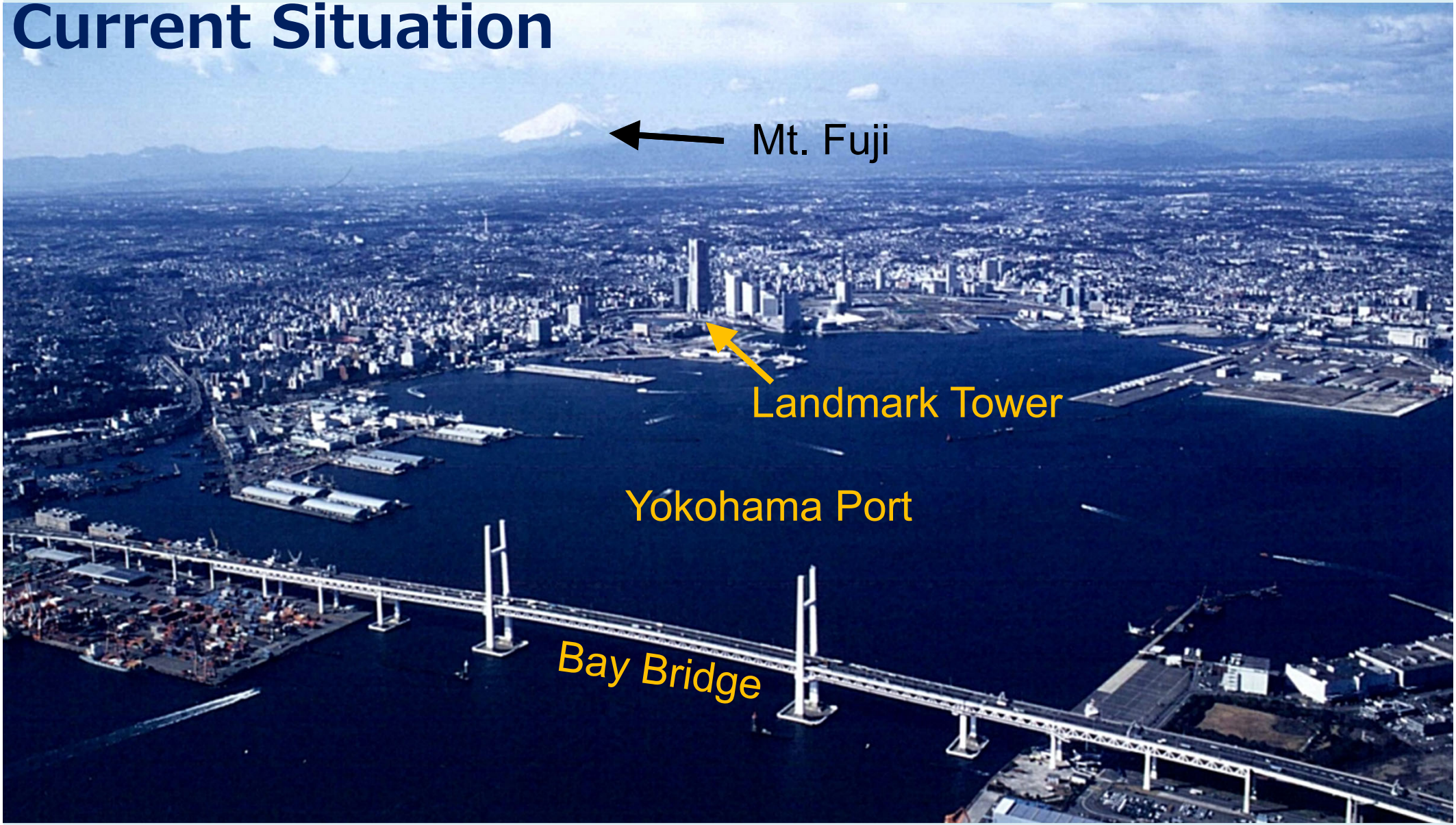
Sewerage Works in Yokohama

January 31st, 2024

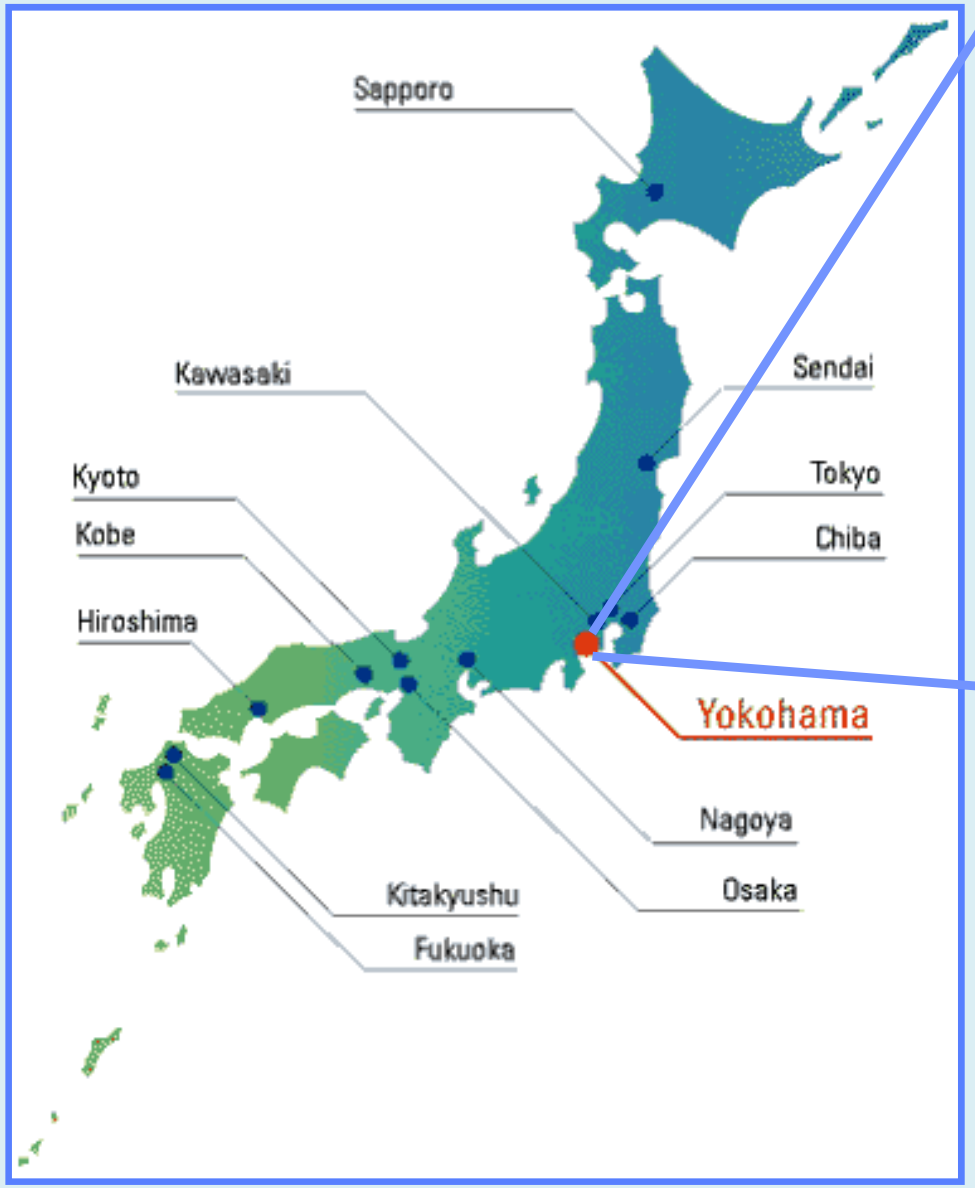
Environmental Planning Bureau
City of Yokohama

Outline of City of Yokohama

Current Situation



Outline



Information (2022)	
City Area	435 ㎢
Population	3.8 million
