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# STUDY ON
# WASTEWATER MANAGEMENT KNOW-HOW TRANSFER
# TO THE
# METROPOLITAN MANILA DEVELOPMENT AUTHORITY

City of Yokohama

March 2008

# TABLE OF CONTENTS

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## 1. Background and Objectives

The Metropolitan Manila Development Authority (MMDA), the Republic of the Philippines, has requested technical guidance from Yokohama City on planning the Project for Marikina River Basin Sewerage System (hereinafter referred to as "the Project") through Japan Bank for International Cooperation

Since Manila is a sister city, the City of Yokohama responded to this request and conducted a field survey to transfer the know-how of wastewater management technology.

Against this background, the study examined the existing sewerage system in the Philippines and the present state of the rivers and drainage facilities, including the Marikina River and Laguna Lake. The terms of references (TORs) of the study are as follows:

- Assessment of the Philippine government policy, its efforts and challenges in the sewerage sector;
- Examination of the conditions and issues in the Project area, which is currently in the planning stage (including conditions of sewage treatment, sanitation and rivers, living conditions of local people, urban planning, etc.);
- Formulation of proposal for measures to improve the Project plan;
- Provision of advice on developing sewerage systems in Metro Manila in the coming years; and
- Other TORs deemed necessary by JBIC on developing sewerage systems in Metro Manila.

## 2. Schedule

| Date & Place | Counterpart | Note |
|---|---|---|
| February 18 (Mon)<br>**Technical Guidance at MWCI** | Mr. Ronald R. Muana,<br>Associate Manager, Project Development, Wastewater Department<br>Ms. Ginger V. Vergara,<br>Project Development Officer, Wastewater Department<br>Mr. Ferdinand S. Asuncion, NJS, etc. | Annex 1, 2 and 3 |
| February 19 (Tue)<br>**Courtesy Call on MWSS** | Mr. Lorenzo H. Jamora, Administrator (Attended initially)<br>Ms. Leonor C. Cleofas, Deputy Administrator for Operations<br>Mr. Edgardo Q. Esteban, Chief of Staff of Administrator<br>Mr. Jose M. Dimatulac,<br>Manager, Engineering and Project Management Department, etc | |
| February 19 (Tue)<br>**Courtesy Call on MWCI** | Mr. Antonino T. Aquino, President<br>Ms. Evangeline R. Matibag, Manager, Wastewater Department<br>Mr. Ronald R. Muana, etc. | Annex 1 |

| | | |
|---|---|---|
| February 20 (Wed)<br><br>**Courtesy Call on MMDA** | Mr. Bayani Fernando, Chairman<br>Mr. Robert C. Nacianceno, General Manager<br>Ms. Corazon Bautista-Cruz, Assistant General Manager for Planning<br>Mr. Martin Louis C. Ongpin, Technical Consultant | Annex 1 |
| February 20 (Wed)<br><br>**Visits to Marikina City Hall, Proposed three STP sites of the Project, etc** | MMDA Mr. Rey Lunas, etc.<br>MWCI Ms. Ginger V. Vergara, Project Development Officer, etc.<br>NJS Mr. Kageyama, Mr. Asuncion<br>CTI Mr. Seki, Mr. Suzuki and Mr. Fujimoto | |
| February 21 (Thu)<br><br>**Coordination Meeting with MWCI,<br>Site Visit to Mangahan Floodway and Laguna Lake Area** | Ms. Evangeline R. Matibag, Manager, Wastewater Department<br>Mr. Ronald R. Muana<br>Ms. Ginger V. Vergara | |
| February 22 (Fri)<br><br>**Inspection of Septic Tank Desludging** | MWCI Ms. Ginger V. Vergara, Project Development Officer, etc. | |
| February 22 (Fri)<br><br>**MMDA<br>Wrap-up Meeting** | Mr. Bayani Fernando, Chairman<br>Mr. Robert C. Nacianceno, General Manager<br>Ms. Corazon Bautista-Cruz, Assistant General Manager for Planning<br>Mr. Martin Louis C. Ongpin,<br>Technical Consultant, Office of the Chairman<br>Mr. Rey Lunas | Annex 4 |

## 3. Government Policy, Its Efforts and Challenges in the Sewerage Sector

(1) Government Policy and Efforts

The basic law on sewerage legislated by the government is the Code on Sanitation of the Philippines (Presidential Decree No. 856, effective in December 1975).

(2) Challenges

The sewerage system is a social capital which requires substantial cost for development. In the City of Yokohama with a population of 3.63 million, the total amount of investment in this sector is about 3 trillion yen.

Annual investment in the water and sanitation sector in the Philippines amounts to approximately 3-4 billion peso (9-12 billion yen). In Metro Manila, investment in the sanitation sector amounts to about 500 million peso (1.5 billion yen), which was covered by water and sewerage charges collected from citizens.

As public funds are not used in providing sewage service, it is expected to take a very long time to complete the sewerage system, considering that Metro Manila has a population of about 10 million.

The overall plan for the Project does not have a clear distinction of responsibilities between the departments handling the flood control projects and those handling sewage treatment projects including environmental improvement. In addition, the unavailability of basic data necessary for completing the Project might hinder the implementation of the plan.



## 4. Conditions and Issues in the Project Area

*(conditions of sewage treatment, sanitation and rivers, living conditions of local people, urban planning, etc.)*

(1) Sewage Treatment

In February 2008, the groundbreaking ceremony was held for the World Bank-funded construction of the Olandes Sewage Treatment Plant (STP) having a capacity of 10,000 cubic meters per day. While this is part of efforts to increase sewage treatment capacity, the current capacity of 60,000-80,000 cubic meters per day accounts for only 3% of the required capacity of 2.4 million cubic meters for the entire areas to be covered by Metropolitan Waterworks and Sewerage System (MWSS).

For sludge treatment, a new plant has been in operation.

(2) Sanitation

The coverage of sewerage system is about 4% in the Philippines as a whole and 10% in Metro Manila. In the areas without sewerage system, household sewage is treated in the septic tank. However, since most of the wastewater is discharged into drainage channels, there has been increasing pollution in the channels and rivers.

Manila Water Company, Inc. (MWCI) has recently allocated 90 vacuum desludging trucks (of which 30 trucks with permits are in operation) and also constructed new septage treatment plants.

Septic tanks are often not well-maintained and placed in the underground of houses. Thus there are cases where maintenance is difficult in some houses, posing challenges to public health as well as operation and maintenance.

(3) Rivers

The Marikina and Pasig Rivers run into Laguna Lake and Manila Bay. As the two water bodies are connected with high and low tides, the weir has been built to manage water flows.

The level of pollution in the rivers is high due to underdeveloped STPs, lack of management of septic tanks and domestic wastewater discharge. As there is odor as one comes closer to the rivers, it is routine to see illegal dumping of garbage into drainage channels and rivers.

In the wet seasons and dry seasons in the Philippines, there is a marked difference in rainfall in the two seasons. During the wet season, the water levels in the rivers tend to rise significantly with squalls. For example, the water level in the Marikina River near the Marikina City Hall at one time rose about 8.5 meters in the past.

Thus when rainfall is scarce in the dry season, the water quality of river severely deteriorates with polluted water. Even in the wet season, inflow of polluted water remains unchanged although water pollution is seemingly avoided through dilution (see Annex 4, 1.).

