

Systematization of Methods for Considering Water Quality Improvement in Dam Reservoirs

(Study period: Fiscal 2015 and 2017)

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1. Introduction

In dam reservoirs, a phenomenon of water quality change may cause a problem. According to a survey in fiscal 2015, about 30% of the dam sites do not satisfy the environmental standards and eutrophication phenomena, such as microcystis, were confirmed in about 40% of the dam reservoirs.

In order to advance water quality improvement measures more accurately and efficiently in the severe financial status, it is required to organize the findings and know-how accumulated on water quality improvement measures, points of attention in introduction, etc. and systematize them for utilization.



Photo 1: Example of water quality change phenomena in the dam reservoir
(Left: Eutrophication, Right: Long-term persistence of turbid water)

2. Systematization of water quality improvement method for dam reservoir

This study identified and systematized the common study process to the water quality improvement measures for dam reservoirs and organized basic concepts of the measures under the conditions where hydraulic / hydrologic and inflow load characteristics, social environmental characteristics of the basin, water quality improvement levels required, urgency of response to water quality problems, etc. are different according to dams.

The basic frame of water quality improvement measures is shown in Figure 1 System chart (proposal). The measures are roughly classified into three processes: "Emergency response process", "Countermeasure study / implementation process", and "Maintenance process."

2.1. Emergency response process

"Emergency response process" shows the flow of emergency response in the event of water quality change phenomena. This process determines the necessity for emergency response based on recognition of the situation and whether to shift to "Countermeasure study / implementation process."

2.2. Countermeasure study / implementation process

"Countermeasure study / implementation process" shows the flow for implementing water quality improvement measures and verifying the effect after implementation. After estimation of the factors causing water quality change phenomena, necessity for countermeasure implementation is determined, method and operation rules for water quality improvement measures are considered, and monitoring survey plans are formulated.

2.3. Maintenance process

Maintenance process shows a flow for confirming whether continuous effect is produced from the water quality improvement measures implemented in the countermeasure study / implementation process and for implementing efficient operation and monitoring survey. This process periodically verifies the effect of water quality improvement measures and considers, as needed, operation of countermeasures, efficiency increase of countermeasure facilities, etc.

Additionally, in each process, "Utilization of cooperation / advice", "Hearing of opinions from dam management follow-up, etc.", and "Provision of information" on dam management status etc. to citizens and basin stakeholders are positioned, including cooperation with basin stakeholders and guidance / advice from academic experts, etc. Further, PDCA cycle is adopted in each process to look back on the consideration by returning to the step as needed according to situations if the effectiveness of water quality improvement measures was not confirmed or if a different water quality change phenomenon occurred.

3. Future activities

We plan to prepare and publish a guide based on this system chart in cooperation with the MLIT.

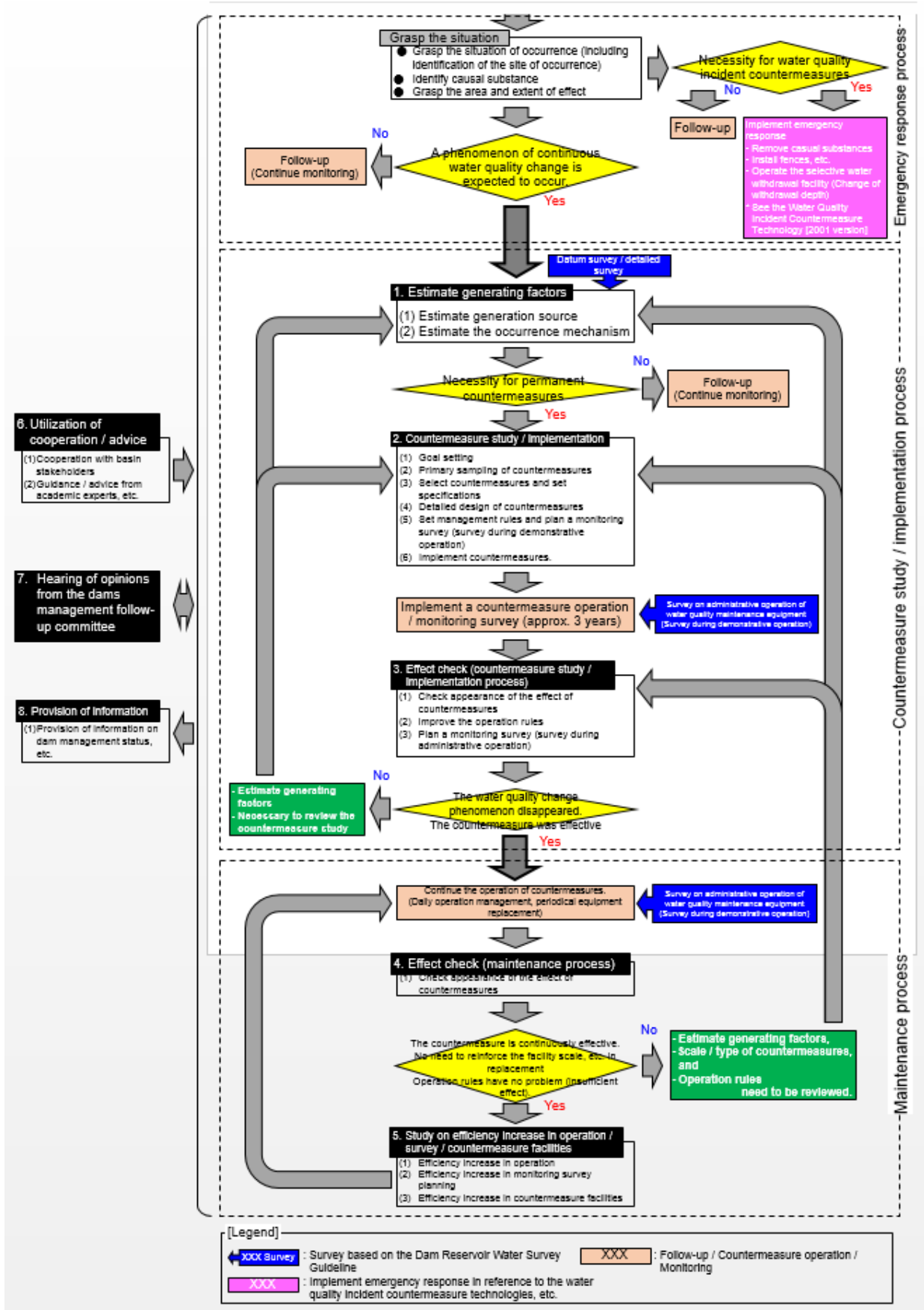


Figure 1: System chart for considering water quality improvement in dam reservoirs (proposal)