

A Method of Water Quality Monitoring and Effective Use of the Results

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Abstract

We started Water Environment Collaborative Monitoring with local inhabitant's groups from April 2005. The results of the monitoring are put in Electric Library which sends some information to local inhabitants on the internet. We could accumulate the monitoring data for two years (from April 2005 to March 2007) so we are just starting to examine how to use these data effectively. So I describe the present situation of Water Environment Collaborative Monitoring with local inhabitant's groups and the examination of effective use of accumulated data for improvement the water quality in this report. This might be a simple and good way to share the information among the concerned people each other and to conserve water quality.

Introduction

(1) The reason that we start Water Environment Collaborative Monitoring

We have only natural lake in Aichi prefecture. The name of the lake is ABURAGAFUCHI. The summary of ABURAGAFUCHI is as table 1.

Table 1. The summary of ABURAGAFUCHI.

<ul style="list-style-type: none">· Located in the southern-central part of Aichi· Only natural lake in Aichi· Surface area : 5.83 km²· Circumference : 6.3 km· Average depth : 3 m· Maximum depth : 5 m
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Water quality of ABURAGAFUCHI is not good because of the development of the urbanization in the basin and closed water body. We have tried to improve the water quality until now but it's impossible that the water quality restore to purity so as to be able to swim in the past. Annual average of Chemical Oxygen Demand (COD) was 8.3 mg/l in fiscal 2004 year (according to the official regular monitoring result) and it was the worst 6 in the national lakes.

The cause of water pollution is domestic waste water mainly and other causes are waste water from factory and non-point pollution, etc. These kinds of pollution have accumulated in the bottom of lake and have become the sediment. So we settled on second period short term water environment improvement action plan and we have conducted comprehensive countermeasures for water environment improvement. And from April 2005 we started the water environment collaborative monitoring with local inhabitant's groups to promote their understanding the present situation of water environment. Because we think it's very important to understand the present situation for local inhabitants to promote the domestic waste water countermeasures by themselves. In addition we can not improve the water environment only administration and we need the collaboration from local inhabitants.

The present situation of Water Environment Collaborative Monitoring

(1) Measurement items and points

We measure the water quality once a month basically and the administration measures various items by official method but local inhabitant's groups measure 2 items (COD and horizontal visibility) by simple method in principle.

There are 102 monitoring points include the river which flow in and out ABURAGAFUCHI. We share the monitoring point, 32 points are measured by administration and remaining 70 points are measured by local inhabitant's groups. These monitoring points dotted the variety river such as city drainage, irrigation canal or drainage for agriculture and the small river.

(2) Shearing the role of administration and local inhabitant's groups

We are shearing the role to conduct the collaborative monitoring as table 2. Administration (Aichi Prefecture Government) provides the tools which is necessary for water intake and the measurement as table 3. Local inhabitant's groups measure the water quality to use tools which provided by administration once a month and register the result of investigation at Electric Library on the internet if some groups don't have the computer they may send the results by the facsimile.

Table 2. The role of collaborative monitoring.

Name of organization		Role to conduct the monitoring
Local inhabitant's groups		Investigate the water environment once a month at the point that was assigned (Totally 70 points are assigned now) Report the result to environment department of Aichi Prefecture Government on the internet or facsimile Attend to the Information Exchange meeting once a year
Administration	Local city	Investigate the water quality including the items which local inhabitant's group doesn't measure once a month at the point that was assigned (Totally 20 points are assigned now) Report the result to environment department of Aichi Prefecture Government on the internet Attend to the Information Exchange meeting once a year
	Aichi prefecture	Investigate the water quality including the items which local inhabitant's group doesn't measure once a month at the point that was assigned (Totally 12 points are assigned now) Administrate the Home Page containing the Electric Library on the internet Make the report of monitoring results and hold the Information Exchange meeting and explain the report

Table 3. The list of tools provided by administration.