While the STPs are planned to be constructed along the downstream of the Marikina River basin under the Project, the land acquired for each proposed STP site amounts to only 3,000-7,000 square meters.

In case the Project is implemented, its plan needs to be consistent with the river improvement plan of the Marikina River basin which is under planning.

(4) Living Conditions of Local People

Metro Manila has a high population density with more than 10% of the national population

living in this area. As a commuter town of Metro Manila, the Marikina River basin area is predicted to promote urbanization with rapid population growth by approximately 1.4-fold—from 1.54 million to 2.22 million between 2008 and 2023. Given this projection, this area is faced with a major challenge of providing basic services, including sewerage and sanitation.

(5) Urban Planning

Master plan for developing sewerage systems, METROSS I-V, has not been managed for implementation.

## 5. Proposals for Measures to Improve the Project Plan

Due to significant pollution and difficulty in acquiring land necessary for proposed STP sites, it is more effective to directly purify water in the Marikina River rather than building STPs to improve water quality of river by constructing a purifying facility. The facility is a simple structure that can be constructed in the river or creek with light on-site work, and most of the construction materials can be locally procured.

In planning to construct such facility, the first stage is to install a facility using the contact aeration method that removes biochemical oxygen demand (BOD) and suspended solids (SS) (see Figure 2 and 3). The second stage is to improve this facility in stages, converting it to the Shimanto-gawa system that removes nitrogen and phosphorus (see Photograph 1 and Figure 4). In this way, the project will be economically implemented in a short period.

In constructing a purifying facility, the first stage is to fill a concrete box unit with filter made of processed charcoal, deadwood, rocks and other natural materials, and force air into it to improve the water quality (see Figure 1). The second stage is to develop a more elaborate system by constructing additional units and replacing filter materials.

These units should be placed at downstream end of tributaries in the number and scale needed to meet the level of pollution in the drainage channels and rivers (see Figure 2). A screen to remove garbage and over flow weir necessary as a flood countermeasure will also be developed (see Figure 3).

Figure 1: Map of Unit Locations




Figure 2: Cross Section of a Unit
(Image of Treatment Unit

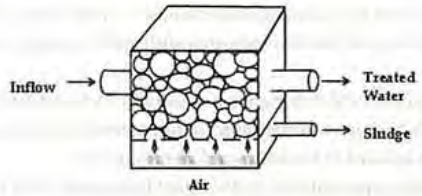
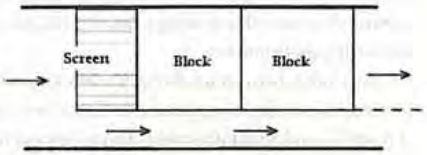


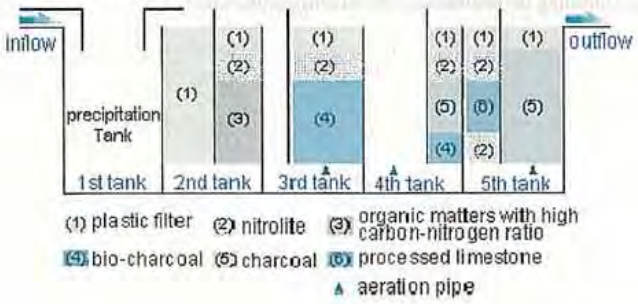

Figure 3: Layout of Units




Photograph 1: Example of the Shimanto-Gawa System (See Annex 4, 2-1)
(Kubokawa Town, Kochi Prefecture, Japan)
Capacity: 2,000 m³/day (Facility: [width] 2.5 m; [length] 88 m; [depth] 3.3 m)

Construction Cost: About 50,000-100,000 yen/m³ (in Japan)

Figure 4: Structure of Shimanto-Gawa System



## 6. Advice on Developing Sewerage Systems in Metro Manila

(1) Environmental Improvement in Residential Areas

In the Philippines, inflows of effluents from septic tanks of households, domestic wastewater and stormwater into the drainage that are laid along the residential roads are causing deterioration in the living environment.

Since only purification of riverwater will not improve the living environment of local residents, construction of sewage treatment tank for each barangay, a minimum administrative unit (see Figure 5), and separate sewer-storm pipe networks need to be developed (see Figure 6).

In constructing sewage treatment tanks, existing septic tanks for individual households will be maintained, for this will enable to downsize sewage treatment tanks and purification facilities, as well as reduce sludge treatment at STPs.

Construction of separate sewer-storm pipe networks inside the existing drainage will solve the problems of excavation and traffic control during the civil works. It will also contribute to about 80% of cost reduction compared with constructing sewer pipes under the road (see Annex 4, 2-2).

**Figure 5: Plan View**

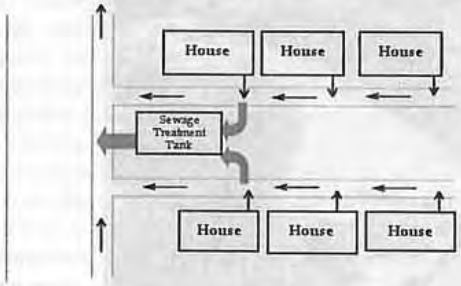
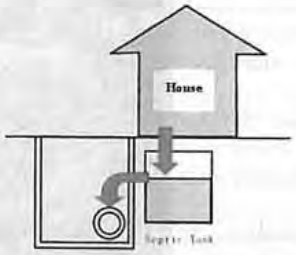



**Figure 6: Cross-Section View**




(2) Others

a. Promoting the Project with public funding
b. Developing the institutional and legal framework for promoting the overall urban planning
c. Securing the water quality by developing the sewerage system law and regulating illegal discharge of effluents (see Annex 4, 2-3.)
d. Consensus building on maintaining the existing septic tanks



# ANNEX 1

# Sewage Works in Yokohama

# Sewage works in Yokohama

24 Aug 2007

Hozumi Nakata
Policy Planning Director for Administration
Environmental Planning Bureau
CITY of YOKOHAMA

## Location and Topography of Yokohama

- Yokohama is situated at 139 degrees east longitude and 35 degrees north latitude
- Total area is 434.95 square kilometers
- The width of the city is 23.63 kilometers from east to west and 31.11 kilometers from north to south
- The highest point of the city is 159.4 meters above sea level
- The lowest point of the city is 6.7 meters below sea level

## The location of Yokohama city

## The history of Yokohama city

1859 The open of its port to trade with the West

1889 Yokohama instituted the municipal system
The population of the city is only 116,000

1950s Yokohama experienced a rapid influx of population

1960s All river sections were seriously contaminated

2007 The sewered population rate to 99.7%



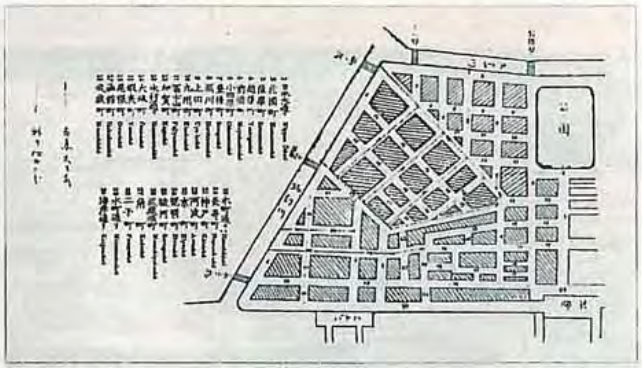
View of the Kannai district at the time of the opening of Yokohama's port to foreign trade

