RIVER OF LIFE: IMPLEMENTATION OF INTERCEPTOR
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• RIVER OF LIFE COMPONENTS
• OBJECTIVES OF INTERCEPTOR
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WHAT IS "RIVER OF LIFE"?
River of Life
Transforming Klang & Gombak Rivers into a **vibrant and liveable** waterfront with **high economic value**

- **2011**
  - **River Cleaning**
    - Clean and improve the **110km stretch river tributaries** along the Klang River basin from current Class III-V to **Class IIB by 2020**
    - Covers the municipal areas of:
      - Selayang (MPS)
      - Ampang Jaya (MPAJ)
      - Kuala Lumpur (DBKL)
  
  
- **River Beautification**
  - Masterplanning and beautification works will be carried out along a **10.7km stretch** along the Klang and Gombak river corridor
    - Significant landmarks in the area include Dataran Merdeka, Bangunan Sultan Abdul Samad and Masjid Jamek

- **Land Development**
  - Cleaning and beautification works will **spur economic investments** into the areas immediately surrounding the river corridor
    - Potential government land will be identified and tendered out to private developers through

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2011 - 2020
RIVER OF LIFE: RIVER CLEANING
TRANSFORMING THE KLANG RIVER REQUIRES AN INTEGRATED APPROACH THAT STOPS POLLUTION AT THE SOURCE

### Key Initiative

<table>
<thead>
<tr>
<th>Key Initiative</th>
<th>Description</th>
<th>Lead Agency</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Upgrading existing sewerage facilities is the most impactful and important initiative to reduce Klang river pollution</td>
<td>JPP</td>
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<td>2</td>
<td>Existing regional sewage treatment plants must be expanded to cater for future growth</td>
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<td>3</td>
<td>Wastewater treatment plants need to be installed at 5 wet markets to decrease rubbish and pollutants</td>
<td>DBKL</td>
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<td>4</td>
<td>Install additional gross pollutant traps will improve the river aesthetics and water quality</td>
<td>JPS Selangor/DBKL</td>
</tr>
<tr>
<td>5</td>
<td>Utilise retention ponds to remove pollutants1 from sewage and sullage</td>
<td>JPS WPKL</td>
</tr>
<tr>
<td>6</td>
<td>Relocation of squatters will significantly reduce sewage, sullage, and rubbish in the Klang river</td>
<td>MB Sel office/MPAJ</td>
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<tr>
<td>7</td>
<td>Implement the Drainage and Stormwater Management Master Plan to upgrade drainage systems</td>
<td>BPB JPS</td>
</tr>
<tr>
<td>8</td>
<td>Systematic hydrological study and rehabilitation of the river are needed for flow control</td>
<td>BPLS JPS</td>
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<tr>
<td>9</td>
<td>Promote, enforce, and manage river cleanliness and health – erosion from urban development</td>
<td>BSMA JPS</td>
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<tr>
<td>10</td>
<td>Promote, enforce, and manage river cleanliness and health – restaurants, workshops, and other commercial outlets</td>
<td>JKT</td>
</tr>
<tr>
<td>11</td>
<td>Promote, enforce, and manage river cleanliness and health – industries that generate wastewater/effluent</td>
<td>DOE</td>
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<tr>
<td>12</td>
<td>Promote, enforce, and manage river cleanliness – general rubbish disposal</td>
<td>JPS/JPSPN</td>
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<tr>
<td>13</td>
<td>Interceptor System</td>
<td>DBKL/JPS</td>
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### Class III & IV
- unsafe for body contact

### Class IIB
- recreational use with body contact

**Aspiration**

- **1**. Upgrading existing sewerage facilities is the most impactful and important initiative to reduce Klang river pollution

- **2**. Existing regional sewage treatment plants must be expanded to cater for future growth

- **3**. Wastewater treatment plants need to be installed at 5 wet markets to decrease rubbish and pollutants

- **4**. Install additional gross pollutant traps will improve the river aesthetics and water quality

