

BENEFICIAL RE-USE OF TREATED SEWAGE EFFLUENT

**Presented
By**

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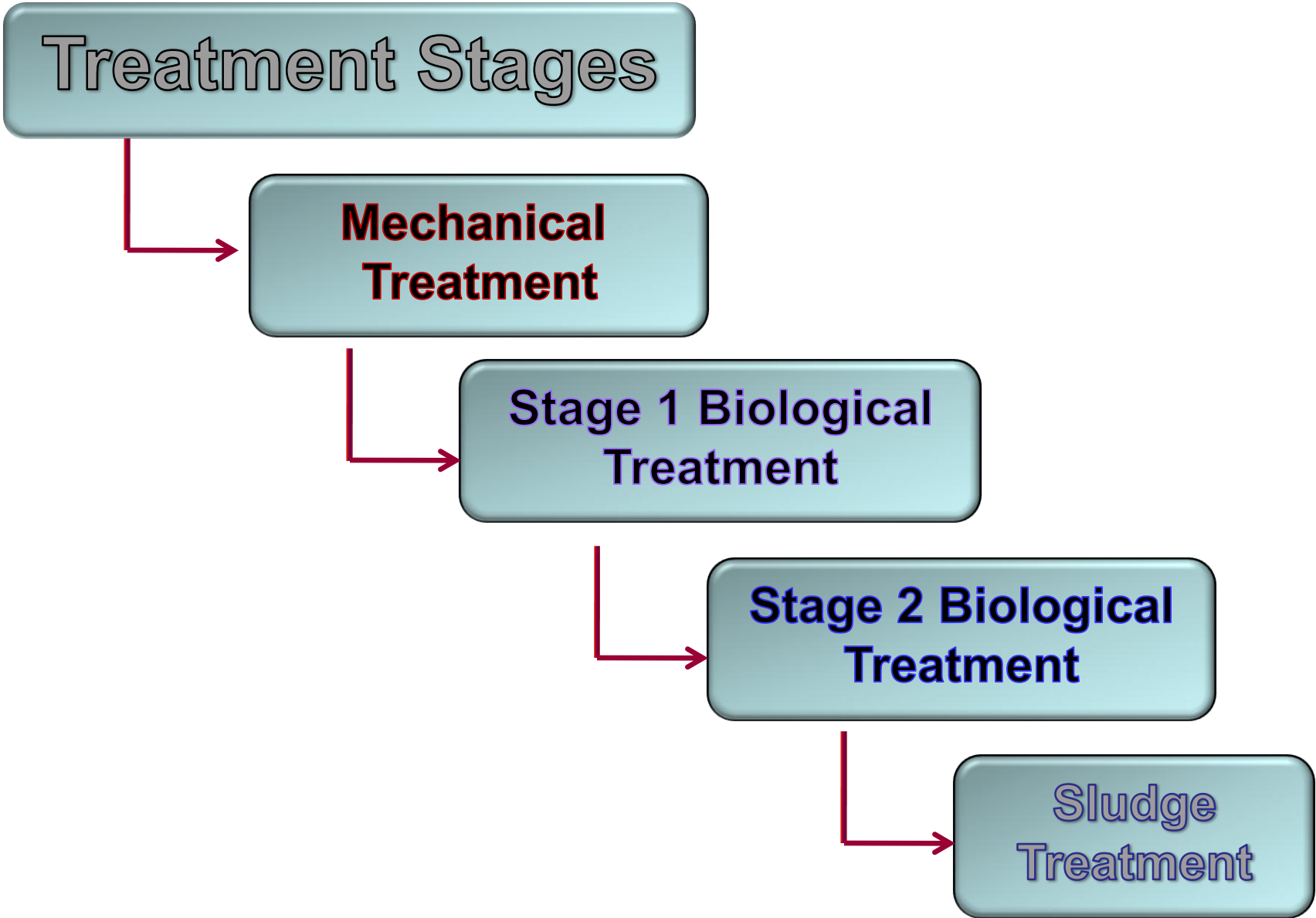
TSE reuse in 4 x application directions:

1. Discharge of TSE to the creeks, rivers, natural lakes and the sea to maintain natural balance of water.
2. Irrigation water for greenery covered areas (gardens, lawns, parks).
3. Industrial water for chilled water network of extended air conditioning systems.
4. Decorative facilities like park pools, ponds of golf clubs, lakes of prestigious buildings.