Household	1.8 million
Total Budget	25.4 billion USD

（JPY/USD=150）

International City

Nissan Stadium, where the final game of Rugby World Cup 2019 was held.

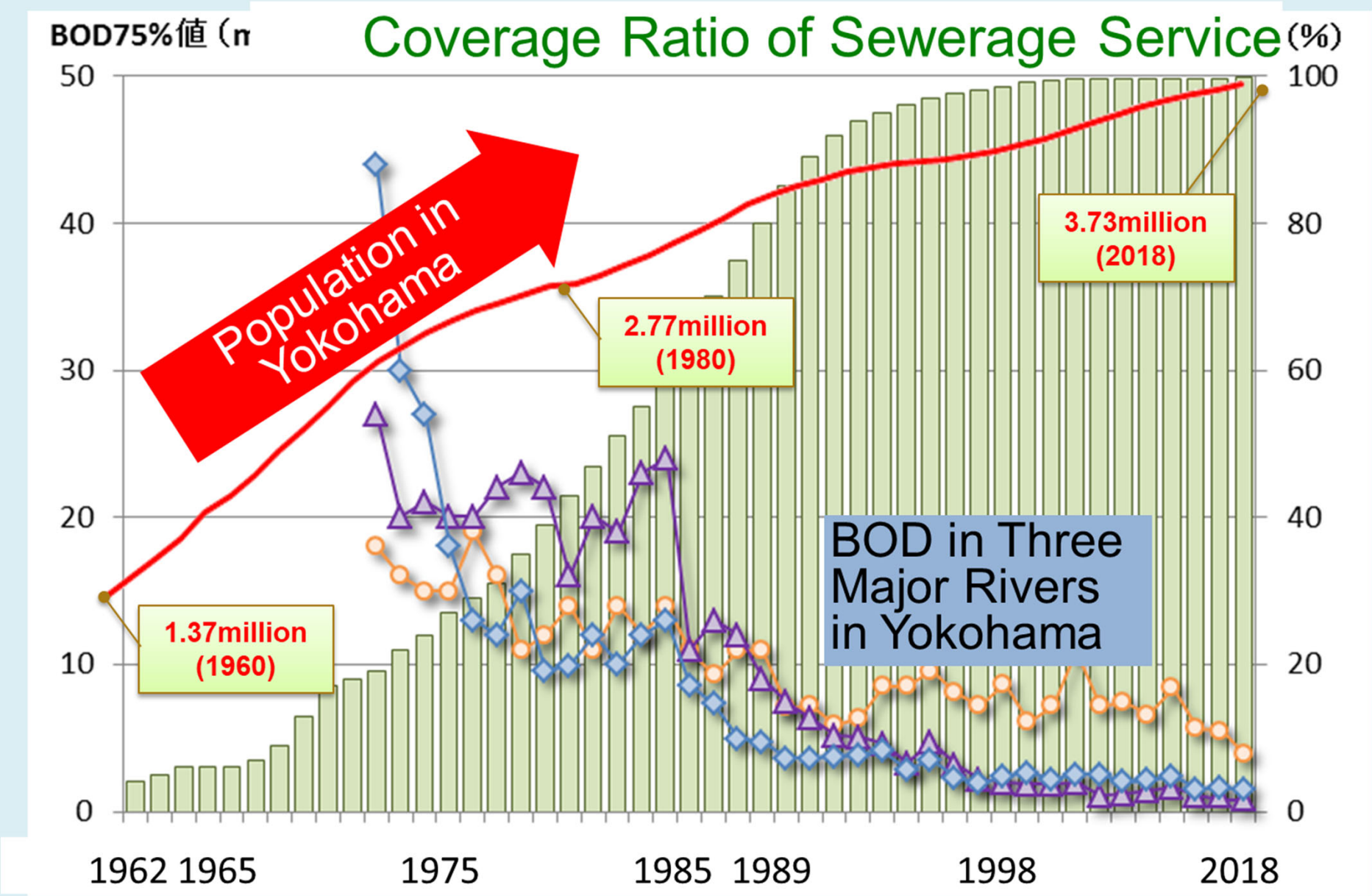
Pacifico Yokohama hosts the largest number of international conferences in Japan by venue. (2019)

