being monitored .

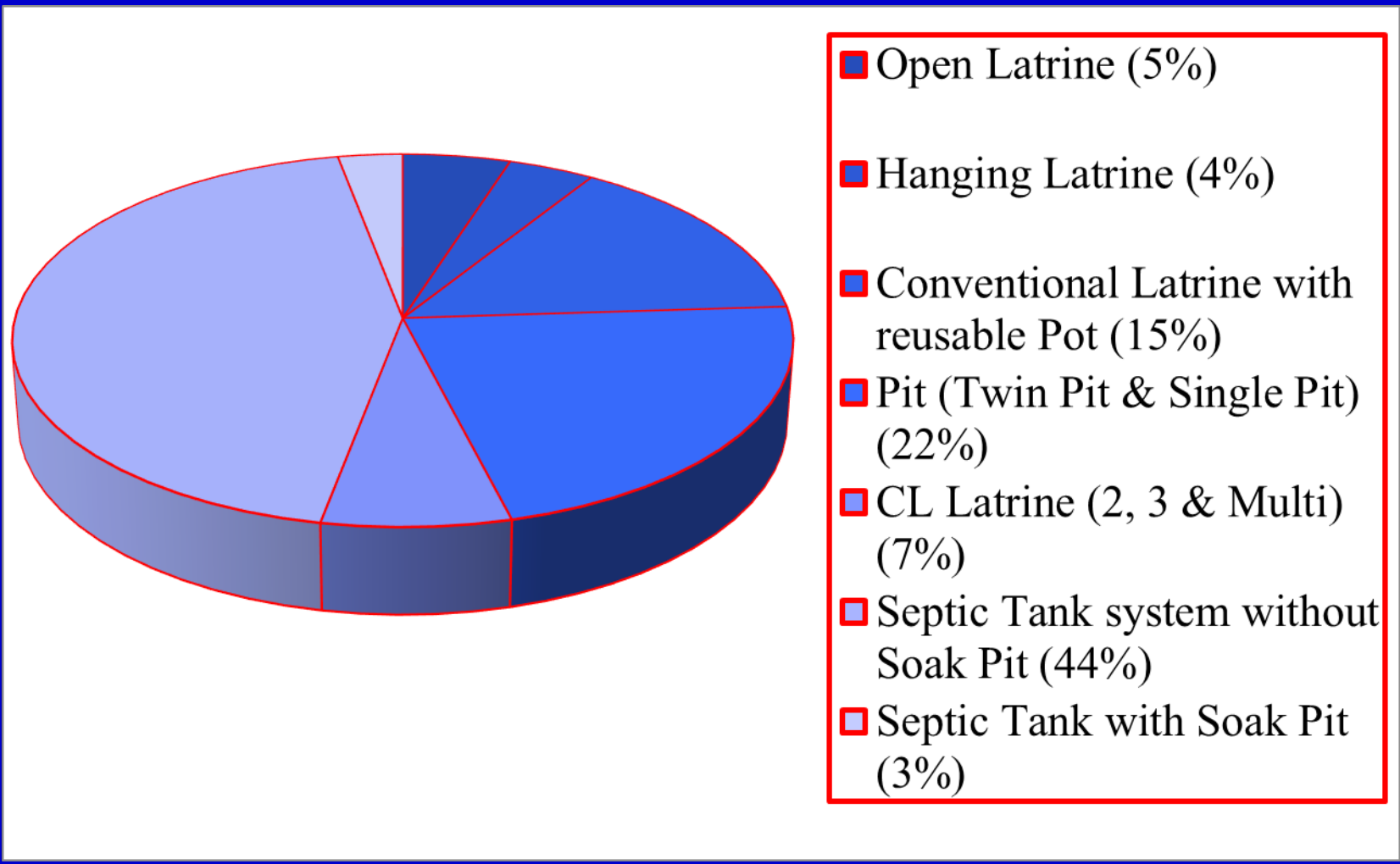
Types of Surveyed Area in KCC

No.	Types	Numbers
1	Residential Areas	116
2	School/ College/ Coaching/ Kindergarten/ Maddrasa	60
3	Offices/NGOs	66
4	Market Places	17
5	Slum Areas	199
	Total Areas	458

Types of Latrine

1. Open Latrine
2. Hanging Latrine
3. Conventional Latrine with reusable Pot
4. Pit (Twin Pit & Single Pit)
5. CL Latrine (2, 3 & Multi)
6. Septic Tank system without Soak Pit
7. Septic Tank with Soak Pit

