



## **Analytical framework for reservoir desiltation strategy in Taiwan**

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### **Abstract**

Reservoir desiltation has become a global vital issue for sustainable water resources management and reservoir operation due to reservoir sedimentation. There is a wide range of sediment management techniques to preserve reservoir capacity and pass sediment downstream, and it is essential to utilize a multi-strategy of reservoir desiltation in order to achieve the goal of sustainable reservoir operation. In perspective of the reservoir sediment management, there are three categories of desiltation methods with different directions (1) sedimentation prevention: methods to route sediment through or around the reservoir, (2) sedimentation desilting: methods to remove sediments accumulated in the reservoir to regain capacity, and (3) sedimentation reduction: approaches to minimize the amount of sediment arriving to reservoirs from upstream. However, in perspective of engineering and desiltation techniques, there are generally two main categories: “Hydraulic Desiltation” and “Mechanical Removal” with numerous minor classes, e.g. sediment flushing, empty flushing, flood sluicing, sediment bypassing, turbidity current venting, dredging, excavation (shown as figure 1). Not all these techniques are feasible for every dams, in other words, some criteria of these desiltation techniques are there for each dams which have different conditions. Basson(1997) and Palmieri et al.(2003) proposed a method of feasibility analysis which classifies the flood flushing, sluicing, and turbidity current venting by collection of worldwide dams’ data. It could be shown as a coordinate map according to their results. Sumi et al.(2012) utilized dams in Japan by the similar methods.

This study classifies some representative dams of Taiwan and Japan by the previous method (figure 2). In further, we present an analytical framework which is separated to two parts: (1) potential analysis and (2) feasibility assessment, in order to analyze the optimization of desiltation strategy for dams. In the first part of this framework, we focus on the potential desiltation ability of dams with factors such as storage-runoff ratio (the indicator of the influence of current force) and drainage-runoff ratio (the indicator of the supply and demand). In the second part of this framework, we analyze the construction and drawdown ratio of dams, the topology conditions, and cost related to techniques. We apply practical operation data of Taiwan dams and propose the corresponding criteria of each factors. In conclusion of this study, we present a desiltation inspection standard for sustainable operation of dams in order to give an analytical reference of reservoir desiltation strategy.

Keywords: Sustainable Reservoir, Desiltation Strategy, Analytical Framework, Hydraulic Desiltation, Mechanical Removal

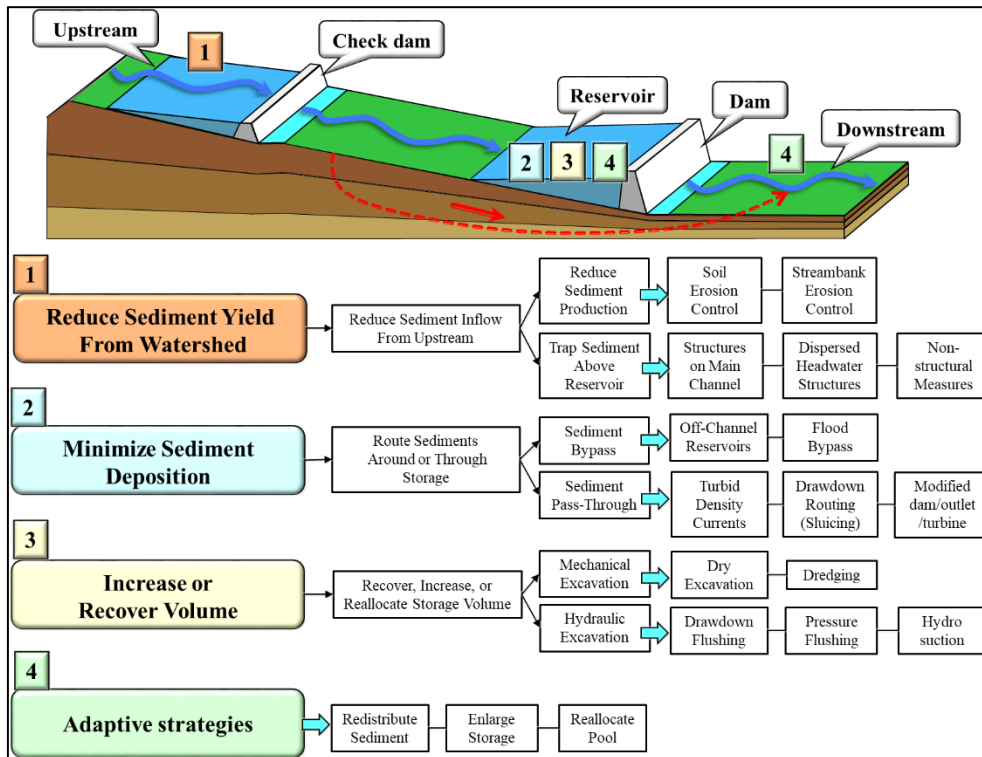


Figure 1 Integrated sediment desiltation strategy

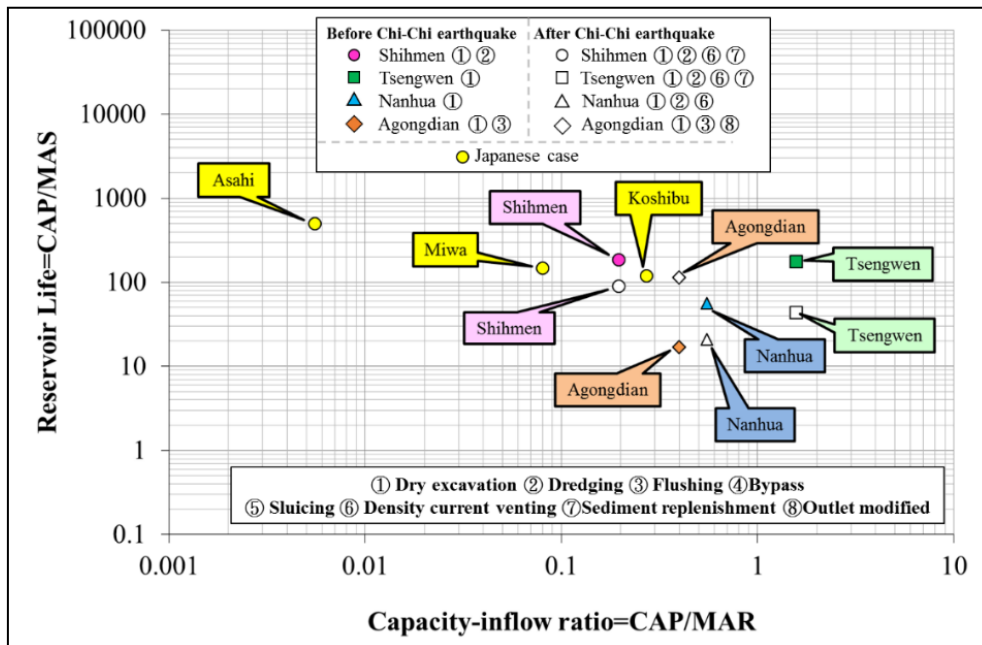


Figure 2 Feasibility analysis of the representative dams of Taiwan and Japan for reservoir desiltation

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