

Research on the best collaboration of various wastewater treatment facilities in system upgrade

Whole term

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(Purpose)

The purpose of this research is to investigate the best collaboration method for three kinds of plant (sewage treatment plant, rural wastewater treatment plant, and Johkaso) in system upgrade. For Kasumigaura watershed as an examination field, the degree of water quality improvement of the lake by upgrade of wastewater treatment and efficient collaboration way of the upgraded plans are examined.

Concretely, the effect on water quality improvement and required construction and maintenance costs for upgrade are estimated. Future collaboration strategy for construction of upgraded plans are considered based on the cost-efficiency derived from the above estimations for Kasumigaura lake.

(Results)

The results obtained from this research are as follows.

1 . Amount of inflow load to Kasumigaura lake

Inflow loads to the lake are estimated for the present of 2000 and for the future of 2020. Estimation for the future is made in the condition that percentage of sewered population will be almost 100 percent in 2020 following to the conclusion described in “Domestic Effluent Measures Master Plan (Best Plan) by Ibaraki Prefecture”.

The differences of inflow loads to Kasumigaura lake between with and without upgrade are estimated as about 28% of COD , 15% of T-P, and 5% of T-N. Upgrade of sewage treatment plants show the highest contribution to inflow load reduction among others.

2 . Effect on water quality improvement at Kasumigaura lake by upgrade of wastewater treatment facilities

It is found that estimated future water qualities of COD (75% value), T-N and T-P (T-N and T-P are mean value during year) at six typical points of Kasumigaura lake would not meet the level of environmental quality standards. Therefore, other measures are thought to be required to achieve environmental quality standards. The water qualities of Kasumigaura lake are estimated as 4.9mg/ ℓ of COD, 0.88mg/ ℓ of T-N and 0.086mg/ ℓ of T-P when the largest amount of the load reduction is achieved.

3 . Cost required for upgrade of wastewater treatment facilities

Construction and maintenance costs are estimated for upgrade of wastewater treatment plant from secondary to advanced ones, while upgrade cost of Johkaso is considered as replacement cost because Johkaso need to be reconstructed for upgrade.

The annual cost for upgrade of sewage treatment plants, rural wastewater treatment plants and Johkasos are estimated as 827 million yen, 235 million yen and 1,027 million yen respectively under the interest rate of 4% assumption.

4 . Cost-efficiency for water quality improvement of Kasumigaura lake

The most efficient upgrade is of sewage treatment plants, and it's water quality improvement by unit cost of one billion yen is 0.82mg/ ℓ for COD, 0.11mg/ ℓ for T-N and 0.011mg/ ℓ for T-P. Water quality improvement by unit cost is 0.59mg/ ℓ for COD, 0.018mg/ ℓ for T-N and 0.008mg/ ℓ for T-P by upgrade of rural wastewater treatment plants and 0.02mg/ ℓ for COD, 0.005mg/ ℓ for T-N and 0.0005mg/ ℓ for T-P by upgrade of Johkasos. The effect of the water quality improvement becomes gradually lower from sewage treatment

plant to rural wastewater treatment plant and to Johkaso. These costs for upgrade are calculated as interest rate of 4% respectively.

(Conclusion)

The effect of upgrade of wastewater treatment facilities is considerably high for improvement of Kasumigaura lake water quality. The similar approach to this research is considered to be quite important for collaboration of various types of sewerage works for effective water quality improvement.

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key words

Wastewater treatment, Upgrade, Collaborative wastewater treatment facility construction works, water quality improvement, Construction and maintenance cost