M	Meeting
I	Incentive Travel
C	Convention
E	Event/Exhibition

International conventions

180times (2019)

Sewerage Development



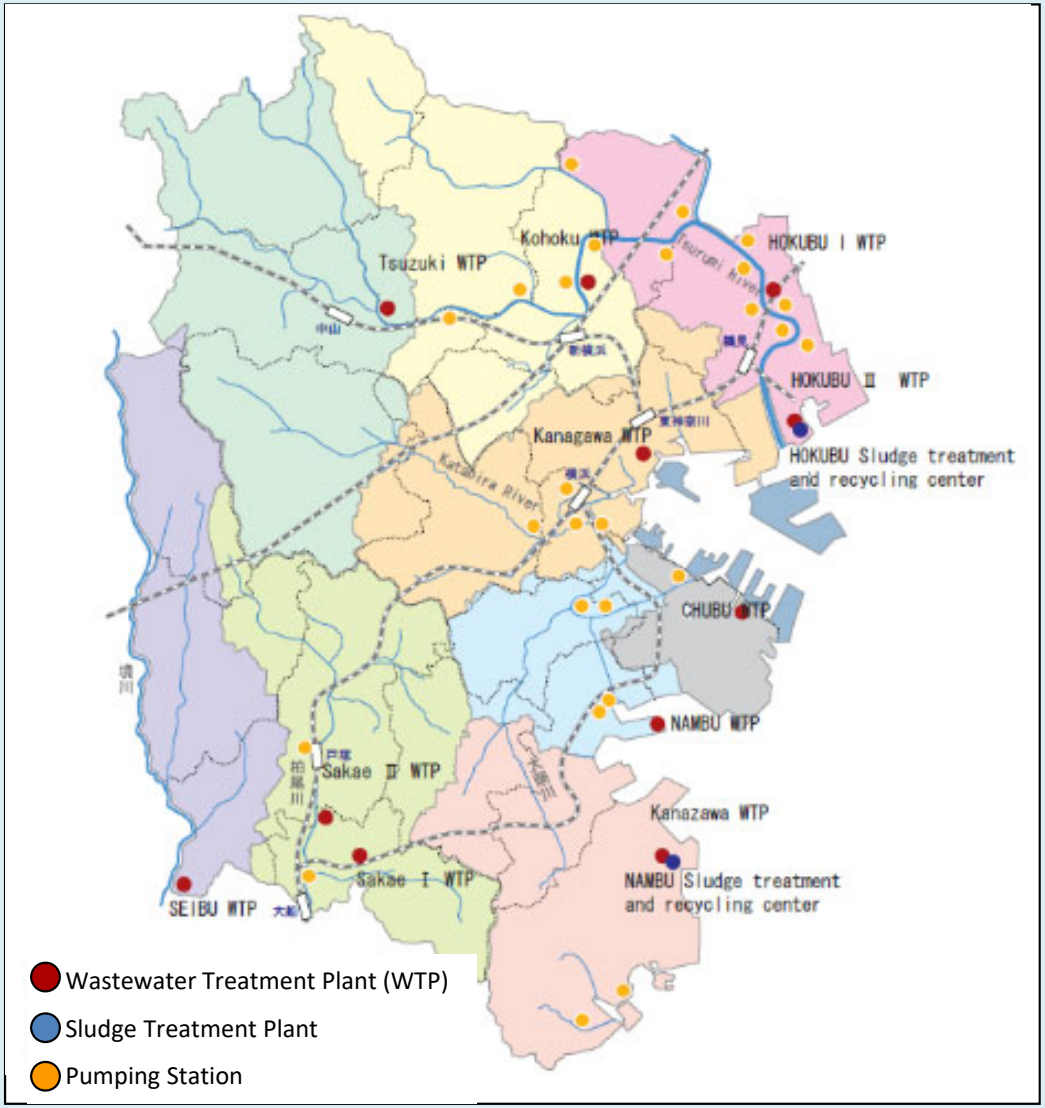
Treated Water in Yokohama　BOD　3.7mg/l（2010）

大変きれいな水 BOD3.0mg/ℓ以下	きれいな水 BOD3.0～5.0mg/ℓ	やや汚れている水 BOD約5.0～10.0mg/ℓ	汚れている水 BOD約10.0mg/ℓ以上
 シマドジョウ	 アユ	 モツゴ	 イトミミズ
 アブラハヤ	 メダカ	 フナ類	 セスジユスリカ

ＢＯＤ Biochemical Oxygen Demand
Biochemical oxygen demand or B.O.D. is the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period.

