Urban Environmental Engineering 2

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Lecture in the Last time

- Phenomena observed in
  - Estuary and Tidal River, coagulation
  - Lakes and Reservoirs (Closed Waters)
- BOD, COD, TOC
  - Definition, Significance, Measurement
  - Fundamental Equations of Change
- Questions and Exercise

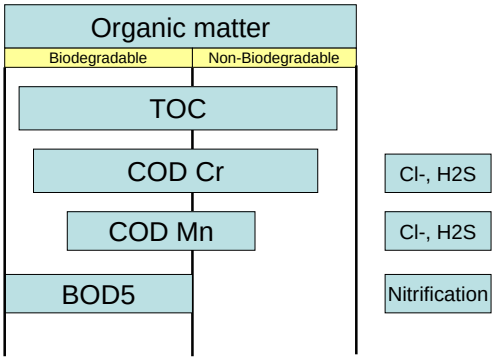
Today's Lecture

- BOD, COD, TOC
  - Recent Water quality improvement
  - Equation of change
- N, P
  - Various form of nutrients
  - Equation of Change

BOD, COD, TOC - Definition

- All of these parameters are relating to organic content of water.
- The most important point of regulating organic matter in effluents is to avoid anoxic and anaerobic condition in water environment.
- BOD_5 measures the oxygen utilized for the biochemical degradation of organic material.
- COD measures the content of organic matter which can be oxidized by a specified chemical reagent (such as $K_2Cr_2O_7$ in most countries and $KMnO_4$ in the case of Japan).
- TOC measures carbon content.

BOD, COD, TOC



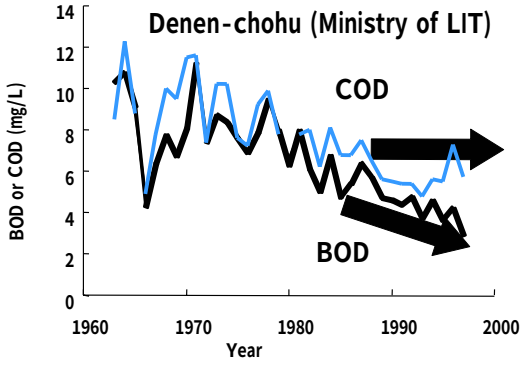
Comparison of COD(Cr) and COD(Mn) of standard solutions which theoretically give oxygen consumption of 100 mg/L.

Solution	COD(Cr)	COD(Mn)
Formic acid	99.4	14
Stearic acid	92.5	0
Methanol	95.3	27
Glucose	97.6	59
Starch	86.5	61
Glutamic acid	102	6

Typical values

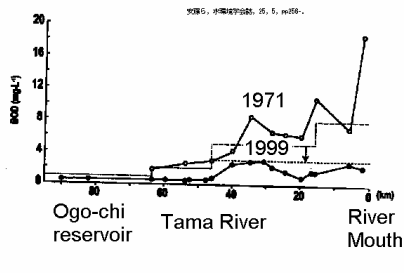
	Domestic wastewater	Treated wastewater	Tama River Tokyo
BOD5 (mgO/*L*)	200	5	3
CODcr (mgO/*L*)	300	30	10
TOC (mgC/*L*)	80	7	3

Change in BOD and COD in the Tama River

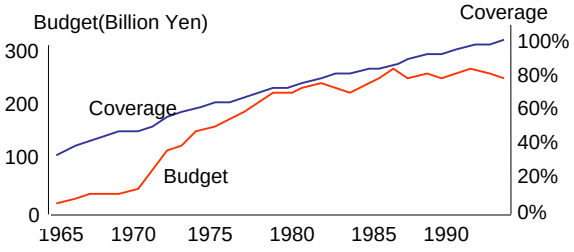


Foaming at the Denen-chohu(1970)

BOD in the Tama River

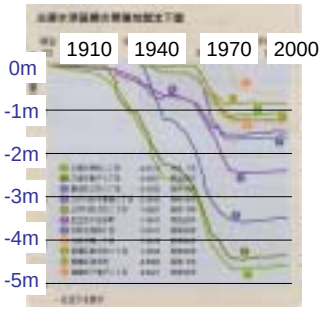


Coverage of and budget spent for public sewer in Tokyo 23 ward area

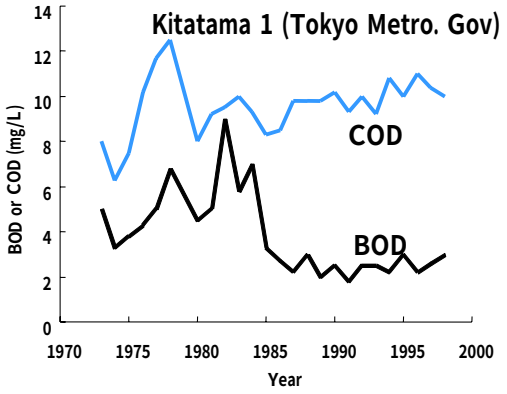


We reached 100% coverage of public sewer in Tokyo 23 ward area.

Land subsidence in Tokyo

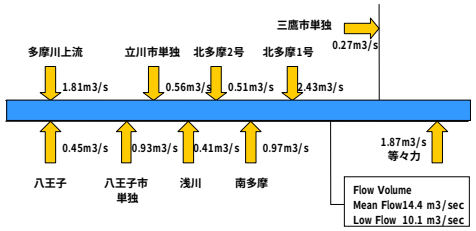


Change in BOD and COD in the treated wastewater



Ratio of treated effluents to the total river flow

Tama River



Ratio of Pollution Loads discharged from wastewater treatment plants to the total load in the case of Tama River

	July	October	January
T-N	59	51	64
NH_4-N	83	49	77
NO_X-N	48	53	50
T-P	63	62	73
C-BOD	49	26	48
COD	54	45	58
TOC	53	42	59
SS	16	9	25
Cl^-	62	53	57
SO_4^{2-}	45	32	45