- **5**. Utilise retention ponds to remove pollutants1 from sewage and sullage

- **6**. Relocation of squatters will significantly reduce sewage, sullage, and rubbish in the Klang river

- **7**. Implement the Drainage and Stormwater Management Master Plan to upgrade drainage systems

- **8**. Systematic hydrological study and rehabilitation of the river are needed for flow control

- **9**. Promote, enforce, and manage river cleanliness and health – erosion from urban development

- **10**. Promote, enforce, and manage river cleanliness and health – restaurants, workshops, and other commercial outlets

- **11**. Promote, enforce, and manage river cleanliness and health – industries that generate wastewater/effluent

- **12**. Promote, enforce, and manage river cleanliness – general rubbish disposal

- **13**. Interceptor System

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1. Aspiration and the different classes of use indicate the level of safety and appropriateness for various activities within the river environment.
River Cleaning Structures in River of Life Catchment Area

Site No. 1 – Puah Pond
Site No. 2 – RWTP Sg. Sering
Site No. 3 – WWTP Pasar Air Panas
Site No. 4 – Bunus STP

01 PUAH POND
02 GPT
03 HYDROSEEDING
04 FLOATING WETLAND
05 SUBMERGED SOLAR AERATOR
06 FLOOD MITIGATION
07 RWTP (Sg. Sering)
08 FLOOD MITIGATION SYSTEM
09 RWTP (Pasar Air Panas)
10 WWTP (Pasar Air Panas)
RIVER OF LIFE: RIVER CLEANING
STRUCTURE MEASURE FOR RIVER CLEANING

KI 1 & KI 2: JPP
Upgrading Sewerage Treatment Plant

KI 3 & KI 4b: DBKL
Waste Water Treatment Plant

KI 4a: JPS
Gross Pollutant Trap

KI 5: JPS
Puah Pond

KI 5: JPS
Floating Wetland

KI 7: JPS
Gross Pollutant Trap

KI 5: JPS
River Water Treatment Plant

KI 5: JPS
Mechanically Stabilized Earth Wall
River of Life: *Structure Measure for River Cleaning*

KI 10 : JKT

Grease Trap

KI 13 : JPS

Interceptor

Interceptor
MASJID JAMEK – CONFLUENCE of KLANG AND GOMBAK RIVER
Hydraulic Tilting Gate

Steel Tilting Gate (Hydraulic Type)

Technical Data:
- **Product** = Hydraulic Collapsible Gate
- **Material** = Stainless Steel
- **Operation Method** = Hydraulic Cylinder
- **Maximum Recommended Height** = 10m
- **Warranty Period** = 5 years
- **Life Span** = Approx. 40-50 years depends on site conditions and usage's frequency
OBJECTIVE

To implement an interceptor pipeline and waste water treatment system to improve the river water quality for 10.7 km of Sg. Gombak & Sg. Klang within RoL area so as to create a clean & aesthetically pleasing river front for the city of Kuala Lumpur.
SCOPE OF WORKS
**Project goal:** To improve water quality by intercepting and treating dirty drain water:

- To intercept dry weather and first flush flows from drains that discharge to Sg. Klang and Sg. Gombak

- First flush flow is defined as 5% of 1 month ARI storm event

- Treat the intercepted flow to Class IIB water quality and return to the river
SOURCE OF POLLUTION

- Connections from Kitchens
- Sullage water discharging into the drain without treatment
- Leaking Sewer Pipe
- Overflow Illegal Sewer Connection
BASIC CONCEPT OF INTERCEPTOR SYSTEM

- Divert low flow & first flush to interceptor pipeline while excess high flows will bypass at Combined Stormwater Overflows (CSO) & discharge to rivers.
- Install pipelines along both banks of rivers to collect polluted discharges (sullage) from drainage outlets & convey to treatment plants (RWTP).
- Intercepted discharges after being treated at River Water Treatment Plants (RWTP) will be released back to the river.
- To have CSO, pump stations and most part of treatment plants below ground as far as possible.
Existing Drainage Interceptor will channel sullage/trade waste first to treatment plant.

