

# EFFORTS TO IMPROVE WATER QUALITY IN LAKE KASUMIGAURA BY THE IBARAKI PREFECTURAL GOVERNMENT

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## ABSTRACT

*Abstract: Lake Kasumigaura is the second largest lake in Japan and a million people lives Kasumigaura watershed. Lake Kasumigaura is expected to support economic development of Ibaraki and the metropolitan area as precious water resources. However, the economy developed caused deterioration of lake water quality. Therefore, Ibaraki Prefectural Government has placed Lake Kasumigaura water purification at important prefectural administration and has formulated Lake Kasumigaura Water Quality Conservation plan for 30years. The plan consist of various efforts i.e. Household Wastewater Management, Livestock Waste Management, Agricultural Measures, etc. Ibaraki Prefecture make Prevent Eutrophication in Lake Kasumigaura ordinance was established in 1982(reformed the Ordinance to Water Conservation in Lake Kasumigaura in 2007). The ordinance focused on the idea of reducing the amount of nitrogen and phosphate in the wastewater and included a ban on the use and sale of phosphorus detergent and the strict wastewater standards for the factories. In 2005, Ibaraki Kasumigaura Environmental Science Center was established to conduct the conservation of rivers and lakes, as an opportunity which the Governor propose its establishment during the 6th World Lake Conference held in Ibaraki prefecture in 1995. Moreover, to be a financial source to conserve lake Kasumigaura project, Ibaraki Prefectural Government introduced a local tax called 'Forest and Lake Environment Conservation Tax' in 2008. As a result of these efforts, economy and population have been growing up whereas Lake Kasumigaura water quality remains on the same level recent years.*

**Keywords:** Lake Kasumigaura, Water Quality Conservation plan, Eutrophication, Ibaraki Kasumigaura Environmental Science Center , Forest and Lake Environment Conservation Tax

## INTRODUCTION

Lake Kasumigaura is located in the plains of southern Ibaraki Prefecture (**Fig.1**). It is the second largest lake in Japan. Lake Kasumigaura attracted attention early on as an important resource for the development of Ibaraki prefecture. This water is divided among agricultural use, industrial use, and public water supply. The region is a major agricultural production area, and is also experiencing marked urbanization. As of 2010, about 973,000 people live in the basin (**Table.1**). It is extremely shallow lake as the average depth is 4m. For this reason, Kasumigaura is at high risk of pollution.

Examining the trends in water quality, it can be noted that in the late1950s and 1960s, COD<sub>Mn</sub> (the amount of oxygen consumed when organic substances in water are decomposed by chemical oxidants) hovered around 3~4 mg/L level. The increase of economic activities in the basin starting in the 1970s rapidly brought pollution. In 1979, COD<sub>Mn</sub> climbed 11 mg/L, the highest pollution level in the history of the lake to date (**Fig.2**).

## THE SYSTEM FOR WATER QUALITY IMPROVEMENT

The pollution process of Lake Kasumigaura is a complex one indeed. In order to come up with an effective system to improve the Lake's water quality, many different kinds of measures must be taken to combat each factor causing the pollution. It is this kind of thinking that has given rise to a consolidated system based on

eutrophication in Lake Kasumigaura ordinance and the Water Quality Conservation Plan for Lake Kasumigaura.