Percentage of various types of latrines



Open Defecation

Open Defecation

Hanging Latrines

Hanging latrine on a canal

Series of hanging latrines

Conventional Latrine

Conventional Latrine which is used by Railway

Open Latrines

Open latrine

Behind a latrine

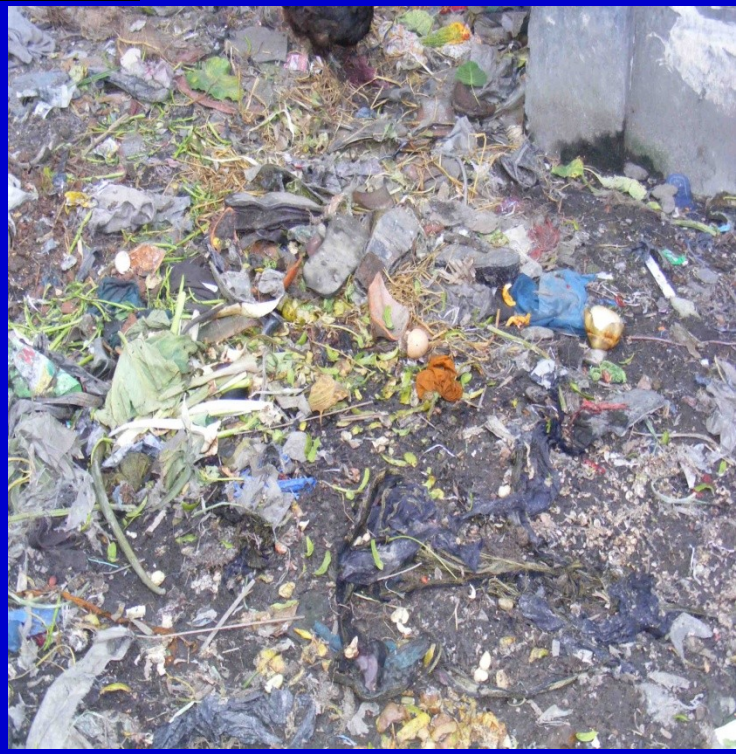
Pit Latrines

Pit Latrine Near a Canal

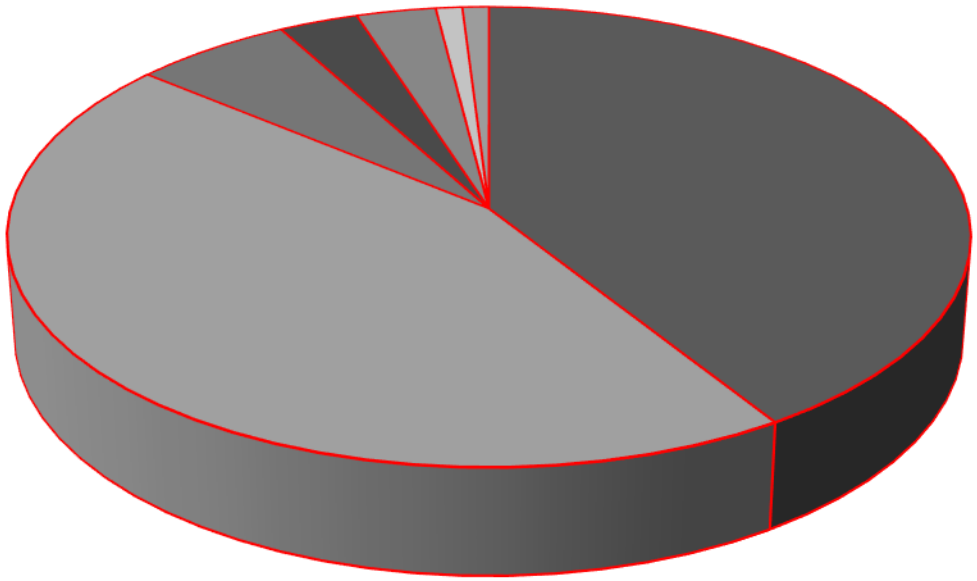
Latrine with offset pit

Fecal Sludge Disposal

No.	Disposal methods	No of survey	Percentage
1	Mud hole	162	41
2	Drain	179	45
3	KCC van	18	6
4	Local Sweeper	20	3
5	River	5	3
6	Canal	1	1
7	Pond	1	1
	Total =	**386**	**100**



Fecal Sludge Disposal



- Mud hole (41%)
- Drain (45%)
- Carried by KCC van (6%)
- Carried by local sweeper (3%)
- River (3%)
- Canal (1%)
- Pond (1%)

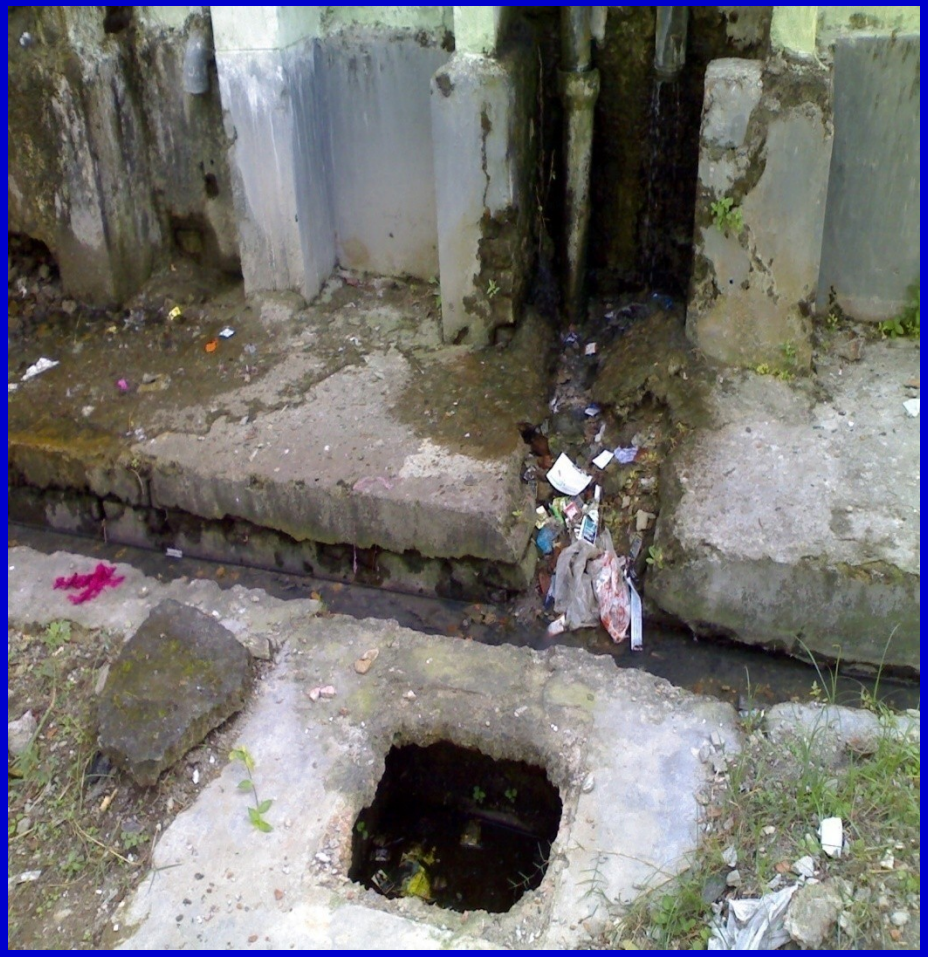
Fecal Sludge Disposal- Situation in Khulna