Typical lay-out of Sewage Treatment Plant (STP) comprises:

1. Mechanical Treatment.
2. Biological Treatment.
3. Tertiary Treatment with filtration and disinfection to achieve high quality of TSE.
4. Sludge Handling Zone.
5. Chemical Treatment at any stage of process.

Treatment Stages



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graph TD; A[Treatment Stages] --> B[Mechanical Treatment]; B --> C[Stage 1 Biological Treatment]; C --> D[Stage 2 Biological Treatment]; D --> E[Sludge Treatment];
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The diagram illustrates a five-stage wastewater treatment process. It begins with a box labeled 'Treatment Stages' at the top left. A red arrow points down and then right to a box labeled 'Mechanical Treatment'. From there, another red arrow points down and right to 'Stage 1 Biological Treatment'. This pattern continues with a third red arrow pointing down and right to 'Stage 2 Biological Treatment', and a final red arrow pointing down and right to 'Sludge Treatment' at the bottom right. All boxes are light blue with rounded corners and a slight shadow. The text in the boxes is in a serif font, with the first box in a larger, lighter blue font and the subsequent boxes in a smaller, darker blue font.

**Mechanical
Treatment**

**Stage 1 Biological
Treatment**

**Stage 2 Biological
Treatment**

**Sludge
Treatment**



Screen Building (JASTP)

Screens

1. STP must be safeguarded by Coarse Screens (10 – 15 mm spacing).
2. Fine Screening Requirement:
 - A. 6 mm bar spacing or punched holes for conventional STP
 - B. MBR Plant preferred: <1 mm mesh or punched hole screening

Efficient Screening and how it works (at 6 mm perforation)





Primary Settling Tank (WSTP)



Invent Aeration (JASTP)



Surface Aerators (WSTP)



RAS Screw Pumps (WSTP)



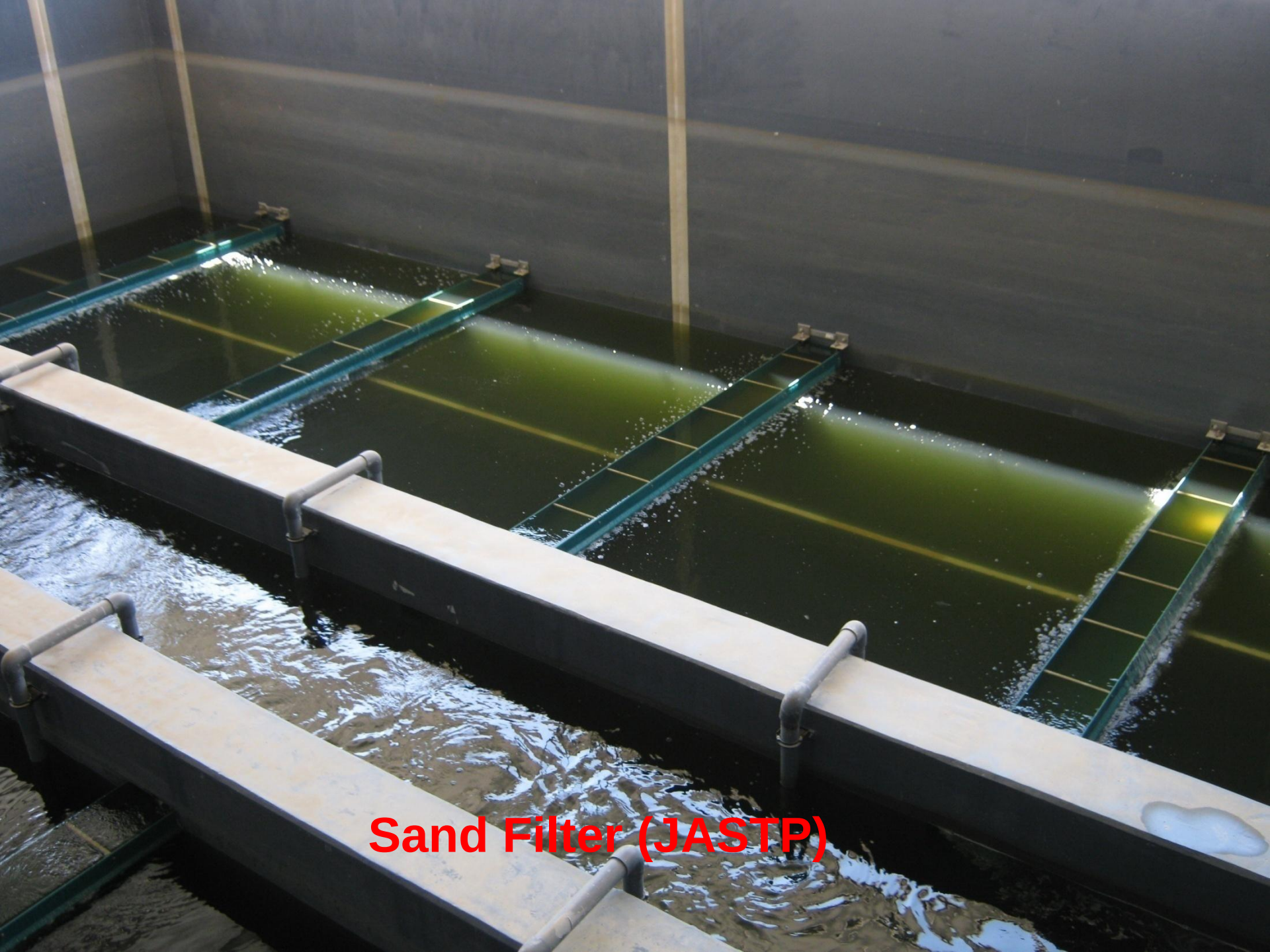
Secondary Settling Tank (WSTP)