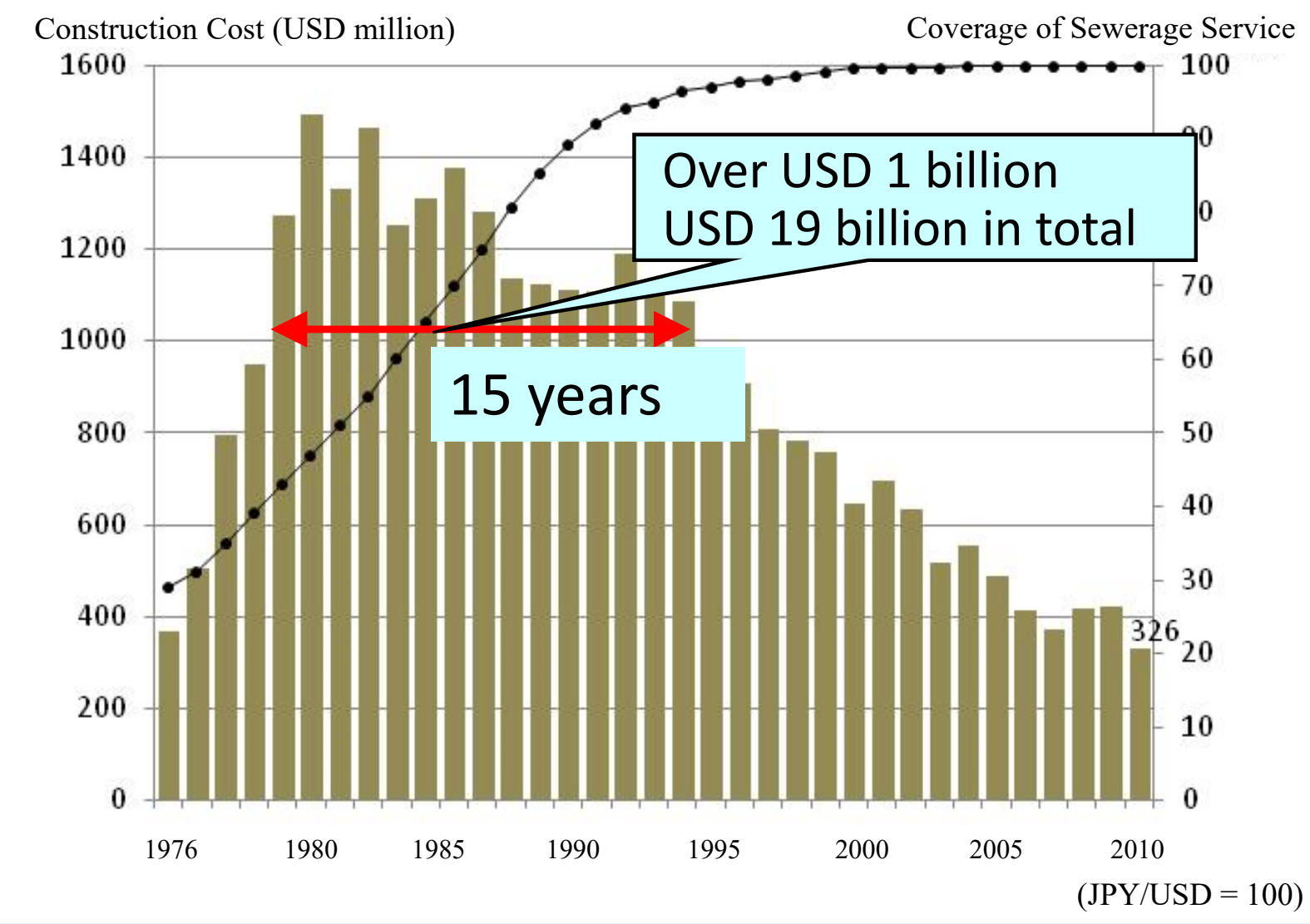
Treatment District & Facilities

Item	Value
Population	3.772 million
Coverage	99.9 %
Served District	9
Wastewater Treatment Plant	11
Sludge Treatment Plant	2
Major Pumping Station	26
Total Sewer Length	Approx. 11,800 km
Volume of Treated Wastewater	1.6mil.m3/day



Environmental Deterioration in 1960's

Intensive investment in sewerage development



Principal of Cost Burden in Sewer

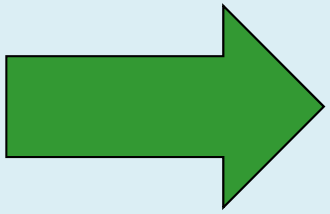
（雨水公費・汚水私費の原則）

Treatment of Rainwater＝TAX(General Account)

Rainwater is natural phenomenon.
Therefore, general account is applied.

Wastewater = Tariff

「Polluter-Pays Principle」Therefore, tariff is applied for treatment of wastewater.



Appropriate Cost Burden

(cf. Combined Sewer Line)

Subsidy by the National Gov.

Although water facilities shall be constructed by local government as their own administrative works, the national government shall promote the sewer works through bearing a part of cost.

	Subsidy Ratio
Sewer Line	1／2
Treatment Plant	5．5／10 or 1／2

Other than national subsidy, municipal bond is issued for applying the principal fund. Considering the life cycle of sewer facility as 40 years, The redemption period is 30 years for considering the fairness in burden between generations.

Budget and Personnel (2020)