Fecal Sludge Disposal

No septic tank & waste directly mix with drain water

Waste fall directly from the 1st floor

Fecal Sludge Disposal

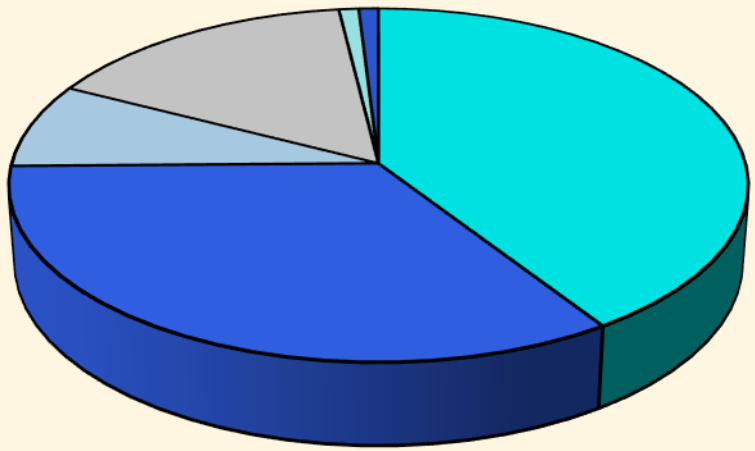


Septic tank without lid & without connection with the latrine pipe

Fecal Sludge Disposal

Residential Area

Surveyed Houses : 103 Nos.

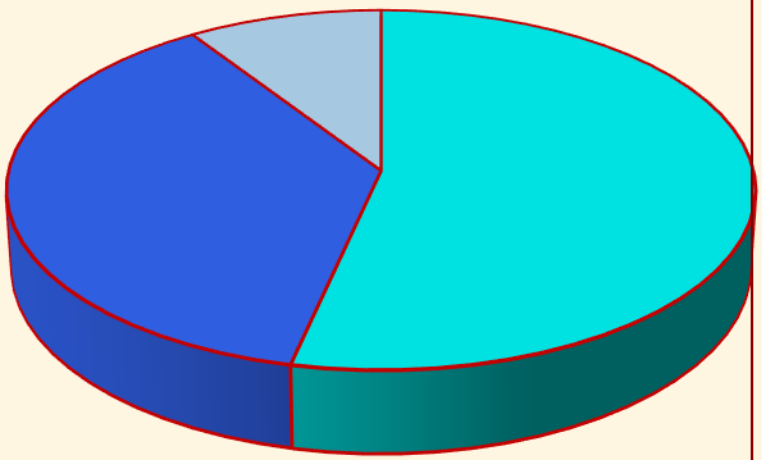


- Mud hole (41%)
- Drain (34%)
- Carried by KCC van (8%)
- Carried by local sweeper (16%)
- River (1%)
- Canal (1%)

Fecal Sludge Disposal

Schools/Colleges/Coaching's/ Kindergartens/Maddrasa

Surveyed Institutes : 43 Nos.

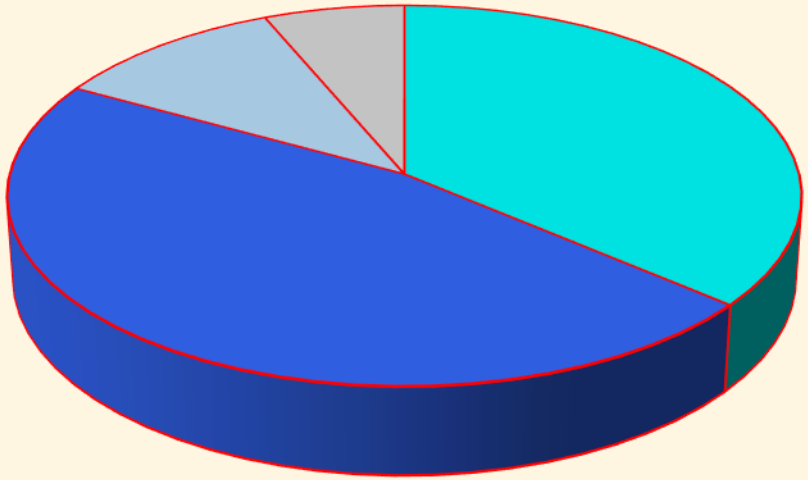


- Mud hole (53%)
- Drain (37%)
- Carried by KCC van (9%)
- Carried by local sweeper (0%)
- River (0%)
- Canal (0%)

