

## Research on Urban Water Environment Studies using Reclaimed Wastewater

Whole term

2005.10 ~ 2006.3

### (Purpose)

Based on “To the nostalgic future~The road of the water which moistens a city~ (issued by the Urban Waterway Investigative Commission), which is a series of recommendations for preserving, revitalizing, and creating urban canals, the Ministry of Land, Infrastructure and Transport publicly solicited model regions for the formulation of urban waterway plans. In response, Sakai City nominated a networked region——formed around a main waterway extending 13km——to serve as a model region for urban waterway planning. This main waterway flows from Sayama-ike Pond (Japan’s oldest pond), through the Mozu Burial Mounds (which include the Daisen Burial Mound, a heritage site of international importance), to Sakai Old Port, which is located at the lower end of the Uchikawa River system. The application was approved in May 2005.

In FY2003, the total annual amount of treated sewage water in all of Japan amounted to 13.74 billion m<sup>3</sup>. However, the fact is that only 250 million m<sup>3</sup> (approximately 1.8% of treated sewage water) is effectively used.

This research project conducted a water quality simulation using a model of the water system that includes the Uchikawa River and Doikawa River of the Daisen Burial Mound area and Sakai Senboku Port. This simulation was for the purpose of contributing to the promotion of an efficient project based on measurement surveys by determining the effects that are obtained by using reclaimed water as a water source, an approach that forms a part of Sakai City’s water environment improvement plan.

### (Results)

To determine the amount of reclaimed water that must be brought in to improve the water environment, a case study was extracted and improvement of oxygen-poor conditions in which it was difficult to attain some targets through short-term measures and long term were envisioned (Table— 1 ).

**Table— 1 The Water Environment Reclamation Plan of Sakai City and Targets Established for this Case Study**

Period	Location	Target	Reason for establishment
Short-term	Doikawa River Uchikawa River	BOD ≤ 8 mg/ℓ DO ≥ 2 mg/ℓ	As an initial step toward achieving a level suitable for fish habitation, appearance (water color) of the upper reaches of the Doikawa River to a point that neighboring residents and tourists do not find displeasing is improved.
	Daisen Burial Mound moat	Ensure water volume	Elimination of dry areas of the outer moat, restoration of the scenic and functional roles of the outer moat, and the supply water to the Doikawa River
Long-term	Doikawa River Uchikawa River	Transparent water in which fish can live	Reduction of pollution load from river basin, and efforts to bring the water quality of the Uchikawa and Doikawa Rivers close to that of seawater at the point of seawater influx
	Daisen Burial Mound moat	Control of abnormal growth of phytoplankton	Creation of a rich urban waterfront as a target concept

This study engaged in continuous water-quality calculation of load from the Daisen Burial Mound moat using a flat 2-dimensional and box eutrophication model for the Daisen Burial Mound moat and a flat 2-dimensional multilayer model for the Uchikawa and Doikawa Rivers. As a result, it was speculated that the following targets can be attained if 20,000 m<sup>3</sup> per day of reclaimed water from the Sayama Mizu Mirai Center is introduced.

1. Daisen Burial Mound moat target : Control of abnormal growth of phytoplankton and improvement of water transparency (50 cm or more)
2. Doikawa/Uchikawa River targets : Satisfying or exceeding target of DO 2 mg/ℓ in order to eliminate poor oxygen conditions that result in fish death

However, as the amount of reclaimed wastewater is increased, the amount of reclaimed wastewater-borne T-N, T-P, etc., became higher than the present.

(Conclusion)

It was speculated that wastewater in urban waterways has a significant impact in improving the water quality of the moat and connecting rivers. In the future, it will be necessary to improve the water quality of the Mozukawa River while also analyzing water pollution in a manner that considers parallel measures——study of advanced wastewater treatment of T-N, T-P, etc., in water undergoing advanced sewage treatment, introduction of seawater from the lower stretches of the Doikawa River, etc.——with the goal of promoting an effective project.

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key words

Reclaimed wastewater, Improvement of water environments, Water quality simulation