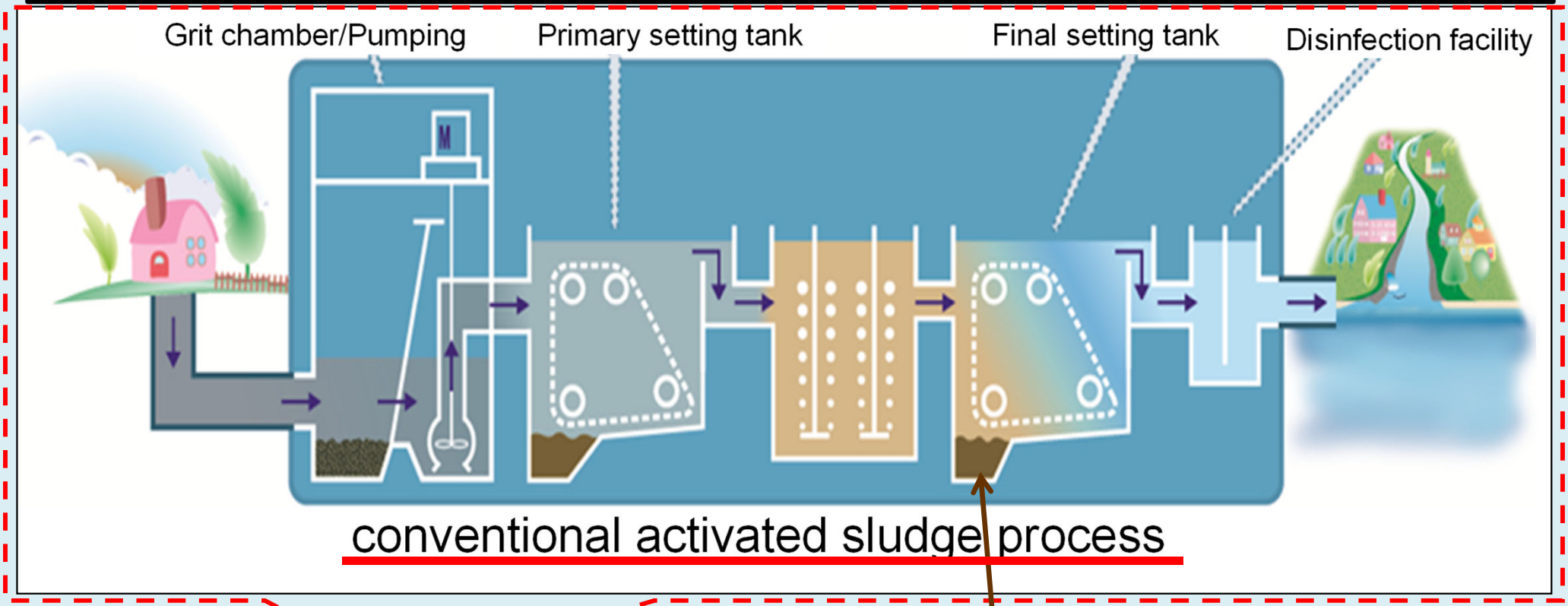
(JPY/USD=150)

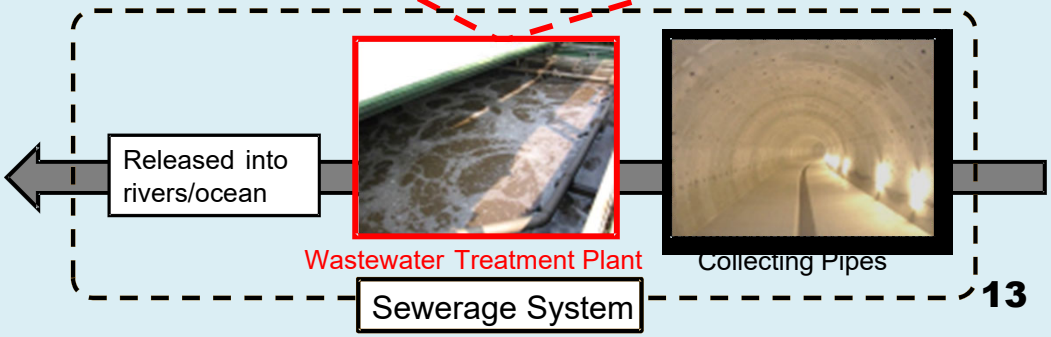
Budget	USD	Composition Ratio
Total	24 Billion	(100%)
Sewage Works	1.7 Billion	7%

Employees	People	Composition Ratio
Total	44,227	(100%)
Sewage Works	832	1.9%

Basic Treatment System in Yokohama

- The wastewater becomes odor-free and clean by conventional activate sludge process.
- Sludge generated from this wastewater treatment process is transmitted to sludge treatment system.