Fecal Sludge Disposal

Government offices/NGOs

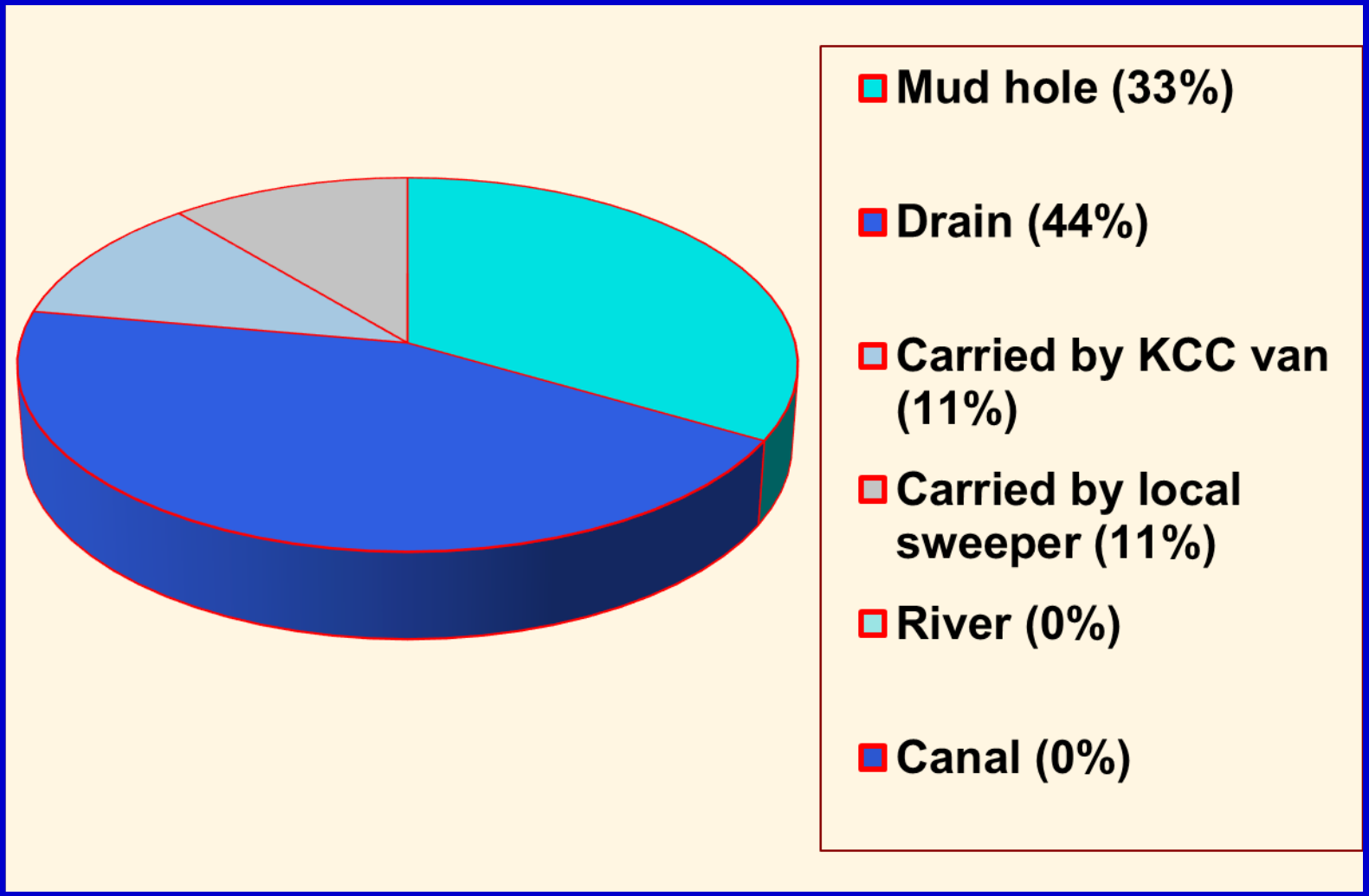
Surveyed Offices : 47 Nos.



Fecal Sludge Disposal

Market/ Shopping Places

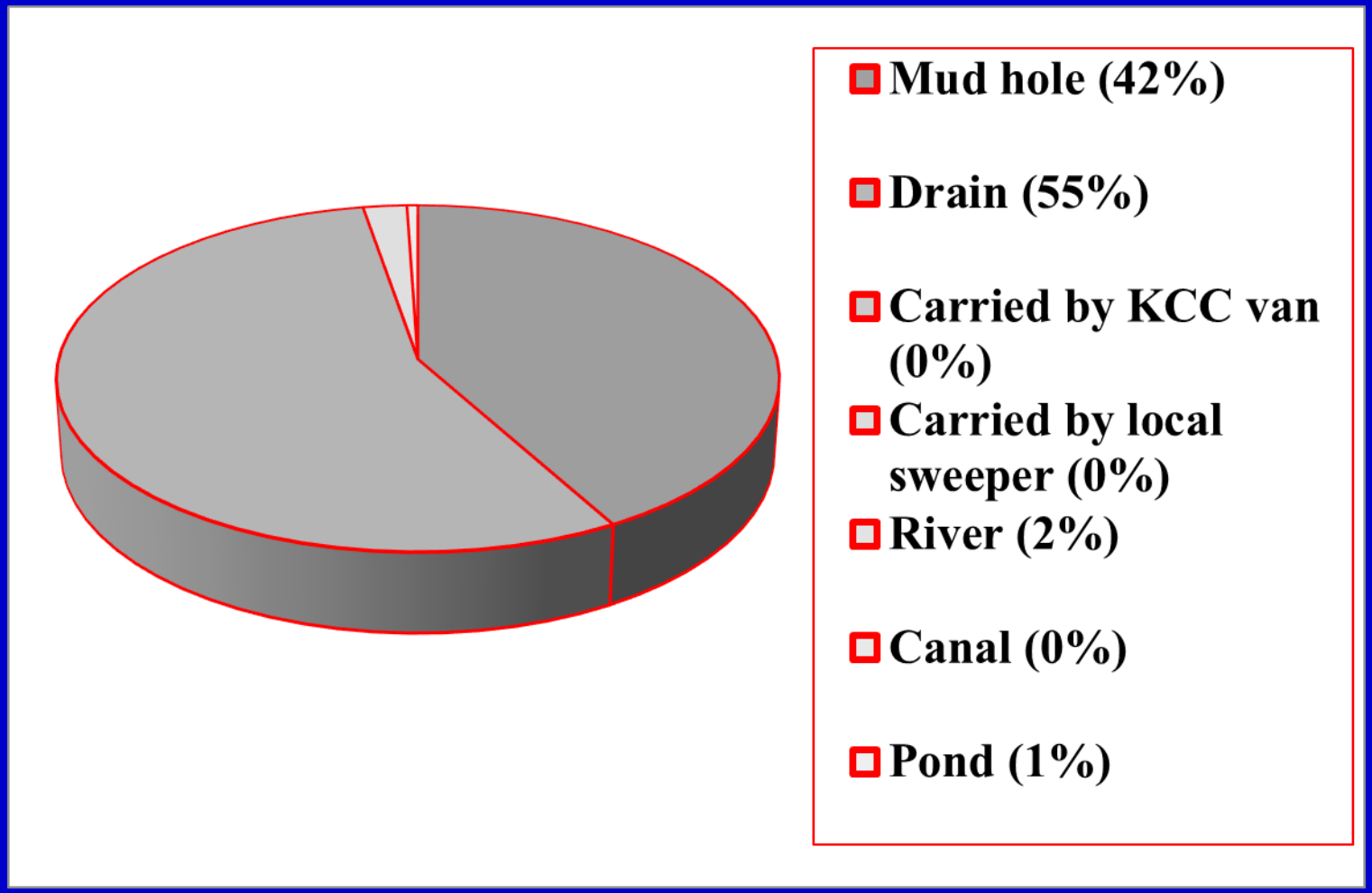
Surveyed Markets : 9 Nos.