Investigation Item	Name of the tool	Number (per one group)	Commentary
Water temperature Observation	Field note	—	File for A5
	Thermometer	2	Stick thermometer
Water intake	Bucket	1	Made of plastic
	Rope	1	10m with a rewinding handle
	Beaker with a handle	1	1ℓ Beer mug type made of plastic
	Dipper	1	With long shaft
	Polyethylene bottle	According to investigation points	1 liter with a cover (In case of measurement Horizontal Visibility in the room) 200ml with a cover (In case of measurement packed COD)
Color of water	Color chart	—	A5 Both sides laminated processing, contained Filed note
	Coloring observation container	1	10cm in height, diameter of 9cm, white color
Horizontal visibility	Horizontal visibility meter	1	1m Made of acrylic
COD	Packed COD test kit (D)	1	Low concentration use (measurement range is from 0 to 8 mg/l)
	Packed COD test kit		High concentration use (measurement range is from 0 to 100mg/l)
	Comparison color		Low concentration use

	list		High concentration use
	Beaker	According to investigation points	100ml Made of plastic
	Timer	1	Reaction time is 5 minutes
Safekeeping and Transportation	Container	1	Made of plastic with a cover and a handle
	Vinyl back	1	Using to carry tools

(3) The way to collect the monitoring data and announce the results

We make the investigation seat as table 4 to share the information among the concerned people each other. These data are taken in an Electric Library and especially COD and Horizontal Visibility are able to be displayed the change every spot. The contents of Electric Library (http://www.aburagafuchi.jp/web_page/library/index.html, original form is Japanese) are as table 5.

Table 4. Investigation seat for ABURAGAFUCHI water environment monitoring.

Investigation seat for ABURAGAFUCHI water environment monitoring										
Basic items	Name of monitoring point		Code of the point							
	Investigation date	Date	Month	Year						
	Parson of entry									
	Investigation time	AM · PM	Hour	Minute						
	Weather	1 : Fine 2 : Cloud 3 : Light rain 4 : Others ()								
	Temperature				.					(°C)
Water quality monitoring items	Water temperature				.				(°C)	
	Smell of water	Strength	1 : Nothing 2 : Slight smell 3 : Distinct smell 4 : Strong smell							
		Kind	1 : Sewage 2 : Soil·Mud 3 : Detergents 4 : Rotten 5 : Mold 6 : Oil 7 : Urine 8 : Shell·See 9 : Others ()							
	Color of water	1 : Yellow 2 : Greenish yellow 3 : Grayish green 4 : Greenish brown 5 : Grayish brown 6 : Dark brown 7 : Gray 8 : Yellowish brown 9 : Colorless 10 : Green								
	Horizontal visibility				.				(cm)	
	COD	Water temperature at measurement				.			(°C)	
		Concentration								(mg/l)
Note	Water quantity, Speed of a moving fluid, State of the circumference, Yesterday's weather, and River construction work, etc.									

Table 5. The contents of Electric Library on the web page.

The result of water quality measurement	
Water quality data (measurement point)	
<u>Each point data</u>	
<u>Map indication each month (COD・Horizontal visibility)</u>	
<u>List of COD・Horizontal visibility in this month</u>	
<u>List of COD・Horizontal visibility last fiscal year</u>	
Water quality data inside of the lake	
<u>Water quality data inside of the lake last fiscal year</u>	
The result of creature research	
<u>The results of creature research for last two fiscal years</u>	
<u>Activity reports</u>	
<u>Introduction of participation groups</u>	<u>What's voluntary group?</u>
<u>Water quality monitoring manual</u>	

We conduct the water quality monitoring with related organizations to understand the present condition of water quality as possible finely and we announce the results by the Electric Library on the internet to many people. The image of this system is like figure 1.