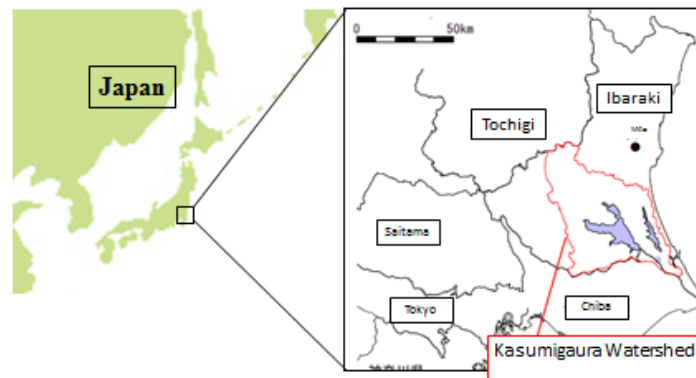


Figure 1. Location of Lake Kasumigaura

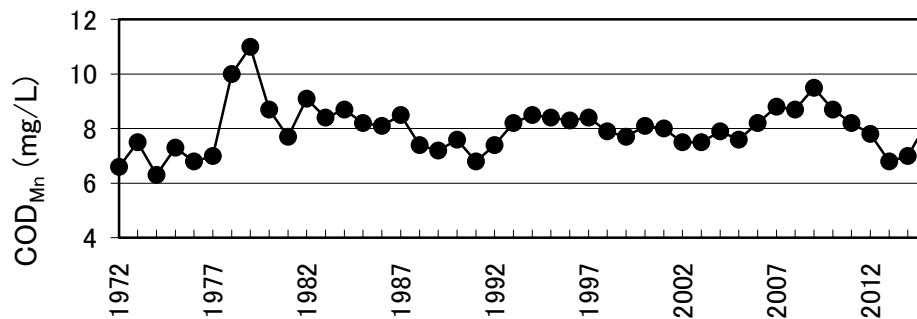


Figure 2. COD<sub>Mn</sub>

Table 1. Statistics Lake Kasumigaura

Category	Item	Unit	Lake Kasumigaura
Lake	Origin	-	Inland sea
	Maximum Depth	m	7
	Average Depth	m	4
	Surface area	km <sup>2</sup>	220
	Shoreline	km	252
	Volume	Billion m <sup>3</sup>	Approx. 0.85
	Average water turnover	days	Approx. 200
Watershed area	Surface area	km <sup>2</sup>	2,157
	Municipalities in the watershed area	-	24
	Watershed-area population	-	Approx.973,000people(2011)

## POLICY DETAIL

### 1. Household measures (Domestic wastewater)

It is very important to treat both black water (the waste water from toilet) and gray water (the waste water from kitchen, washing and bathing) about household measures.

- Fundamental to household measures is the installation of sewage systems. Sewage systems are required in populous areas. The growth rate of the population supported by the sewage system serving Kasumigaura Lake has increased.

- Integrated johkaso (a kind of septic tank) treatment systems are desirable in places where there are no sewage systems. In Kasumigaura watershed, installation of Nitrogen and phosphorous removal type Johkaso is required. Ibaraki prefectural government have established subsidies to promote this type Johkaso. Tandoku-shori johkaso which is designed for treating wastewater from exclusively flush toilets were forbidden in Kasumigaura watershed.

## **2. Agricultural measures**

Essential guidelines have been established for fertilization, water control and healthy soil building methods conducive to the prevention of fertilizer run-off from paddies and dry fields.

- Acknowledgement of eco-friendly farmers is to be promoted to reduce the use of chemical fertilizer and agricultural chemicals.

- Advice is given using a computer tool called ‘Fertilizer Navigation’, so that the proper amount and type of fertilizer is used.

- With this system, agricultural wastewater is recycled as irrigation water, preventing wastewater from flowing directly into the lake.

## **3. Livestock farming measures**

Essential guidelines for livestock farming businesses have been established for the basic purpose of recycling domestic animal excrement for agricultural use. Guideline is provided on the proper treatment of such waste, while taking into consideration the stabilization of business management.

- In order to prevent wastewater from draining out of the barn, regulation is taken in modifying the barn and wastewater treatment facilities. Proper management of these facilities is also promoted.

- The construction of facilities which turn livestock waste into fertilizer effectively and properly is promoted by subsidizing construction costs.

- Distribution of compost outside the catchment area is promoted.

## **4. Measures for factories and businesses**

All factories and plants are required to maintain wastewater standards based on the water pollution control law by such practices on the spot inspection. The quality of corporate wastewater has been strictly regulated by effluent standards, but stricter effluent standards are being applied because of the inclusion of small factories and other facilities not conventionally covered by these regulations in Kasumigaura watershed.