Fecal Sludge Disposal

Slum Area

Surveyed Houses : 184 Nos.



Survey on Soak Well

No.	Types	With soak well	Without soak well	Total No. of survey
1	Residential Areas	5	115	116
2	School/College/Coaching / Kindergarten/Maddrasa	7	53	60
3	Government Offices / NGOs	3	63	66
4	Market/ Shopping Places	0	17	17
5	Slum Areas	20	179	199
	Total	35	427	458
	Percentage	**7.64%**	**92.36%**	

Fecal Sludge Disposal

Desludging Time

- at night : 70%
- at daylight : 30%

Cost for Desludging

- Small houses : Tk.1000 ~ Tk.1500
- Large residence : Tk.2000 ~ Tk.3000
- Offices : Tk.2500 ~ Tk.3500
- School : Tk.2500 ~ Tk.3500

Advantages of DEWATS

- Low infrastructure cost
- Reliable and long-lasting construction design
- Low maintenance and operation cost
- Provide a good sanitation system
- Create clean and aesthetic environment
- Protects public health and the environment
- Can enhance property values
- Efficient treatment for daily wastewater flows up to 1000m3
- Tolerant towards inflow fluctuations

Before implementation of the Nabolok EEHCO Project

Implementation of the Nabolok EEHCO Project

- To improve water and sanitation situation of urban slum area under Khulna City Corporation Nabolok implement Enhancing Environmental Health by Community organization (EEHCO) project with the assistance of Water Aid Bangladesh since 2005 in 8 wards.

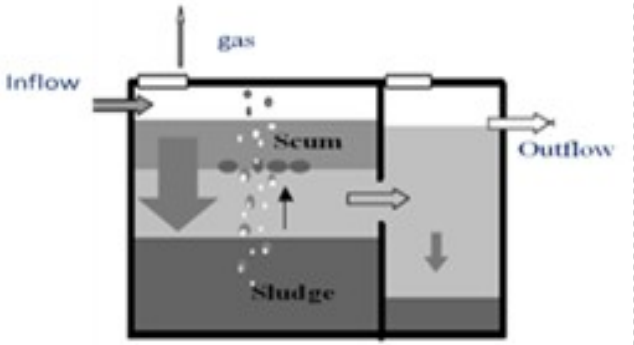
- Two DEWATS are already constructed at the Panchtola Colony in Khalishpur, Khulna.

Components of DEWATS

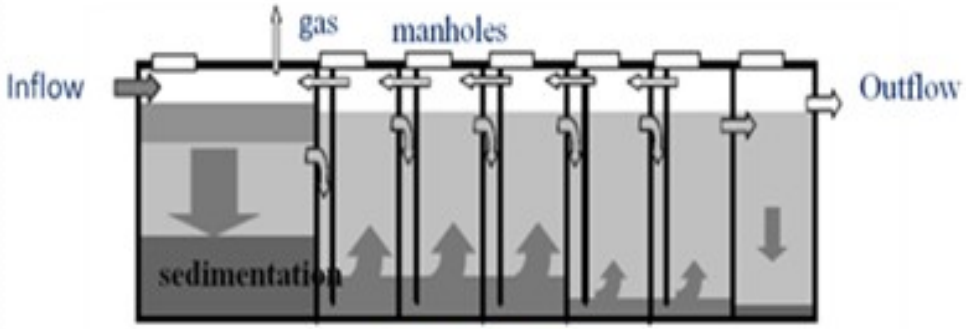
Decentralized system is the combinations of aerobic and anaerobic treatment process.

- Septic tanks (sedimentation and floatation).
- Baffled Reactors (Anaerobic Treatment).
- Anaerobic filters (Anaerobic Treatment).
- Planted Gravel Filters (aerobic treatment).
- Polishing ponds (aerobic treatment).