## Development of the modern sewerage system in Yokohama ( I )

1881 The modern sewerage system began in Japan

1881～87 The construction of modern sewerage system took place in the Foreigner's Settlement in Yokohama

Design drawing for sewerage in the Kannai district



Sewer with an egg-shaped profile



## Development of the modern sewerage system in Yokohama (Ⅱ)

1881 The modern sewerage system began in Japan

1881～87 The construction of modern sewerage system took place in the Foreigner's Settlement in Yokohama

1922 The Great Kanto Earthquake occurred

1945 The air raids during the Second World War destroyed the city

The burnt-out of Yokohama's central area in 1945

## Development of the modern sewerage system in Yokohama(Ⅲ)

1881 The modern sewerage system began in Japan

1881～87 The construction of modern sewerage system took place in the Foreigner's Settlement in Yokohama

1922 The Great Kanto Earthquake occurred

1945 The air raids during the Second World War destroyed the city

1957 Full-fledged construction of sewerage in Yokohama commenced with the Chubu treatment district

1962 The Chubu wastewater treatment plant was placed into operation

1984 All eleven of the wastewater treatment plants in the master plan had been constructed

## The extension of the treatment district area


認可区域拡大の変遷



## Chubu Wastewater Treatment Plant

## Sewerage system planning map

# Sludge pipe network planning map


# List of wastewater treatment plants

(March 2000)

| Treatment plant | Location | Site area | Current | | Design | | Treatment Process | Receiving water | Operation started |
|---|---|---|---|---|---|---|---|---|---|
| | | | Area served | Treatment capacity | Area served | Advanced Wastewater Treatment | | | |
| 1 Hokubu I | Motomiya, Tsurumi-ku | m² 100,320 | ha 2,641.2 | m³/day 169,000 ( 11,600) | ha 2,150 | m³/day 61,200 | Activated sludge Process | Tsurumi River | July '68 |
| 2 Hokubu II | Sachiura, Tsurumi-ku | 166,400 | 663.6 | 116,500 ( 0) | 721 | 288,400 | oo | Tokyo Bay | Aug '84 |
| 3 Kanagawa | Oiwake, Kanagawa-ku | 103,330 | 4,626.1 | 293,400 ( 92,140) | 4,764 | 263,600 | oo | Tokyo bay | Mar '79 |
| 4 Chubu | Honmokujunten, Naka-ku | 66,300 | 904.4 | 96,300 ( 0) | 942 | 121,300 | oo | Tokyo bay | Apr '82 |
| 5 Nambu | Shinsogo, Isogo-ku | 70,620 | 2,147.9 | 167,400 ( 0) | 2,119 | 243,200 | oo | Tokyo bay | July '85 |
| 6 Kanazawa | Sachura, Kanazawa-ku | 129,440 | 3,846.8 | 345,000 ( 0) | 4,913 | 269,900 | oo | Tsurumi river | Oct '79 |
| 7 Kohoku | Futo, Kohoku-ku | 124,960 | 4,565.9 | 245,800 ( 57,920) | 6,279 | 264,500 | oo | Tsurumi river | Dec '72 |
| 8 Tsuzuki | Sueda, Tsuzuki-ku | 87,000 | 5,339.0 | 144,350 ( 82,600) | 6,096 | 339,600 | oo | Tsurumi river | May '77 |
| 9 Seibu | Higashimatano, Totsuka-ku | 101,940 | 2,354.8 | 95,400 ( 0) | 3,513 | 150,700 | oo | Sakai river | Mar. 83 |
| 10 Sakae I | Kosugaya, Sakae-ku | 31,200 | 1,220.3 | 77,500 ( 0) | 2,003 | 93,600 | oo | Ikuchi river | Dec. 84 |
| 11 Sakae II | Nagaimura, Sakae-ku | 92,000 | 2,254.7 | 177,500 ( 0) | 4,232 | 211,600 | oo | Kashio river | Oct. 72 |



# List of sludge treatment plants

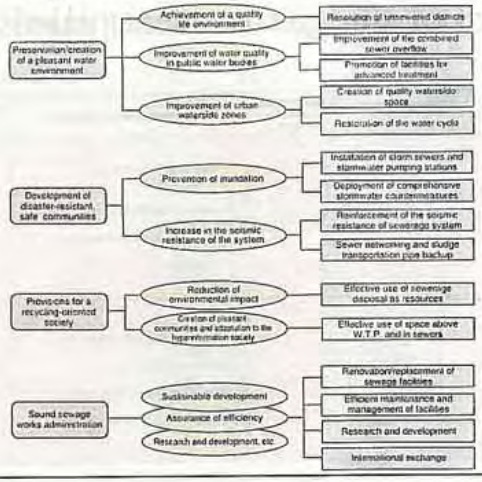
*Sludge containing 99% water

| Sludge treatment center | Wastewater treatment plants served | Sludge treatment capacity* (m3/day) | Sludge treatment process | Operation started |
|---|---|---|---|---|
| Hokubu | Tsuzuki<br>Kohoku<br>Hokubu I<br>Hokubu II<br>Kanagawa | 12,500 | Thickening (by gravity & centrifugation)<br>Anaerobic digestion<br>Dewatering (by centrifugation)<br>Incineration | Sep '87 |
| Nambu | Chubu<br>Nambu<br>Kanazawa<br>Sakae I<br>Sakae II<br>Seibu | 14,700 | Thickening (by centrifugation)<br>Anaerobic digestion<br>Dewatering (by pressurization)<br>Incineration | Nov '89 |