## **5. Direct purification measures**

Water quality will be improved by dredging river and lake subsoil, constructing vegetation-based purification facilities, and removing and other algae.

- Lake Bottom Sediment Dredging. Nitrogen and phosphorous dissolving into the water from sediment accumulating on the bottom of the Lake is one cause of water pollution.

- Vegetation-based purification involves the use of emerging aquatic plants endogenous to the shallows and shorelines of Lake Kasumigaura to improve its water quality.

## FOREST AND LAKE ENVIRONMENT CONSERVATION TAX

Ibaraki Prefectural Government introduced the forest and lake environment conservation tax in 2008 and has promoted environmental conservation of the lake and responsible forestry management in the Kasumigaura basin. The taxable period of the tax in Ibaraki Prefecture is ten years (2008–2017). The tax rates for one year are 1,000 yen for an individual with an address in Ibaraki Prefecture, and 10% of an equally divided prefectural corporation tax for corporations with an office in Ibaraki Prefecture. The income from tax revenues for one year is about 1,600 million yen. Half the total tax revenues are used for forest conservation, and the remaining half are used for measures against water pollution of Lake Kasumigaura.

## IBARAKI KASUMIGAURA ENVIRONMENTAL SCIENCE CENTER

Ibaraki Kasumigaura Environmental Science Center (IKESC) was founded in 2005, after advocacy for its establishment at the 6th World Lake Conference held in 1995 in Tsukuba and Tsuchiura. IKESC aims to effectively perform its four functions research and technical development, environmental education, cooperation with and support for citizen's activities, and information exchange. These functions performed through partnership with citizens, researchers, businesses, and governments bodies in order to tackle issues related to the conservation of lakes and rivers in Ibaraki.

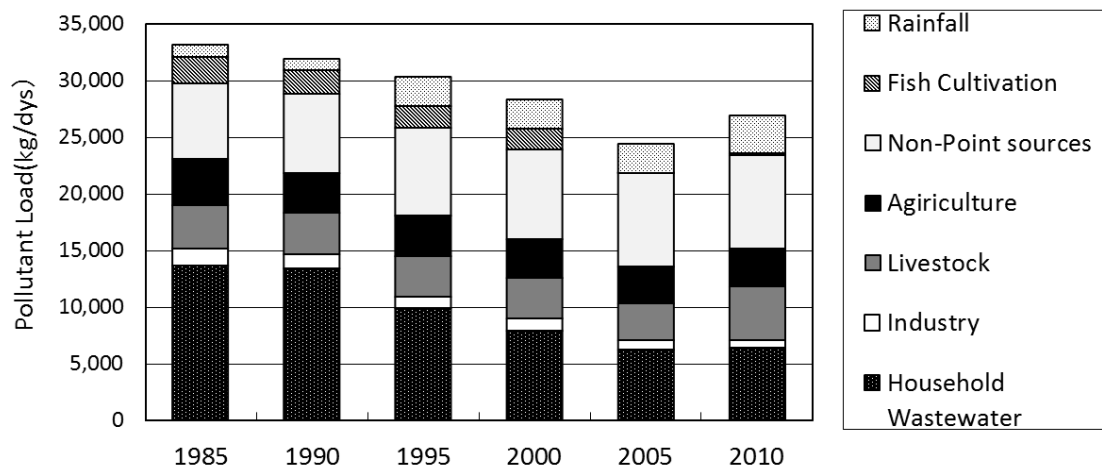


Figure 3. COD<sub>Mn</sub> Pollutant Load

## CONCLUSIONS

Ibaraki prefectural government drawn up the water quality conservation plan since 1985. Although Pollutant Load has tended to decrease (Fig.3), Lake Kasumigaura is still eutrophication. It is the earnest wish of the citizens of Ibaraki that the water be purified, not only because the water of Lake Kasumigaura has been and is a valuable resource supporting the development of the prefecture, but also because the lake is the symbol of the abundance of nature. For these reasons, the national, prefectural, and municipal governments, as well as the residents in the basin, are working together to put forth the maximum effort to improve the quality of the lake's water.

## ACKNOWLEDGEMENT

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