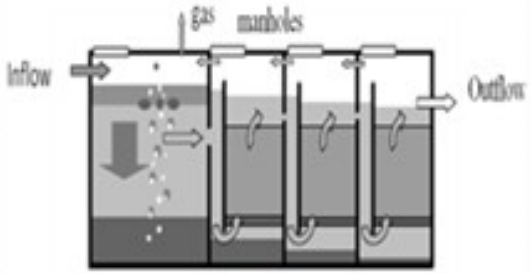
Schematic diagram of DEWATS



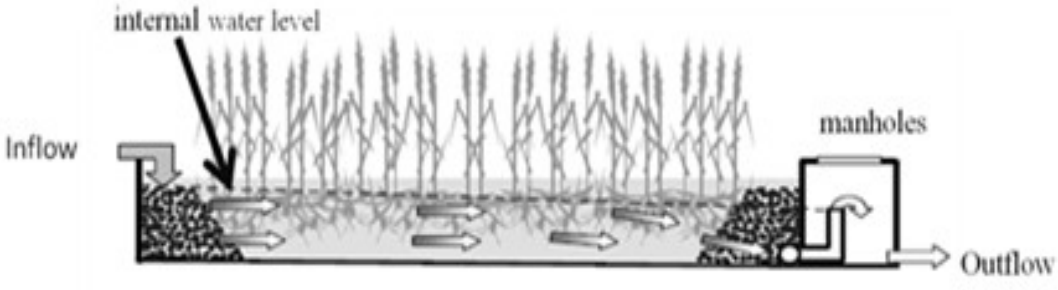
Septic Tank



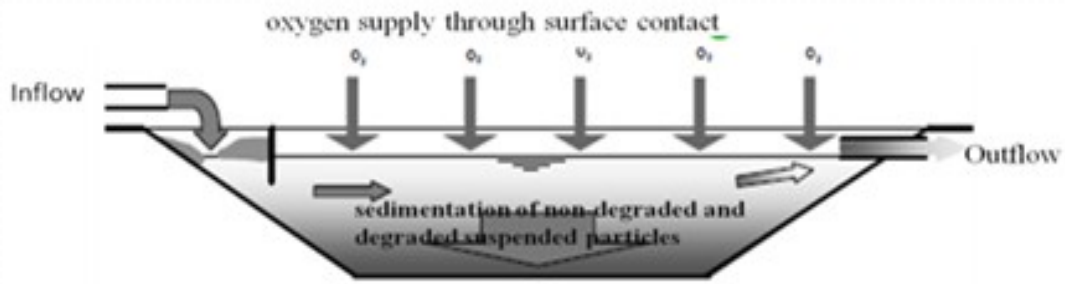
Baffled-Reactor



Anaerobic Filters



Horizontal Planted Gravel Filter



Polishing Pond

During DEWAT Implementation

Septic tanks, Baffled Reactors and Anaerobic filters

Anaerobic filters

During DEWAT Implementation

Planted Gravel Filters (aerobic treatment)

Wastewater samples collection

Waste water samples were collected from six different points of DEWATS such as

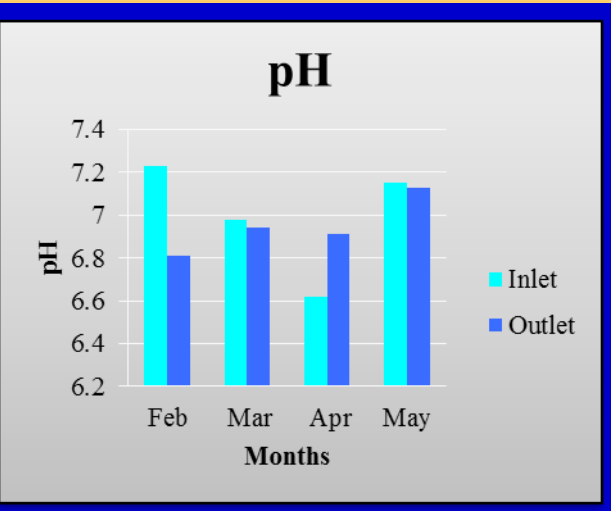
- in point of settler tank (Inlet),
- out point of settler tank,
- middle of aerobic center,
- out of aerobic center,
- out of plant filter,
- out of polishing pond (Outlet).

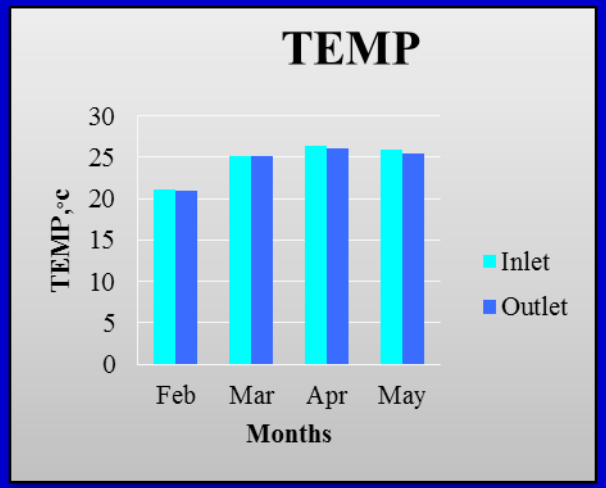
Laboratory Tests

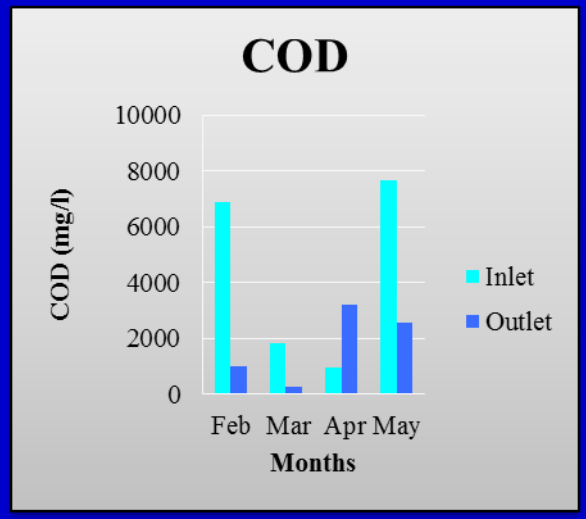
Different parameters were determined of collected waste water sample. such as