Sand Filtration and Disinfection

- **Gallery of Sand Filters, each of them filled with layers of sand in different particle size**
- **Residual suspended solids will be removed from the bio- treated effluent.**



Sand Filter (JASTP)



Sand Filter (JASTP)

Disinfection can be achieved by application of facilities as follows:

1. Traditional Chlorination.
1. Ozonation (by generation of Ozone).
2. Ultra Violet (UV) Radiation.

Chlorination usually consists of two stages:

1. Pre-chlorination is done:

A. Before or after sand filters.

B. Prior to effluent storage basins.

2. Post chlorination, which maintains residual chlorine just before pumping the water for irrigation to the city.



Chlorination (WSTP)

The image shows a close-up of a metal frame, likely part of a laboratory or industrial equipment. The frame is made of dark metal bars. Inside the frame, there are several cylindrical components, which are UV lamps, arranged in a grid-like pattern. The lamps are dark and have a metallic finish. A bright, vertical light source is visible on the right side of the frame, creating a strong glare. The background is a light-colored, textured surface.

UV Lamps (JASTP)



UV Disinfection (JASTP)



UV Lamps (JASTP)

**Quality of
Treated Sewage Effluent
(TSE) Filtered Water
from Biological Activated
Sludge Process Plant
as follows:**

Parameter	STP Eff. Jabel Ali	DM Standard	
		Drip	Spray
pH	7.2	6 - 8	6 - 8
Suspended solids (mg/L)	<5	50	10
Biological Oxygen Demand (mg/L)	1.5	20	10
Chemical Oxygen Demand (mg/L)	<20	100	50
Ammonia - Nitrogen (mg/L)	<2	5	1
Fecal Coliform (number/100 ml)	Nil	500	20