Sullage/trade waste is then treated at river water treatment plants before discharge.

During heavy rainfall, excess stormwater will directly discharge into river.

Interceptor System

A Interceptor will channel sullage/trade waste first to treatment plant

B Sullage/trade waste is then treated at river water treatment plants before discharge

C During heavy rainfall, excess stormwater will directly discharge into river
• CSO - Divert the Polluted Low flows from the drainage outlets to the interceptor pipe lines
• Able to pass a discharge up to the capacity of the existing drainage during high flows and divert to the interceptor pipelines a flow equal to 5% of the 1 month ARI storm discharges
During high flow, the CSO-two chamber in-line structure located slightly upstream of the drainage outlet. The main chamber receives the inflow from upstream and the low weir located on the chamber floor will divert the low flow and initial storm discharge to the adjacent chamber GPT. Non-return check valve installed at the downstream end of the CSO to minimize backflow of water.
PROPOSED LOCATIONS OF PIPELINES

Pipeline in bank (cut & cover)

Pipeline in bank (Pipe-jacking)
SCHEMATIC LAYOUT OF INTERCEPTOR SYSTEM ...
SCHEMATIC LAYOUT OF INTERCEPTOR SYSTEM...
INTERCEPTOR PRECINCT 7 : PHASE 1
PROJECT LOCATION
• 4 Wastewater Treatment Plants (WWTP) treated to Class IIB effluent quality:
  □ Plant 1 - 4.7 m³ / min
  □ Plant 2 - 3.7 m³ / min
  □ Plant 3 - 2.1 m³ / min
  □ Plant 4 - 1.5 m³ / min

• 24 Combined Stormwater Overflows (CSOs):
  □ 8 pumped CSOs complete with gross pollution trap/screen
  □ 16 non-pumped CSOs

• 2 fully underground Pumping Stations of the following capacities:
  □ Pump Station PS2 - 1.82 cu.m / min
  □ Pump Station PS3 – 10.8 cu.m / min

• Approximately 2.25 km of pipelines (gravity and pumped)
L1: Treated at site
L2: Treated at site
TREATMENT PLANT NO 1

PROPOSED TREATMENT PLANT NO 1

DATARAN MERDEKA
TREATMENT PLANT NO 2

PROPOSED TREATMENT PLANT NO 2

MÁŠID JAMIK
TREATMENT PLANT NO 3

PROPOSED TREATMENT PLANT NO 3
TREATMENT PLANT NO 3
TREATMENT PLANT NO 4

PROPOSED TREATMENT PLANT NO 4

DAYA BUMI

LRT PASAR SENI
PLANT1 TYPICAL CROSS SECTION

WWTP located in the public open space that is being developed and improved in the beautification works projects. In order to prevent any clash or adversed impact on beautification projects, WWTP are located below ground with minimal impact above ground features.
The proposed plant are Submerged Biofilter capable consists of solid phase for microbiological growth, liquid phase in which the solids are submerged and gas phase created by the input of air to the biofilter. The plant shall be able to provide self regulating natural conducive environment for the growth of aerobic micro-organism that are able to remove BOD, ammonical nitrogen and suspended solid.
PRIMARY TREATMENT – GPT / SC REEN

Captures:
>95% of gross pollutants >3mm
>50% of gross pollutants >1mm
>70% of O&G with additional absorbents
SECONDARY TREATMENT - BIOREACTOR
Biofilter Media:

- Media with excellent microorganism attachment capabilities, including high initial attachment rate (>25 mg MLSS/m²/hr)
- Long endurance (lifespan not less than 20 years)
- Media material contains mineralised plastic: zeolite (40%) and polyethylene (60%)
- Hydrophilic nature with contact angle less than 90 degrees
- High surface roughness of media material
- Specific surface area of 500 m²/m³
- Liquid fraction of 60%
TERTIARY TREATMENT - CARTRIDGE FILTER

