Joint Research on Non-point Pollution Loads(Otsu City)

Year of Research	2008～2010	

(Purpose)

Setaura Creek (herein after, Creek) for this research locates in the Otsu City Seta district, and is a waterway to the Lake Biwa, which was built during the lakefront landfill project from 1965 in order to discharge rain water from the upstream region.

In the fifth stage plan of " the Water Quality Conservation Plan for the Lake Biwa ", (made in March, 2007 by Shiga Prefecture and Kyoto Prefecture), "Measures for outflow water" is regarded to implement selectively as a new measure for reducing loads from non-point sources, in addition to strengthen point-source pollution loads measures. "Outflow water", which flows into Creek through rivers on rainy days and reaches at the Lake Biwa via Creek, is one of the pollution sources to worsen water quality of the southern area called South Lake. This study focused on purification ability of Creek and shows how to remove the non-point pollution loads with Creek, because there are many kinds of pollution sources around Creek basin, such as urbanized area, roads, hill district area, agricultural land, railways, and an expressway.

In the current year of the scheduled research, structuring water quality evaluation model for design of measures to the whole of Creek was targeted, with 1) investigation of the area to understand for non-point pollution loads measure (e.g. land utility, outcomes of activities of Otsu City and Shiga Prefecture), 2) investigation of water quality of inflow water, flowing water and outflow water, 3) survey of bottom sludge features in Creek, and 4) analysis of effectiveness by measures. This research is applied for the planning scheme (2008~2010) in the Supporting Project for the New Generation Sewerage System (2008~2018) approved in 2007.

(Results)

(1) Results of water quality measurement

① The water quality of inflow from the rivers in rain is worse than the target water quality of the South Lake (Table-1) and the outflow water quality has not met the target water quality yet (Table-2).

② The water quality level of T-N, T-P in Creek are within the condition of mesotrophy or eutrophy. This condition makes a difference to the growth of phytoplankton. (Table-2)

(2) Calculation of inflow loads to Creek (Table-3)

① External loads: fine days of a year × Pollution loads of fine days
+ rain days of a year × Pollution loads of rain days

② Internal loads : The liquated (Solved) loads from the bottom sediment in the Creek
Content of bottom sediment × Liquated (Solved) rate

③ Direct loads : Rainfall volume flowing into Creek directly

(3) The composition of the water quality evaluation model

The water quality evaluation is consisted of the following three kinds of models.

① The runoff analysis model: The runoff network model is prepared and annual water volume and annual pollution loads in the river basin are calculated.

② The plant-purification model: The amount of reduced pollution loads removed by plant-purification system is calculated with considering seasons and plant species.

③ The ecosystem model: The amount of increased or decreased pollution loads in the Creek is calculated by living activity of algae and planktons.
The runoff analysis model systemized in the current year was examined and found to be applicable as the result of calibration.

Table-1 The water quality of inflow from the river

Water quality item	Survey result of 2007 and 2008			Target water quality
	Asakawa river	Miyagawa river	Ubatagawa river	Biwako (South lake)
COD(mg/L)	9.2(3.0)	13.0(5.5)	9.7(3.6)	3.1
T-N(mg/L)	1.4(2.1)	1.8(1.5)	2.2(2.1)	0.31
T-P(mg/L)	0.21(0.04)	0.40(0.14)	0.45(0.15)	0.015

( ) is water quality of fine days

Table-2 In Creek and the outflow water quality

items		in Creek		outflow		
		north	south	north	central	south
Water quality	COD(mg/L)	(10.4)	(2.2)	5.0(4.4)	4.8(3.7)	7.6(3.9)
	T-N(mg/L)	(1.80)	(0.33)	0.9(0.9)	0.8(1.0)	1.2(0.7)
	T-P(mg/L)	(0.380)	(0.125)	0.25 (0.15)	0.09 (0.05)	0.24 (0.12)
	Chl-a(μg/L)	10.4	1.0	2.1	4.1	2.7
Content of bottom sediment	COD(mg/g)	(16)	(25)	(37)	(2.4)	(10)
	T-N(mg/g)	(0.86)	(4.2)	(5.5)	(0.44)	(0.87)
	T-P(mg/g)	(0.65)	(5.2)	(5.2)	(0.79)	(0.76)

( ) is water quality of fine days

Table-3 Calculation of inflow loads to Creek

item	External loads	Inside loads	Direct loads	Total
COD(kg/year)	26,397	1,207	130	27,734
T-N(kg/year)	5,531	110	49	5,691
T-P(kg/year)	757	26	3	786

(Future plan)

(1) The plant-purification system will be examined in 2009 and the purification ability of the system applied to Creek will be quantified.

(2) The plant-purification model and the ecosystem model are made, then the water quality evaluation model will be systemized.

(3) Detailed design of the system with the water quality evaluation model will be carried out and yearly project implementation schedule will be prepared.

Collaborators : Otsu City and Japan Institute of Wastewater Engineering Technology
Contact : Osamu Matsushima, Makoto Tanokura, and Akihisa Miura

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