# List of pumping station

| | | Pumping station Name | Location | Designed pumping capacity (m3/s) | Current pumping capacity (m3/s) | Operation started |
|---|---|---|---|---|---|---|
| In operation | Rainy pumping station | 1 Sunyoshi | Shimosunyoshi, Tsurumi-ku | 10.40 | 10.29 | Mar 64 |
| | | 2 Tsurumachi | Tsurumachi, Kohoku-ku | 46.26 | 46.22 | Apr 87 |
| | | 3 Kitahamashima | Hyoeji, Kohoku-ku | 22.20 | 22.12 | May 72 |
| | | 4 Tsurumi | Tsurumichuo, Tsurumi-ku | 12.20 | 12.20 | June 72 |
| | | 5 Sakuragi | Tobitacho, Naka-ku | 28.80 | 28.28 | Aug 79 |
| | | 6 Hodogaya | Tomioka, Hodogaya-ku | 31.50 | 34.40 | Sep 78 |
| | | 7 Isogo | Isogo, Isogo-ku | 42.20 | 42.20 | July 68 |
| | | 8 Kanazawa | Uchinocon, Kanazawa-ku | 68.10 | 68.87 | Mar 81 |
| | | 9 Futo | Futopto, Kohoku-ku | 14.85 | 14.77 | Apr 76 |
| | | 10 Nippa | Nippacho, Kohoku-ku | 67.10 | 57.08 | May 78 |
| | | 11 Totsuka | Totsukacho, Totsuka-ku | 33.80 | 31.58 | Oct 79 |
| | | 12 Kamikaiyoshi | Kamikaiyoshi, Tsurumi-ku | 13.20 | 13.20 | Mar 87 |
| | | 13 Egasaki | Yakou, Tsurumi-ku | 16.00 | 16.87 | Nov 91 |
| | | 14 Takaoka | Takaocho, Kohoku-ku | 32.80 | 32.76 | Mar 88 |
| | | 15 Uchida | Murocho, Tsurumi-ku | 7.60 | 9.76 | Aug 55 |
| | | 16 Ishiki | Ishikicho, Tsurumi-ku | 6.60 | 6.63 | Jun 53 |
| | | 17 Hirasunuma | Hirasunucho, Totsuka-ku | 20.30 | 20.33 | Oct 93 |
| | | 18 Yamashita | Yamashitacho, Naka-ku | 14.40 | 14.40 | Oct 87 |
| | | 19 Mannaka | Mannakacho, Minami-ku | 20.70 | 20.67 | Oct 87 |
| | | 20 Kohama | Kohamacho, Minami-ku | 20.30 | 20.33 | Mar 89 |
| | | 21 Isogo B | Isogo, Isogo-ku | 25.60 | 12.67 | Mar 00 |
| | | 22 Mukoura | Mukoura, Kanazawa-ku | 11.80 | 11.43 | Nov 73 |
| | | 23 Kawamukou | Kawamukouchi, Tsurumi-ku | 20.70 | 20.73 | Mar 98 |
| | | 24 Kamio | Higashimiogicho, Midori-ku | 19.00 | 18.93 | Mar 86 |
| | | 25 Kasama | Kasamacho, Sakae-ku | 13.90 | 13.68 | July 82 |
| | Drainage pumping station | 1 Kadomori | Fujimicho, Naka-ku | 7.49 | | |
| | | 1 Shinkashima | Shinkashima, Kanagawa-ku | 4.50 | | |
| | | 2 Tonocomi | Tonocho, Hodogaya-ku | 2.50 | | |
| 47 small local pumping stations are also in operation | | | | | | |

## Programs of the sewage works in Yokohama




## Achievement of a quality life environment

- Resolution of unsewered district

**Background**:

attainment of the civil minimum

**Task:**

construction of sewerage



Sewer construction for clean water

## Improvement of water quality in public water bodies ( I )

- Improvement of the combined sewer overflow

**Background:**

discharge of some pollutants during wet weather

**Task:**

construction of stormwater tanks and improvement of storm overflow chambers

Stormwater tank under the athletic ground

## Improvement of water quality in public water bodies (Ⅱ)

- Promotion of advanced treatment

**Background:**

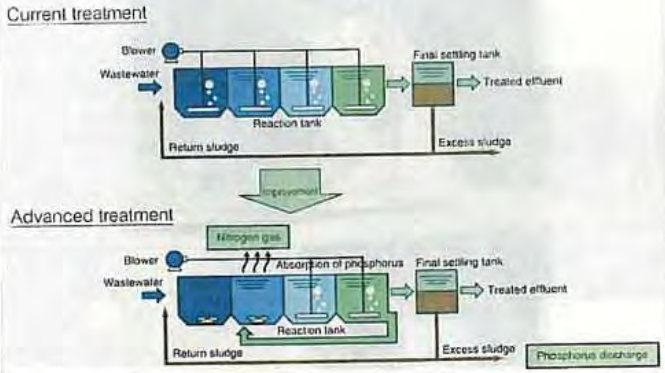
attainment of environment standards for water quality and tightening of regulations regarding concentrations of nitrogen and phosphorus (nutrient salts) in sea area

**Task:**

efficient incorporation of advanced treatment



Incorporation of advanced treatment through renovation of WTP facilities




## Improvement of urban waterside zones

- Creation of quality waterside space
- Restoration of the water cycle

**Background:**

dissatisfaction with neighborhood waterside environments and desires for quality ones

**Task:**

creation of waterside space featuring clean and clear water

Stream replenished with effluent from advanced treatment

## Prevention of inundation

- Installation of storm sewers and stormwater pumping stations
- Development of comprehensive stormwater countermeasures

**Background:**

urban-type flooding-massive damage to property and urban functions

**Task:**

creation priority improvement in inundation-prone districts and curtailment of stormwater runoff



Rain radar & Inundation on the street fronting the city hall

## Increase in the seismic resistance of the sewerage system

- Reinforcement of the seismic resistance of sewerage system facilities
- Sewer networking and sludge transportation pipe backup

**Background:**

assurance of the security of lifeline

**Task:**

reinforcement of the seismic resistance of the entire sewerage system

## Reduction of environmental impact

- Effective use of sewerage disposal as resources (treated water, sludge, digestion gas etc)

**Background:**

construction of a recycling-oriented, zero-emissions society

**Task:**

effective use of treated effluent, and reduction and effective use of sewage sludge

Supply of treated effluent and thermal energy from sewage to the international stadium Yokohama



Brick pavement in the vicinity of the Minato Mirai 21 zone

## Creation of pleasant communities and adaptation to the hyper-information society

- Effective use of space above WTP and in sewers

**Background:**

approaches to improvement of citizen service

**Task:**

improvement and streamlining of maintenance and management capabilities, and provision of open space

Installation of optical fiber circuits by a robot

## Sustainable development

- Renovation/replacement of sewage facilities

**Background:**

progressive superannuation, functional deterioration, and damage

**Task:**

systematic replacement, functional improvement, and reduction of lifecycle cost



Ruptured pipe (a cause of road subsidence)

## Assurance of efficiency

- Effective maintenance and management of facilities

**Background:**

maintenance of the functional capabilities of the huge stock of sewerage system facilities

**Task:**

proper maintenance and management, saving of energy and labor, and curtailment of costs

Cleaning of sewer pipes with a high-pressure cleaning truck

Wastewater treatment plant control room



## Research and development, etc.( I )

- Research and development

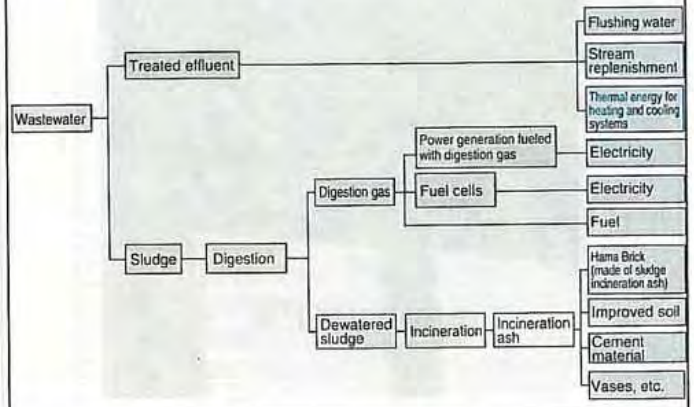
**Background:**

new technology for efficient performance

**Task:**

development of efficient technology for wastewater treatment and for effective application of sewage works resources

Effective use of wastewater



## Research and development, etc.(Ⅱ)

- International exchange

**Background:**

international cooperation and technical exchange

**Task:**

participation in international conferences, dispatch of engineers to and acceptance of trainees from othercoutries