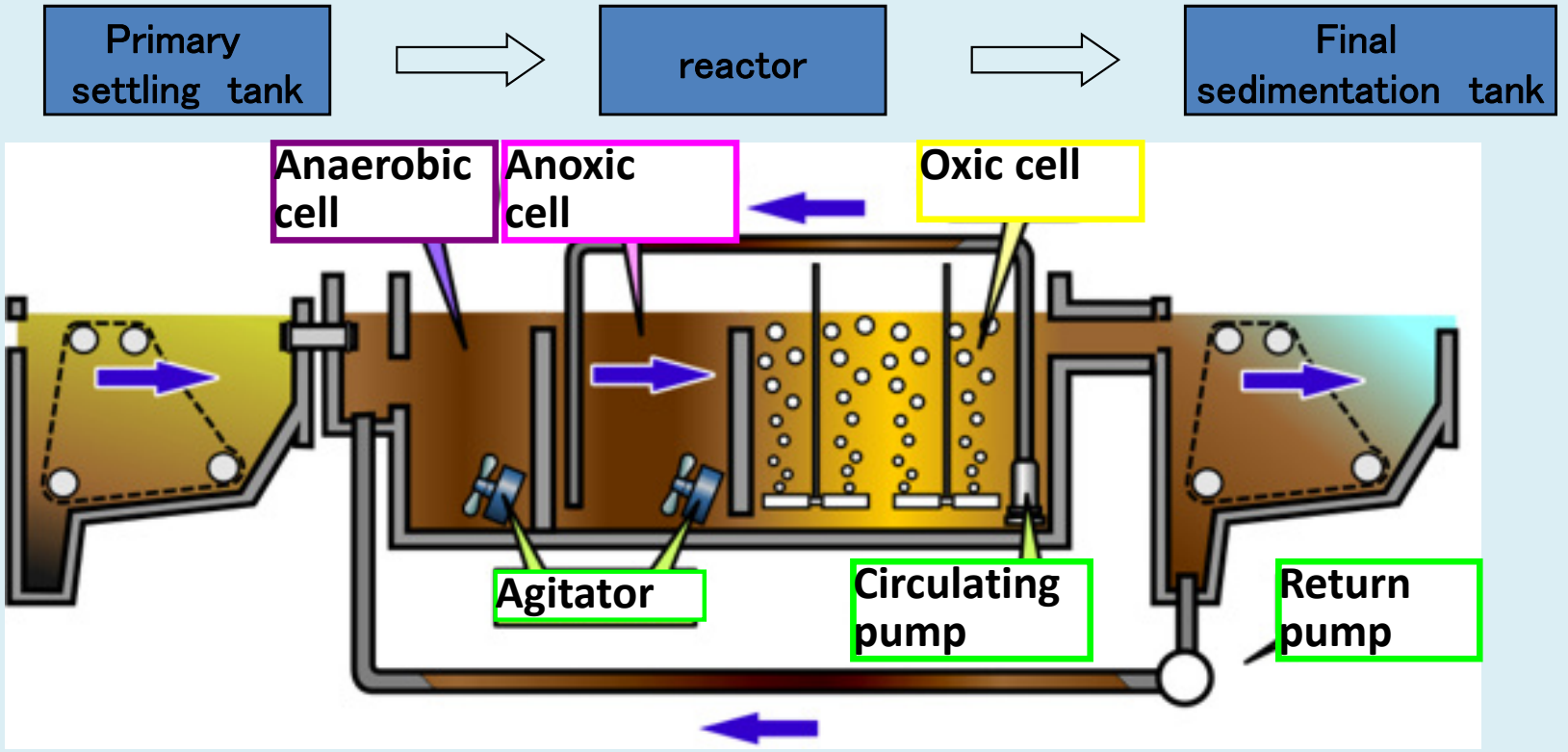
Excess Sludge

Sludge treatment system
(digestion, dewatering, incineration, etc.)

Wastewater Treatment

Anaerobic-anoxic-oxic Process (A2O Process)

The A2O process is a method that aims to remove nitrogen and phosphorus in addition to organic substances.



Wastewater Treatment

Average value of water quality

Category	Water quality (mg/l)		Target (mg/l)	Removal rate (%)
	Influent	Effluent		
BOD	160	3.6	25	98
COD	90	8.3	20	91
SS	140	2.0	50	99
T-N	27	8.2	30	70
T-P	3.4	0.91	3	73

Nitrogen / Phosphorous removal rate（%）			
Standard methods (1997)		Advanced treatment (2010)	
Nitrogen	Phosphorous	Nitrogen	Phosphorous
48	54	74	85

Sludge Treatment (General Information)

Sludge treatment is an important issue

- ✓ Treatment of sewage generates sludge
- ✓ More treatment or more advanced treatment produces more sludge
- ✓ Sludge treatment needs to be considered in combination with sewage treatment

- ✓ Sewage treatment is the removal of solids from sewage, Sludge treatment is the removal of water from sludge.

How it is handled is important.

- ✓ Most of the sludge is organic matter
- ✓ Strong odors are generated at treatment facilities and during the transportation process
- ✓ Sludge and methane can be converted into fuel
- ✓ Methane emissions cause global warming
- ✓ Landfills are limited and less moisture content required
- ✓ Treatment process affects disposal volume, landfill environment, and greenhouse gas emissions

- ✓ Economies of scale are considered

Dewatered Sludge Disposal

Until 1950s

Human Waste

Fertilizer

1965

3,700 tons

Dewatered Sludge

Landfilled

1975

53,700 tons

Dewatered Sludge

Landfilled

1985

165,400 tons

Dewatered Sludge

Incinerated
(16,000tons of Ash)

Transition of Sludge Treatment Methods

De centralized processing method (1962-1987)

Concentration → Digestion → Dewatering @ WWTP

⇒ Disposal/Use as fertilizer

Rapid urbanizationPopulation growthIncreased environmental awareness

Centalized Processing Method (1987-)

Sludge generated from 11 WWTP is pumped through underground pressure pipes to two sludge recycling centers.