- Removes particles up to 93 micron
- Removes up to 92% TSS (20-2000 micron)
- Each cartridge treats up to 16L/s
### DESIGN FLOWS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Plant 1</th>
<th>Plant 2</th>
<th>Plant 3</th>
<th>Plant 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak pumped flow from balance tank</td>
<td>25.9 L/s</td>
<td>20.7 L/s</td>
<td>11.7 L/s</td>
<td>24.7 L/s</td>
</tr>
<tr>
<td>Reactor volume (at min. water level)</td>
<td>145.0 m³</td>
<td>497.1 m³</td>
<td>183.6 m³</td>
<td>47.9 m³</td>
</tr>
<tr>
<td>Liquid volume (at min. water level)</td>
<td>95.7 m³</td>
<td>328.1 m³</td>
<td>121.2 m³</td>
<td>32.2 m³</td>
</tr>
<tr>
<td>HRT at peak flow (on reactor volume)</td>
<td>1.6 hr</td>
<td>6.7 hr</td>
<td>4.4 hr</td>
<td>0.54 hr</td>
</tr>
<tr>
<td>Liquid depth (at min. water level)</td>
<td>4.4 m</td>
<td>4.0 m</td>
<td>4.0 m</td>
<td>3.55 m</td>
</tr>
</tbody>
</table>

Each WWTP should be able to accommodate both the dry weather flow which is anticipated to occur for the vast majority of the time, and wet weather which is equivalent to 5% of first flush of 1 month ARI storm event. The maximum design inflow and the plant required capacity shall be 1.15 times the wet weather flow capacity.
Water quality was collected during dry weather for the drains with outlets that discharge to Sungai Klang and Sungai Gombak. Dry weather quality data represent the flow weighted dry weather influent for each WWTP.
CONTROL AND OPERATION

- Each plant operates automatically under PLC control connected to a SCADA system
- Fully automatic control and operation of the process and all equipment:
  - Level switches for pump control with additional low flow/level switch to prevent dry run.
  - High water level switch to indicate overflow of balance tank and cut-off inflow from pumped CSOs
  - High level alarm switch for sump in equipment room
  - Visual pressure gauges on aeration blowers: incoming air gauge to check for air filter clogging, and discharge pressure gauge
  - Variable speed drive to control aeration blower speed based on DO reading
### TARGET CLASS IIB EFFLUENT QUALITY

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target Value</th>
</tr>
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<tbody>
<tr>
<td>BOD</td>
<td>3 mg/L</td>
</tr>
<tr>
<td>COD</td>
<td>25 mg/L</td>
</tr>
<tr>
<td>NH3-N</td>
<td>0.3 mg/L</td>
</tr>
<tr>
<td>SS</td>
<td>50 mg/L</td>
</tr>
</tbody>
</table>
PHOTOS DURING CONSTRUCTION
CONSTRUCTIONS OF CSO AT PLANT 1
PLANT 1

BIO REACTOR AND CLARIFIER ROOM
Installation of cartridge filter

Loading the media into the plant
PLANT 1

Installation of diffuser

Installation air blower
PLANT 2
PLANT 2 – SLUDGE HOLDING TANK, BIOREACTOR, CLARIFIER & BALANCE TANK

- Installation of water tight cover
- Installation of pump in balance tank
- Installation of water tight cover
PLANT 2 – SLUDGE HOLDING TANK, BIOREACTOR, CLARIFIER & BALANCE TANK
PIPE LINE CONSTRUCTIONS
PLANT3
Pipeline installation

Installation of water tight cover
Combine Sewer Overflow (CSO) Pipeline

Formwork CSO 4-1-1

Concreng CSO 2-1-1
Combine Sewer Overflow (CSO) Pipeline

Pump Installation
CSO 2-3-3

Pump Installation
CSO 1-1-2
CONCLUSION

• Interceptor is one of the initiative implemented by government to improve of the water quality.
• Operation and Maintenance is a key success of the interceptor project.
• Precint 7 Interceptor Project now is under testing and commissioning. Water Quality Class IIB from the treatment facility expected can be achieve after 3 month operation.