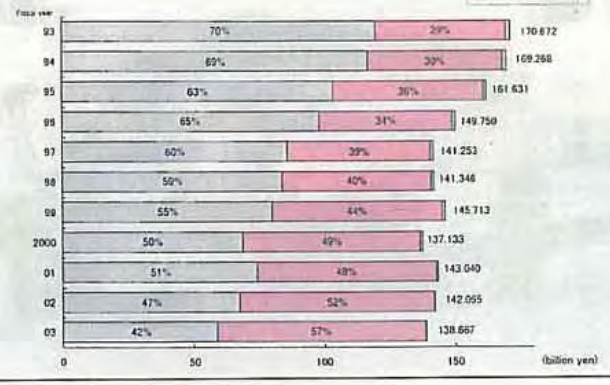
International conference



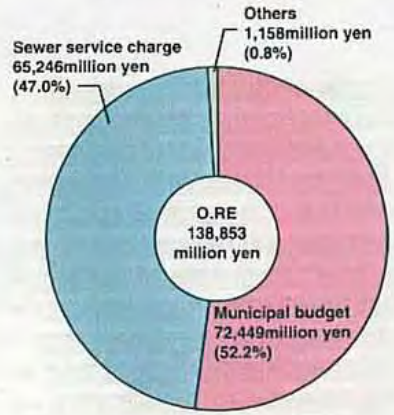

Accepting foreign nationals for training

Revenue expenditure in annual changes

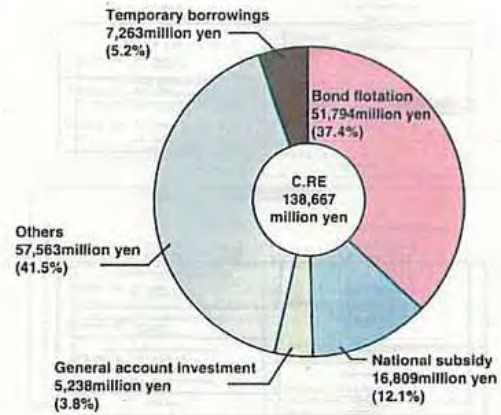
## Capital expenditure in annual changes




## Operating revenue funds



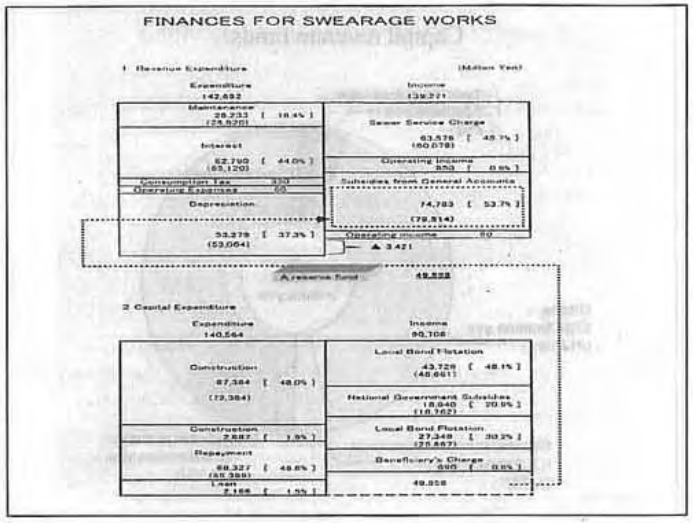

## Capital revenue funds




## Table of current sewer service charge rate

(April 2001)

| Category | Stage | Treatable area | Drainage area |
|---|---|---|---|
| Domestic usage | 0~8m3 (Basic charge) | 630yen | 25yen |
| | 9~10 (yen/m3) | 20 | |
| | 11~20 (yen/m3) | 110 | 5 |
| | 21~30 (yen/m3) | 173 | 6 |
| | 31~50 (yen/m3) | 234 | 7 |
| | 51~100 (yen/m3) | 294 | |
| | 101~200 (yen/m3) | 299 | 9 |
| | 201~500 (yen/m3) | 341 | |
| | 501~1,000 (yen/m3) | 389 | 10 |
| | 1,001~2,000 (yen/m3) | 416 | 11 |
| | 2,001~ (yen/m3) | 472 | 12 |
| Public bath house | yen/m3 | 11 | 11 |






# ANNEX 2

## Operations Overview of Manila Water Company, Inc.

Manila Water

# Manila Water Company, Inc.

*JBIC*

*June 2007*

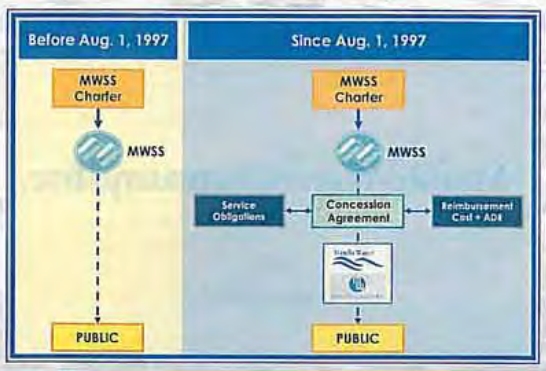
Manila Water *The MWSS Privatization*

## The 1997 Takeover

Manila Water

## The MWSS Privatization

### The Concession Framework




Manila Water

## The MWSS Privatization

### Privatization Objectives

- Expand service coverage
- Improve delivery of service
- Increase operating efficiency



Manila Water

## Profile of Manila Water Company

### Manila Water Stockholders

| | |
|---|---|
| Ayala | 30.4% |
| United Utilities | 11.8% |
| Bank of the Philippine Islands Capital | 4.6% |
| IFC International Finance Corporation | 7.4% |
| Mitsubishi Corporation | 7.9% |
| Employees | 2.7% |
| PUBLIC | 35.2% |