Concentration → digestion → dehydration → incineration/fuel

⇒Utilized as fuel and construction materials

@ Sludge Recycling Center

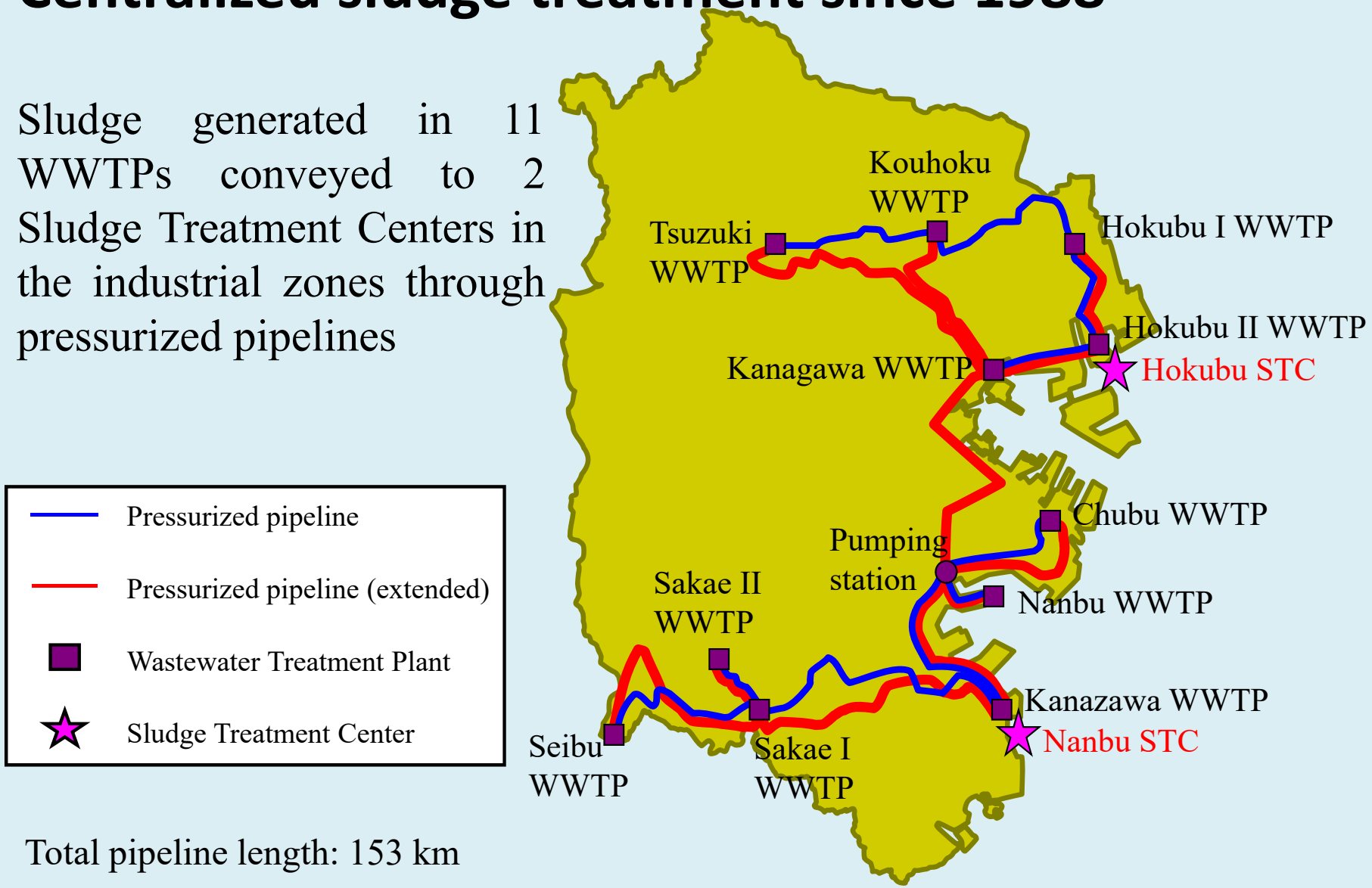
-Cost-effectiveness (economies of scale) -Stable monitoring and control

-Odorless treatment method -More effective use of energy and resources

Sewage Sludge Treatment

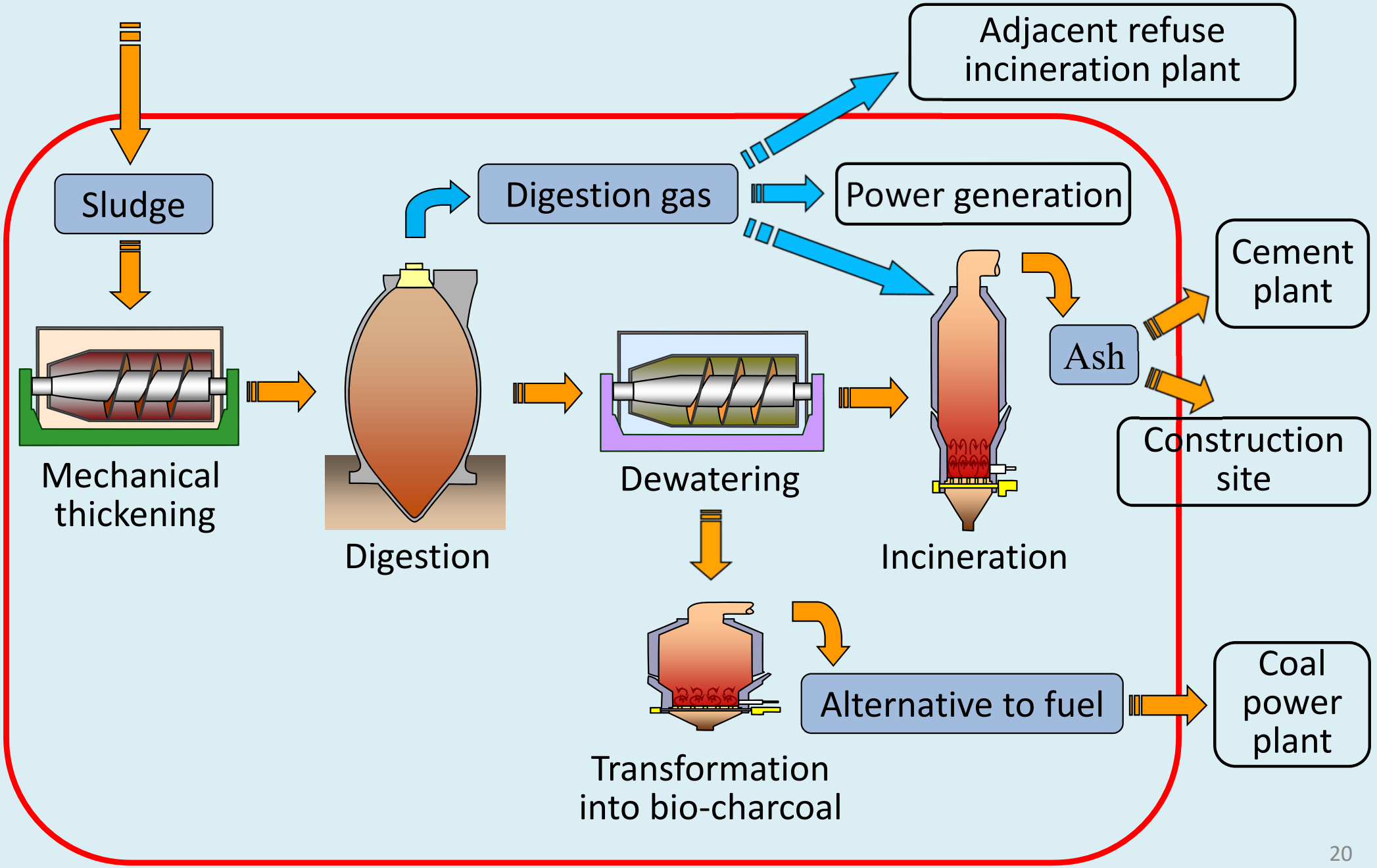
Centralized sludge treatment since 1988

Sludge generated in 11 WWTPs conveyed to 2 Sludge Treatment Centers in the industrial zones through pressurized pipelines