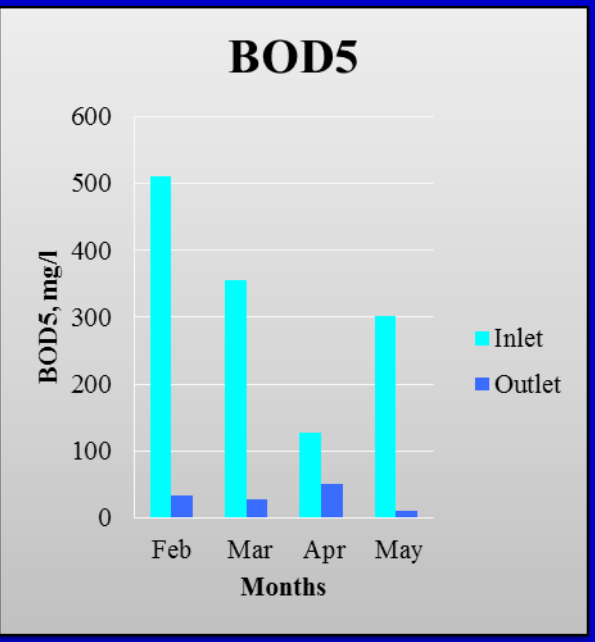
- BOD,
- COD,
- P^H,
- Nitrate,
- Phosphate,
- Temperature,
- Oil Grease,
- Total Dissolve Solid (TDS),
- Fecal Coliform (FC),
- Dissolve Oxygen (DO),
- Total Suspended Solid (TSS)