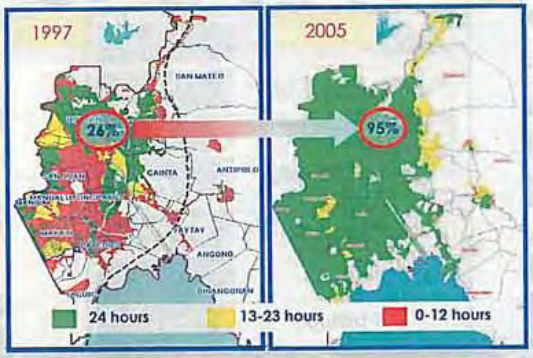
Manila Water

## The MWSS Privatization

### Service Obligations

Manila Water | Manila Water's Performance

## Improved access to 24-hour water supply



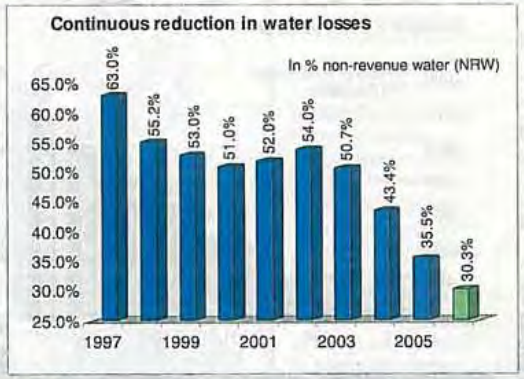

Manila Water | *Key Performance Indicators*

**Total Capex of P23 billion since 1997**



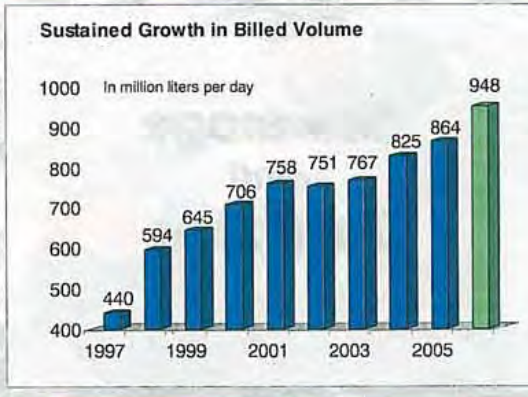

Manila Water | *Key Performance Indicators*

**Continuous reduction in water losses**



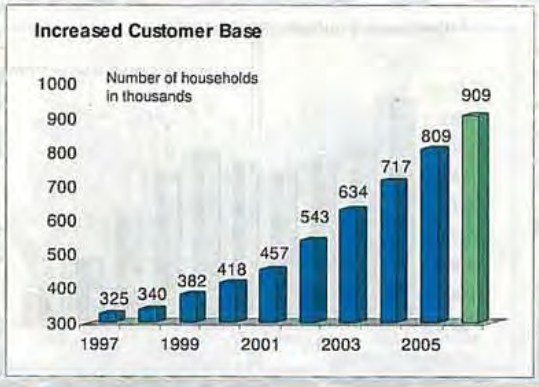

Manila Water | *Key Performance Indicators*

**Sustained Growth in Billed Volume**



Manila Water

## Key Performance Indicators




Manila Water

# Sewerage and Sanitation

May 2007



Manila Water

## MWSS Systems-1997


**1 Central Sewerage System**
- outfall to Manila Bay
- 7 lift stations, 1 pump station
- 305 km sewer network
- 2,620 ha area served

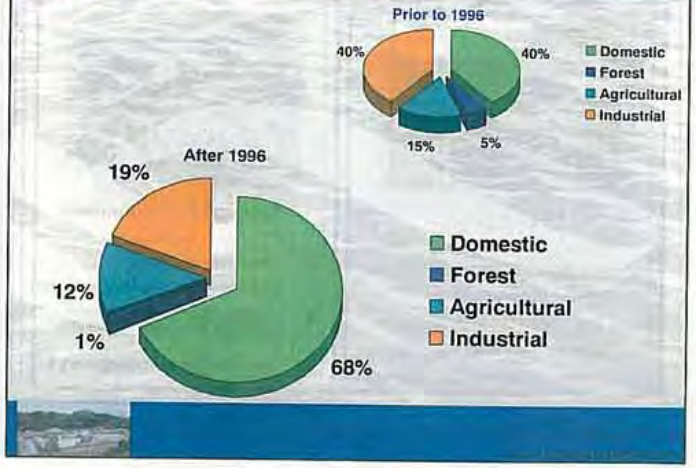
**2 Dagat-Dagatan System**
- aerated lagoon
- 18 km sewer network
- 333 ha area served

**3 Magallanes System**
- Activated sludge WwTP
- 73 km sewer network
- 600 ha area served

**4 Quezon City Separate System**
- 31 communal septic tanks
- 114 km sewer network
- 1,300 ha area served

Manila Water

## Organic Pollution Loading in Laguna de Bay



Manila Water

## Approaches

1 Sewage Treatment Systems

2 Septic tank emptying and septage treatment

3 Community Sanitation Projects

Manila Water

## Sewerage and Septage Management


### Sewerage

Wastewater Treatment Plant (WwTP)

- With network of pipes leading to a centralized treatment plant
- best method to treat wastewater; complete treatment of sewage
- <5% of the Metro Manila population


### Septage Management

Septic Tank

- most common system
- 85% of the Metro Manila population
- most common form of sewage settlement tank; partial sewage treatment
- requires regular desludging every 6 years



Manila Water

## Sewerage – Accomplishments

- 26 Package WwTP completed in 2005
- Existing facilities rehabilitated
- Maintenance equipment procured


Manila Water

## Package Sewage Treatment Plants

Karangalan Village, Pasig

600-1,200 cum/day

UP Diliman

7,000 cum/day

## Sewerage – 2006-2010


## Sewerage – Beyond 2010

**Beyond MTSP (2011-2022)**

- Combined Sewage-Drainage Treatment Systems
- Eight (8) Catchment Areas
- Sewer Service Coverage to 63% of East Zone population by 2022


Target Combined Population: 9M



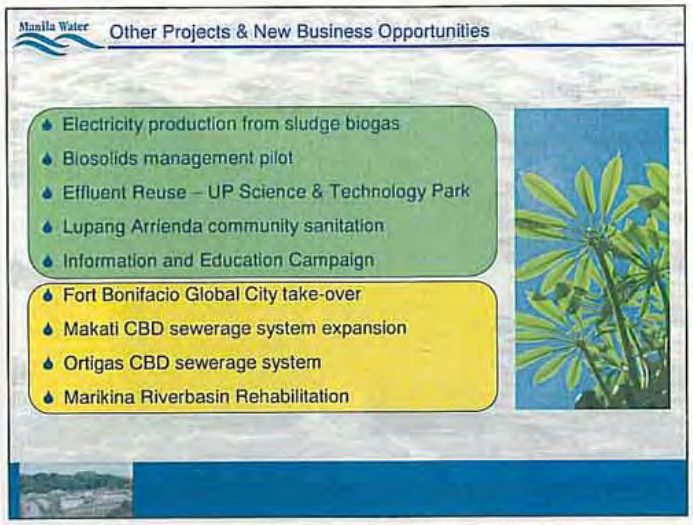
## Septic Tank Desludging Service

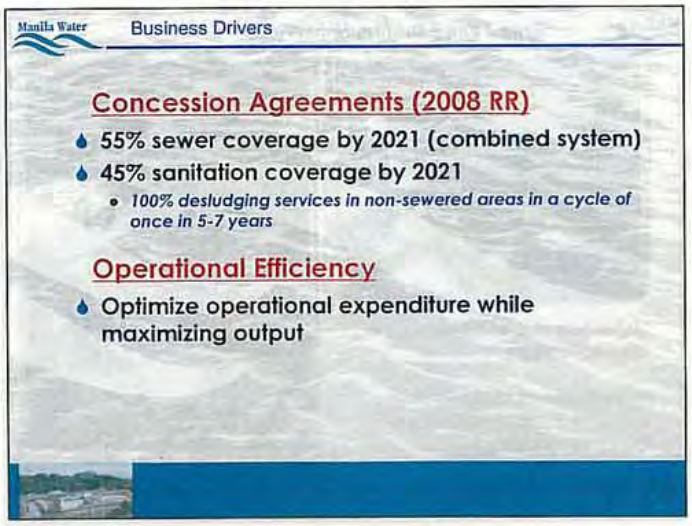
**Septage Plants operational by Q3 & Q4 2007**