Dubai City Landscaping

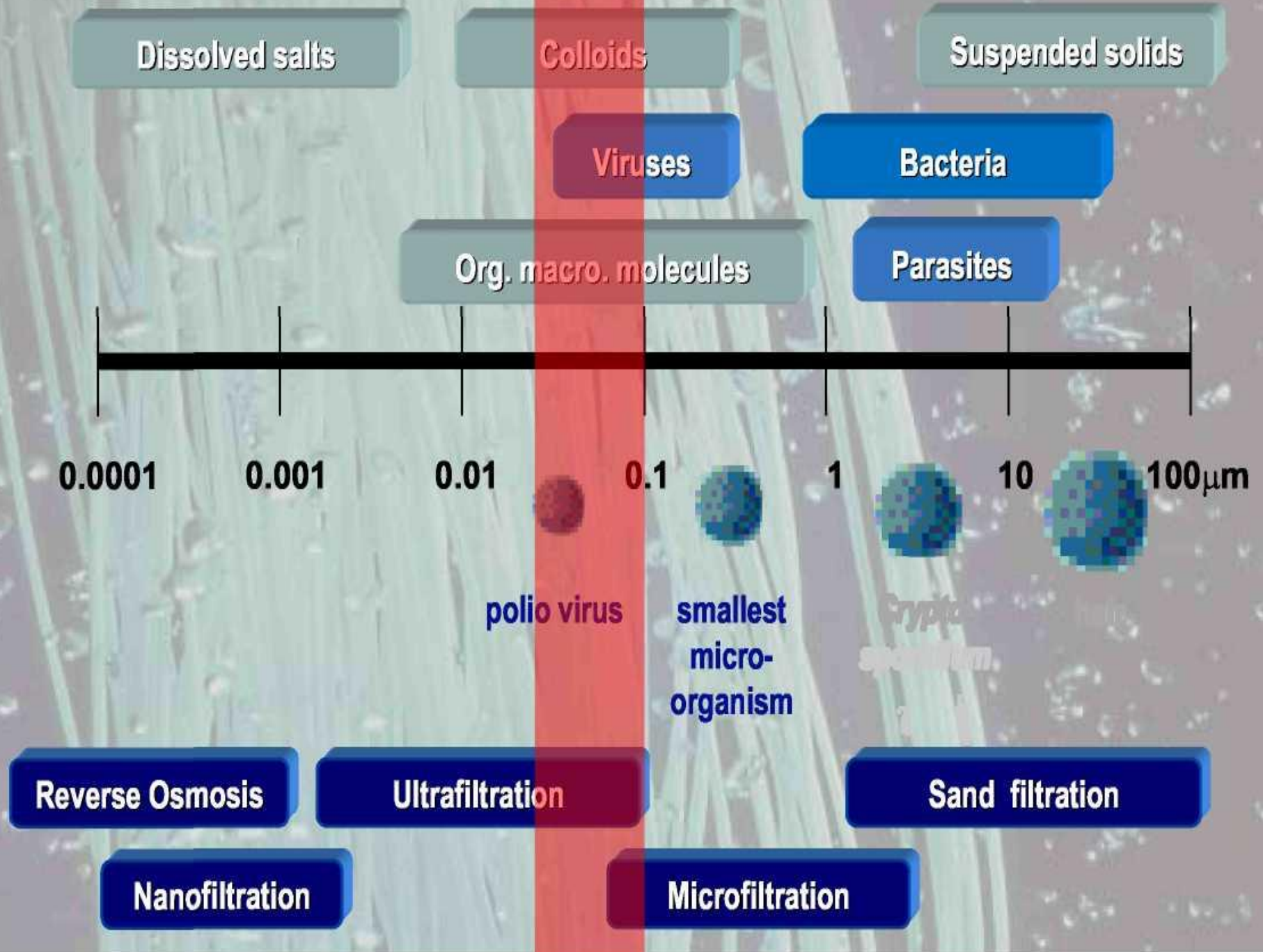


Public Parks & Neighborhood

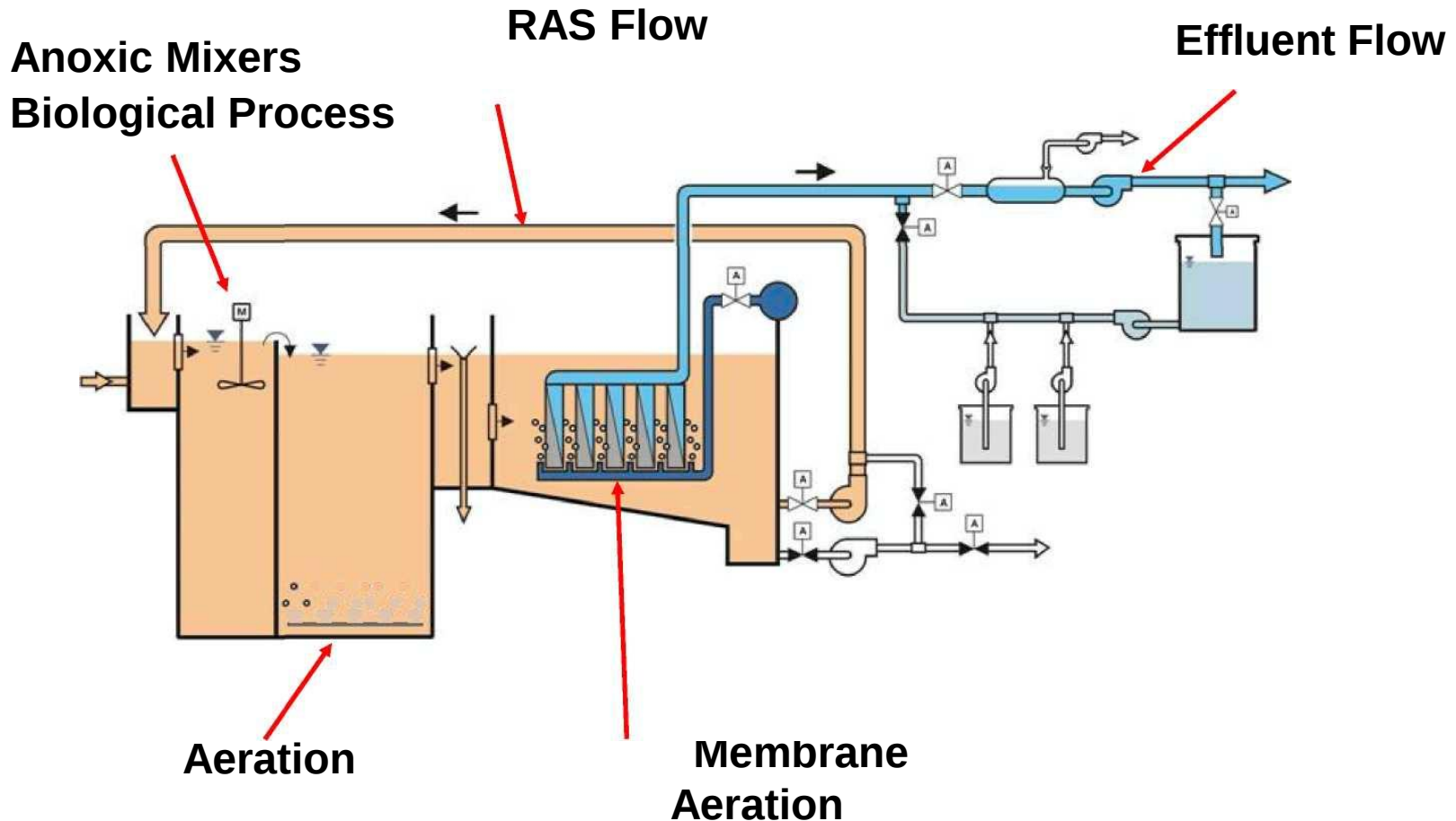
Market Price Comparison:

S.NO.	Water Type	Price (Dhs) per Cubic Meter
1	STP Effluent	1.1
2	Potable (drinking) water from DEWA	7.7

Filtered (10 micrometers)TSE from traditional Sewage Treatment Plant (STP) or final product of Membrane Bio-Reactor (MBR) process may go for further treatment by Reverse Osmosis (RO) to receive high quality Permeate.



Typical MBR Plant





MBR Modules



MBR Modules



Reverse Osmosis (RO) Plant

Effluent Parameters of MBR followed by RO.

Permeate is suitable to fill decorative lake.

Water Parameter	Units	MBR TSE	RO Permeate
TDS	mg/L	1500	100
Total Hardness CaCO ₃	mg/L	400	5
Calcium	mg/L	64	4
Chloride	mg/L	800	40
T-alkalinity	mg/L	70	60
PH (dimensionless)		6-8	7.5-8.0
Electrical Conductivity	(μ S/cm)	250	130



Dubai Lake

Effluent Quality Defined by Discharge Point or Re-use

Parameter	Irrigation Water	Decorative Waters	Marina Water
E. Coli (per 100 mls)	2.2	<100	2.2
Pseudomonas aeruginose (per 10 mls)			
Nitrate – NO ₃ (mg/l)			
Nitrite – NO ₂ (mg/l)			
BOD (mg/l)	<5	<25	<5
Total Nitrogen (mg/l)		<10	<10
Total Suspended Solids (mg/l)	<5		<5
Total Phosphorous (mg/l)		<1	<1
pH	6-9	6-9	6-9
Conductivity (µS/cm)	<700		<700

Effluent Quality Defined by Discharge Point or Re-use (cond....)

Parameter	Irrigation	Discharge Rate	Effluent Quality
Turbidity (NTU)	<0.5		<0.5
Total Hardness - CaCO ₃ (mg/l)			
Ammonia – NH ₄	<2		<2
Chloride – Cl (mg/l)	<100		<100
Sodium – Na (mg/l)	<70		<70
Sulphate – SO ₄ (mg/l)			
Manganese – Mn (mg/l)			
Iron – Fe (mg/l)			

Cooling water Make-up Effluent Quality

Parameter	Value
Chlorides (ppm)	80-90
Alkalinity (ppm)	60-70
Ca Hardness (ppm)	50-70
El. Conductivity ($\mu\text{S}/\text{cm}$)	400-500
pH	7.5-8.0
TDS (ppm)	270-350
Total Hardness (CaCO_3) - ppm	75-85



Chilled Water System (WSTP)



Decorative Pool (WSTP)

Thank you for
Attention