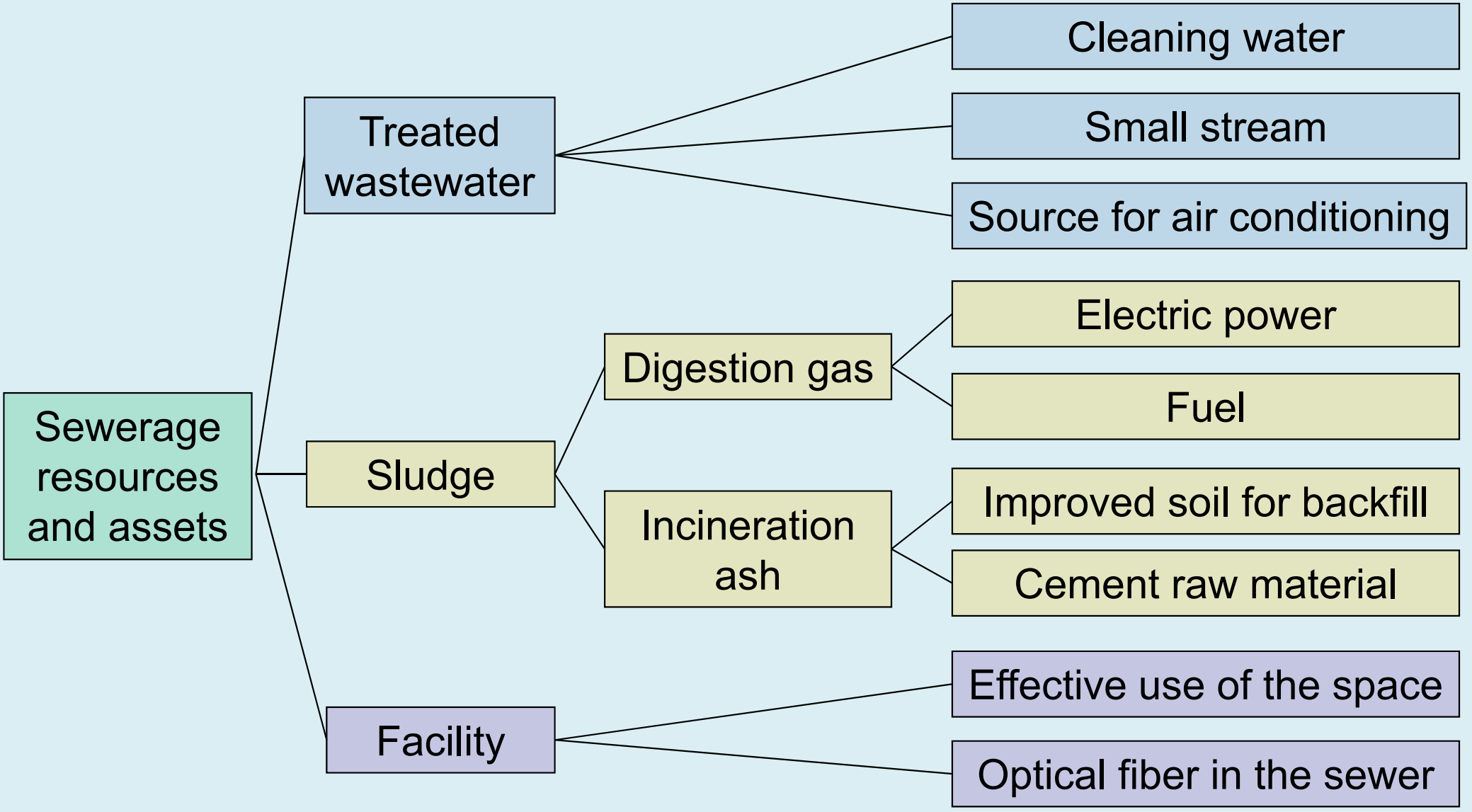
Total pipeline length: 153 km

Sludge Treatment Process



Effective Use of the Sewerage Resources

Effective use of the sewerage resources and assets



Treated Wastewater

Wastewater treatment plant

Water discharged into public water bodies

Used in facilities such as toilets（Sold recycled water）

Usage for small streams

Heat/Cool for air conditioning

Sewage Sludge

Sludge treatment center

Digestion gas

Power generation using digestion gas

Auxiliary fuel for incineration

Incinerator ash

Improved soil for backfill

Coal alternative fuel

Cement raw material

Digester Gas Power Generation Project under PFI Method

City of Yokohama

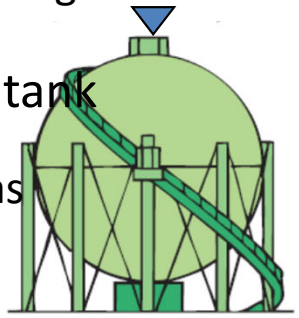
WWTP

sludge

digestion tank

digestion Gas

gas holder



- Licenses to businesses
- Check the management of the business

business plan

Electricity & Heat Supply

Fee Payment

Digestion gas and treated water supply

PFI Operator

Digestion gas generator

Investment in equipment renewal and operation and maintenance costs

Conclusion

- ✓ City of Yokohama has been developing sewerage systems from planning to construction, operation and maintenance in collaboration with the public and private sectors.
- ✓ The system has helped overcome urban, sanitation, environmental, and disaster issue.
- ✓ We will use this know-how to contribute to solving water problems by collaborating with urban cities.

Thank You For Your Attention.