## Septic Tank Desludging Service

More than 80% of MM households use septic tanks

More than half of wastewater pollution loading in MM come from households



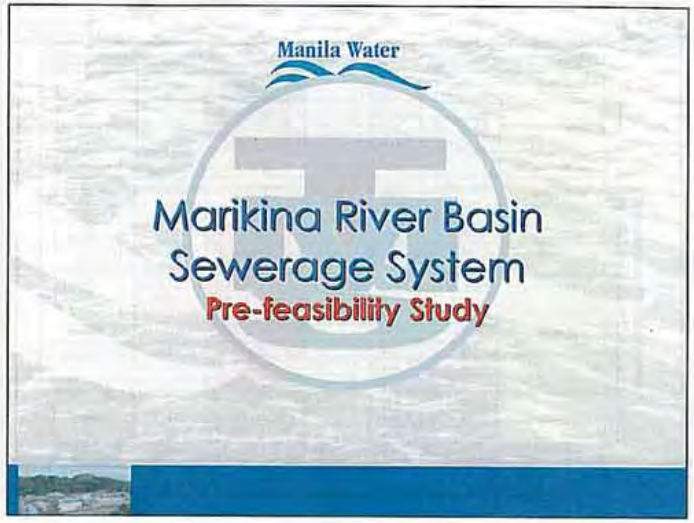


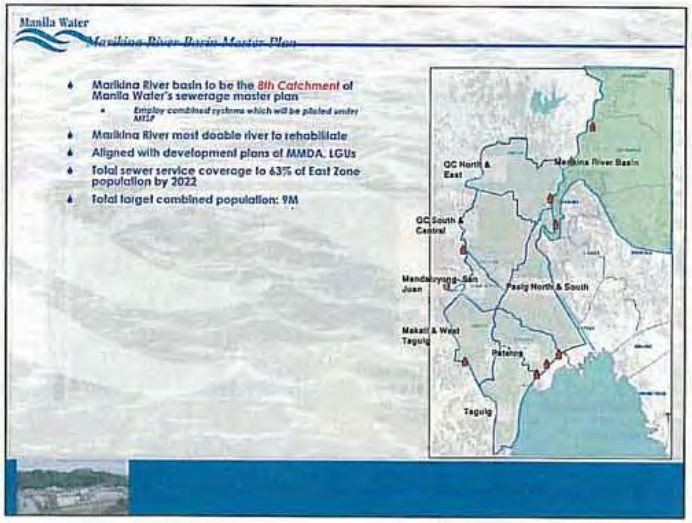

ANNEX 3

Proposed Project Plan

for

Marikina River Basin Sewerage System


Manila Water
Marikina River Basin
Sewerage System
Pre-feasibility Study


Manila Water
Marikina River Basin Master Plan
Marikina River basin to be the 8th Catchment of Manila Water's sewerage master plan
Employ combined systems which will be piloted under MRSP
Marikina River most doable river to rehabilitate
Aligned with development plans of MMDA, LGUs
Total sewer service coverage to 63% of East Zone population by 2022
Total target combined population: 9M
QC North & East
Marikina River Basin
QC South & Central
Mandaluyong-San Juan
Pasig North & South
Makati & West Taguig
Pateros
Taguig

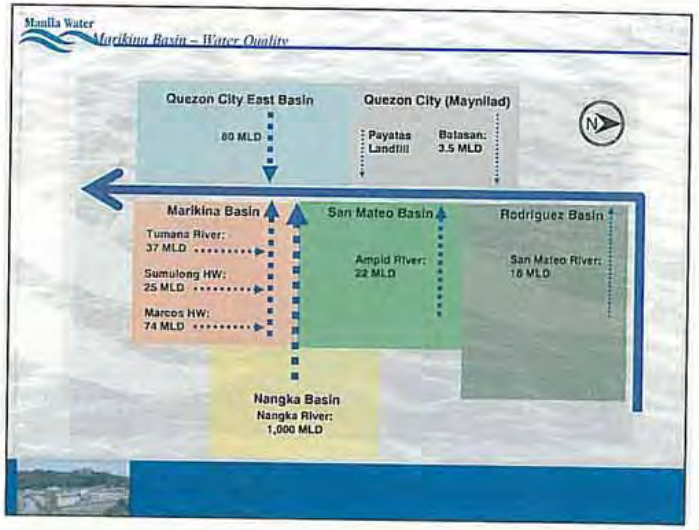
Manila Water

*Marikina River Basin Data*

| Subcatchment Area | Outfall code | Flow (m³/s) | Flow (mil | Water Quality | Area (km²) | Population |
|---|---|---|---|---|---|---|
| Montalban Watershed Area | - | n.d. | n.d. | | 269 | - |
| Montalban Urban Area | 1 | 0.01 | 1 | BOD: 100 COD: 200 | 86.5 | ~135,000 |
| | 2 | 0.04 | 3 | | | |
| | 3 | 0.13 | 11 | | | |
| San Mateo-QC | 4 | 0.26 | 22 | BOD: 50 COD: 100 | 68.8 (Includes Maynilad Area) | ~162,000 |
| Nangka River | 5 | 11.70 | 1,011 | BOD: 50 COD: 100 | 51.4 | ~51,000 |
| Marikina-QC | 6 | 0.43 | 37 | BOD: 100 COD: 200 | | ~391,000 |
| | 10 | 0.29 | 25 | | | |
| | 12 | 0.14 | 12 | | | |
| | 15 | 0.68 | 74 | | | |
| QC Ridge | 7 | 0.36 | 31 | BOD: 100 COD: 300 | 35.6 | ~26,000 |
| | 8 | 0.05 | 4 | | | |
| | 9 | 0.02 | 2 | | | |
| | 11 | 0.14 | 12 | | | |
| | 13 | 0.02 | 2 | | | |
| | 14 | 0.19 | 16 | | | |
| | 16 | 0.20 | 17 | | | |
| QC-Pasig | 17 | 0.03 | 3 | n.d. | 17.8 | ~17,512 |
| | 18 | 0.01 | 1 | | | |
| | 19 | 0.06 | 5 | | | |
| TOTAL | | 14.04 | 1,291 | | ~520 | ~795,512 |

Manila Water

*Marikina Basin – Water Quality*




Manila Water

*Marikina Basin – Water Quality*


Manila Water

*Immediate Plan*

| MARKETS | Feasibility | Cost M Php |
|---|---|---|
| 1. Sta. Elena Market | ✓ | 13.0 |
| 2. Malave Wet Market | | |
| 3. Concepcion Market | | |
| 4. Boy & Nita – Tumana | | |
| 5. People's Market, Tumana | ✓ | |
| 6. Fairlane Market / Greenheights | | |
| 7. Balubad Market | | |
| 8. Milan Flea Market | | |
| 9. New Parang Market | | |
| 10. Linda's Market | | |
| 11. Flor's Minimart | | |
| 12. TMD Market | | |

Manila Water
Potential Sites


Manila Water
Potential Sites




Manila Water
Potential Sites


Manila Water
Potential Sites

Manila Water
*Potential Sites*


Manila Water
*Potential Sites*




Manila Water
*Potential Sites*


Manila Water
*Marikina Basin – Long Term Plan*


| | | | |
|---|---|---|---|
| PhP, M | 2,486 | 2,480 | 988 |
| PhP, M | 359 | 306 | 239 |
| Cost, PhP M | 3,045 | 2,786 | 1,227 |
| Total, PhP M | 7,058 | | |

- Master plan FS under MTSP
- Terms of Reference for World Bank review




ANNEX 4

Presentation Material

for

Wrap-Up Meeting of JBIC's Yokohama Mission

# JBIC Yokohama Mission Wrap-Up Meeting

Marikina River Basin Development Project

February 22, 2008 at MMDA

Hozumi NAKATA,
Yokohama City Office

## Outline

1. The Present Issue
2. Approach to the Issue

2-1. Purification of Riverwater

2-2. Sanitary Condition in Metro Manila

2-3. Regulation

## 1. The Present Issue

- During dry season

  Only wastewater flow into the drainage, Cause of water pollution in Marikina, San Juan and Pasig River

- During wet season

  Wastewater & Storm water flow together in the drainage

  Water pollution is seemingly avoided through dilution.