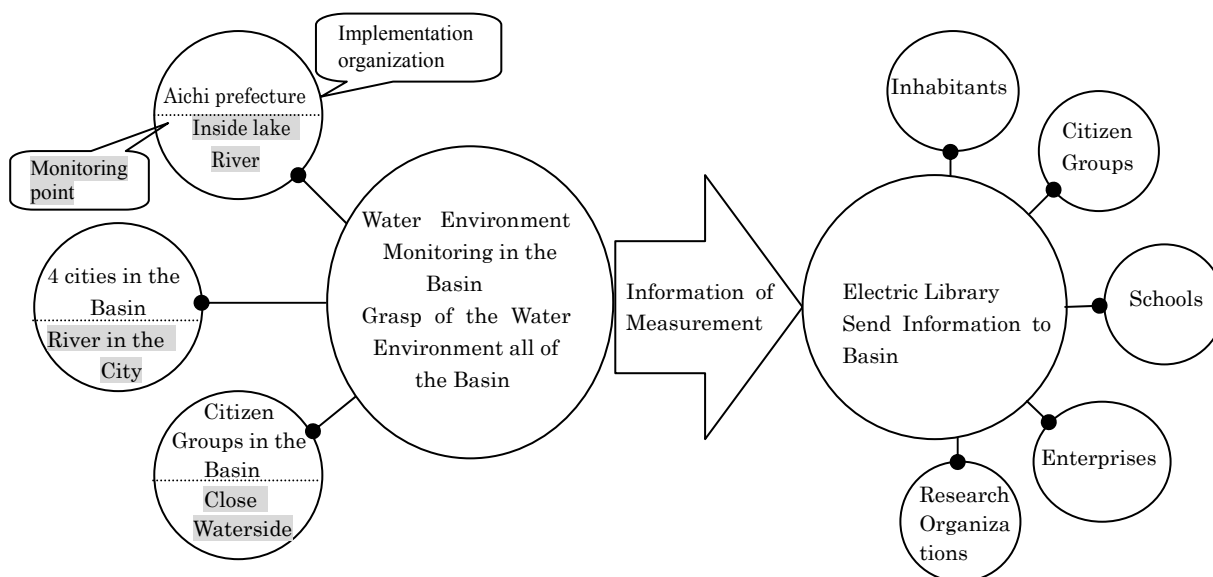


Figure 1. Image of the Water Environment Collaborative Monitoring system

Acknowledgement

(1) The examination of use the accumulated data

We could get some information from the monitoring data for two years. In 2006 fiscal year the inside of lake's water quality (based on the official measure by Aichi Prefecture, COD) became to be better than 2005 fiscal year. We understood the change of COD concentration

was related to the internal production inside of the lake because of the number of inside lake's chlorophyll-a (based on the official measure by Aichi Prefecture) was less than 2005 fiscal year. But average of inflow waterways' water quality (based on the measure by local inhabitant's groups, COD) became to be a little worse. Because of this we started to examine where and when was worse in detail about some inflow waterways. And we begin to understand that there are some points to be worse than 2005 fiscal year and some points are worse in only a few months among one year. So we are now examining where the cause is in those points.

(2) How to develop the countermeasures to improve the water quality in the future

According to the collaborative monitoring results we could find some points that become to be bad water quality. So we are going to investigate the situation of the land use and the existence of specified factory which is reported on the installation of specified facility based on the Water Pollution Control Law around these points.

First we are going to carry out some inspection of specified factory which is near these points and if there will be some problem concerning waste water treatment system or process of production, we are going to lead the factory owner to carry out improvement.

Then we are going to enlighten local inhabitanes who live near these points about the domestic waste water treatment.

Next we are going to lead farmers who cultivate their rice field near these points to reduce of the consumption of the agriculture chemicals and to improve the usage of them.

Finally we hope to be able to conduct these countermeasures comprehensibly in the future. In addition we hope the collaborative monitoring might be useful to promote understanding the present water quality situation for the local inhabitants including factory owners and farmers and conservation water quality by themselves.

Other relevant information

(1) Clear Water Renaissance

Lake ABURAGAFUCHI Water Quality Purification Promotion Council settled on second period short term water environment improvement action plan (another name is Clear Water Renaissance Ⅱ) in fiscal 2004 year.

In this action plan some target values of water quality as table 6 are set. These targets are set as the values which should to be achieved by fiscal 2010 year.

Table 6. The target value of Clear Water Renaissance.

Assessment item	Target value	Improvement level
COD	8 mg/l or less	Improvement to a level where pedestrians smell no unpleasant odors while walking on the lakeside walkway
Dissolved Oxygen	3 mg/l or more (in the bottom of the lake)	Improvement to a level where aquatic organisms, such as fish and shellfish, can survive
Turbidity	Horizontal visibility 30 cm or more	Improvement to a level where the bottom of the lake is visible

We are conducting some measures as follows to achieve these target values now.

- Lake ABURAGAFUCHI and rivers purification measures such as sludge control and installation of river water purification facility, etc.
- Domestic, industrial wastewater and land related pollution control.
- Water Environment Collaborative Monitoring which is one of the way to realize the water environment improvement collaboration with local inhabitants.

References

ABURAGAFUCHI mizu kankyou monitoring (in Japanese), (2005) Department of Environment Aichi Prefectural Government

Dai niki mizukakyou kaizen kinkyuu koudou keikaku (in Japanese), (2004) Lake ABURGAFUCHI Water Quality Purification Promotion Council, Aichi