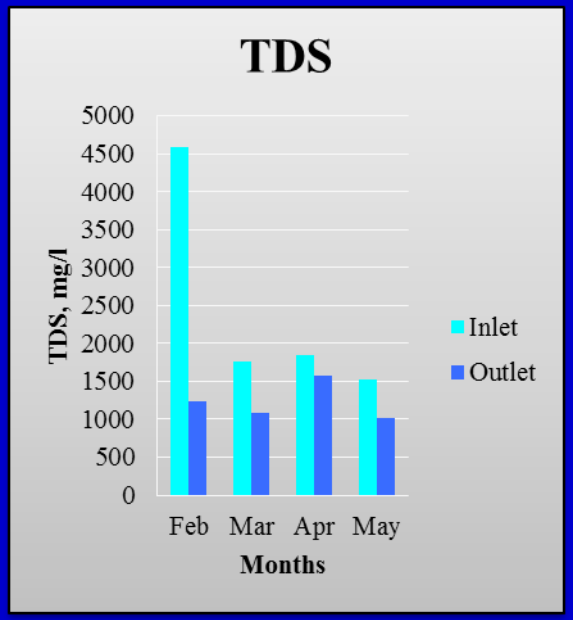
Test Results

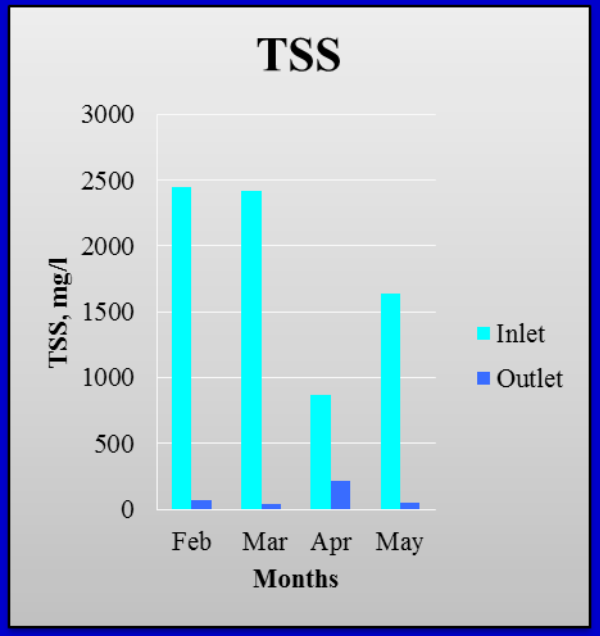




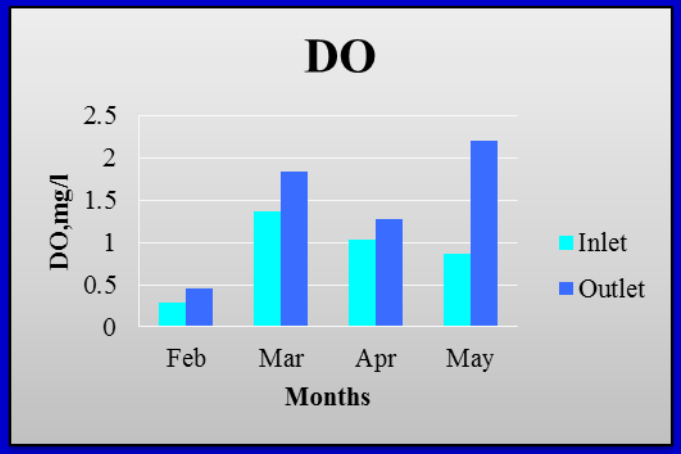


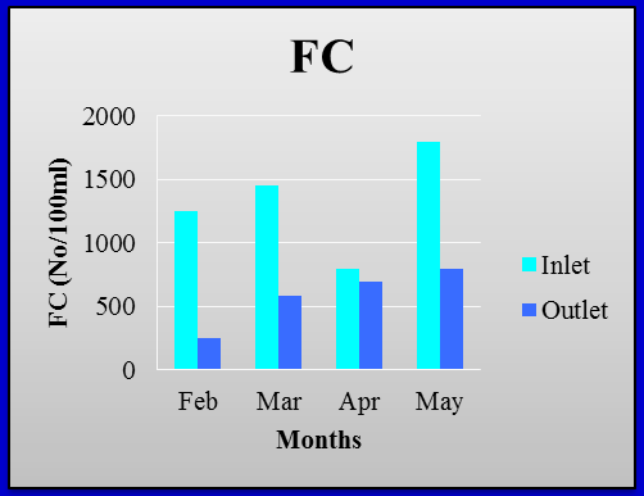


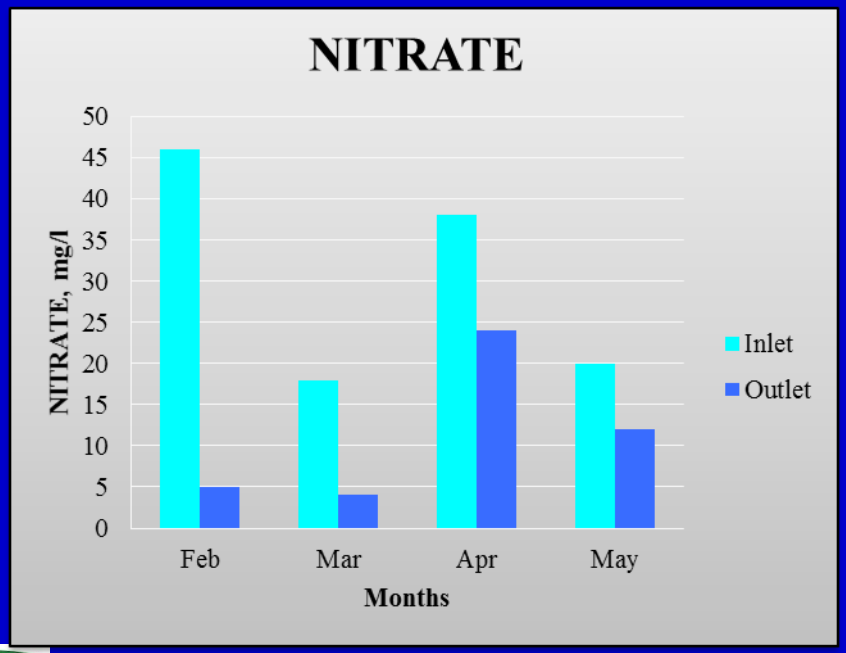


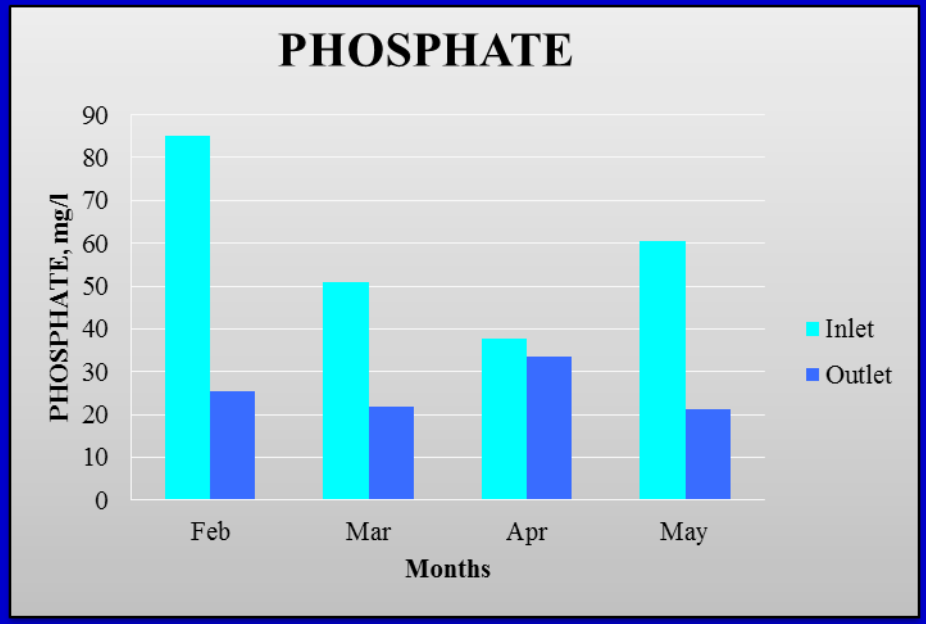


Test Results









Summary of test results

- The values of Oil and Grease were zero for all collected wastewater samples.

- The values of wastewater quality parameters such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil and Grease, pH, Total Dissolved Solid (TDS), Total Suspended Solid (TSS), Faecal Coliform, Temperature, Nitrate and Phosphate were observed to be gradually decreased.

- The values of DO were increasing which indicate that oxygen level was increased in treated wastewater sample.

So, it is a clear indication that the treated wastewater can be mixed with natural water bodies or used for irrigation purposes or reused for the community toilet flushing.

After implementation of the Nabolok EEHCO Project

Planted Gravel Filter

Polishing pond

Let’s bring environmental sustainability in the cities for sustainable development

Khulna University of Engineering & Technology