## 2. Approach to the issue

**Short-term strategy (in next few years)**

2-1. Purify Riverwater

Because of Necessity and Urgency of purification of riverwater, treatment of the existing creek/drainage water before joining Marikina river is recommended through usage of existing structures.

**Long-term (in next decade)**

**2-2. Improve Sanitary Condition of Metro Manila**

Laying culvert/pipe instead of open drainage to keep smooth flow and to avoid contamination of water caused by solid waste

**2-3. Set up relevant Regulations**

To guide stakeholders with proper operation and maintenance, set-up of relevant regulations and monitoring and enforcement structure is necessary.



## 2-1. Purification of Riverwater

- Treatment of Creek/Drainage Water

*The conceptualized locations of the equipment*


Technical Issue

- Can we construct a treatment plant in the creek?
- Can we construct a treatment plant in the river?

## Creek in Marikina City

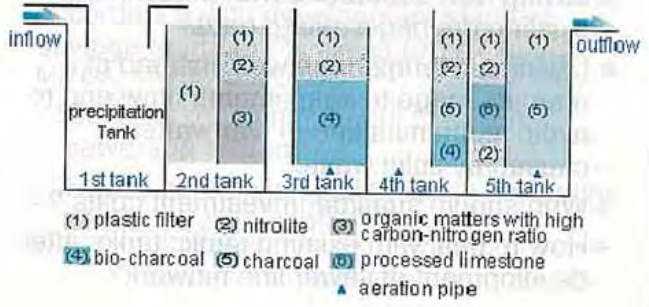
## Image of applicable facility in the creek with function of STP (Kubokawa-town in Japan)

## Marikina River



## Image of applicable facility in the river with function of STP (Shanghai in China)

## Treatment Process (example of Shimanto-gawa system)



## General Ability of this Facility

*Water quality at the inlet and the outlet of the equipment.*

| | BOD | | COD | | Total Nitrogen | | Total Phosphorus | | Detergents | |
|---|---|---|---|---|---|---|---|---|---|---|
| | inlet | outlet | inlet | outlet | inlet | outlet | inlet | outlet | inlet | outlet |
| average (mg/l) | 43.0 | 3.5 | 25.0 | 4.7 | 1.80 | 0.77 | 0.77 | 0.19 | 0.660 | 0.057 |
| maximum (mg/l) | 330.0 | 6.9 | 220.0 | 7.6 | 6.50 | 1.20 | 1.20 | 0.94 | 3.100 | 0.170 |
| minimum (mg/l) | 1.5 | 0.7 | 1.4 | 1.8 | 0.32 | 0.23 | 0.23 | 0.04 | <0.001 | <0.001 |

## 2-2. How to improve Sanitary Condition in Metro Manila

- Laying new separate sewer pipes in the existing drainages along roads
- Laying culvert/pipe network instead of open drainage to keep smooth flow and to avoid contamination of river water caused by solid waste

→ Who should shoulder investment costs ?

→ How to deal with existing septic tanks after development of sewer line network?



## Utilization of existing septic tanks

| Merit | Demerit |
|---|---|
| ➢Decrease of volume of sludge from STP<br>➢Decrease of capacity of STP | ➢Necessity of maintenance of septic tanks (regular desludging) and vacuum tank truck for ever |

## 2-3. How to set up relevant Regulations

- Revision of regulatory framework in accordance with development stage of sewage treatment facilities (DENR, DPWH, MMDA, MWSS and LGUs)
  - □Solid waste management to secure sewerage system
  - □House connection obligation to sewer line network by residents

# ANNEX 5

Photographs

2月18日(月)午後　MWCI技術指導

2月19日(火)午前 MWSS表敬訪問

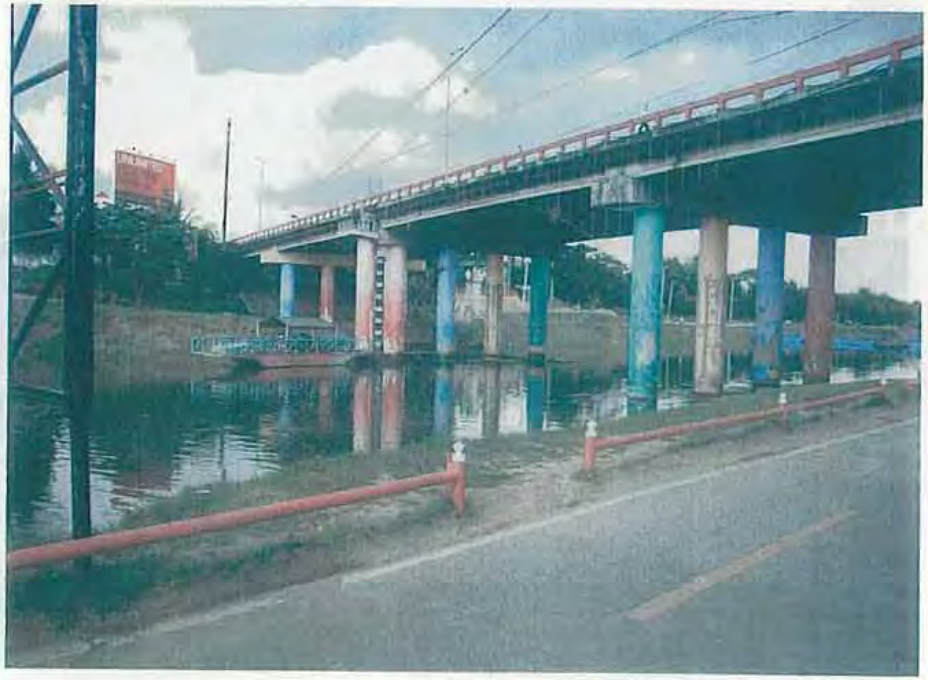
2月19日(火)午後 MWCI表敬訪問

2月19日(火)午後　MWCI表敬訪問

2月20日（水）午前　MMDA表敬訪問


2月２０日（水）午後　マリキナ市等視察－マリキナ川

2月２０日（水）午後　マリキナ市等視察－マリキナ川



2月20日（水）午後　マリキナ市等視察－マリキナ川とSTP予定地

2月20日（水）午後　マリキナ市等視察－STP予定地

2月20日（水）午後　マリキナ市等視察－汚泥処理施設

2月２０日（水）午後　マリキナ市等視察－汚泥処理施設

2月２１日（木）午前　MWCI調整会議

2月21日（木）午後　マンガハン放水路視察

2月21日（木）午後　ラグナ湖視察

2月22日（金）午前　Septic Tank引抜作業視察

2月22日（金）午前　Septic Tank引抜作業視察

2月22日（金）午前　マニラ首都圏家屋状況

2月22日（金）午前　水道メーターとバキューム車

2月22日（金）午後　Wrap-up meeting


2月22日（金）午後　Wrap-up meeting