

**INTEGRATED MANAGEMENT OF THREE RESERVOIRS
TO SOLVE TRI-LEMMA OF DAM CONSTRUCTION
– SAIGAWA RIVER IMPROVEMENT PLAN –**

NOBUYUKI TAMAI¹ and MITSUTOSHI YAMAMOTO²

¹ Professor, Department of Civil Engineering, Kanazawa University
Kodatsuno 2-40-20, Kanazawa, Ishikawa 920-8667, Japan

(Tel: +81-76-234-4629, Fax: +81-76-234-4632, e-mail: tamai@t.kanazawa-u.ac.jp)

² Deputy Director, Civil Engineering Bureau, Ishikawa Prefecture
Kuratsuki 1-1-1, Kanazawa, Ishikawa 920-8580, Japan

(Tel: +81-76-225-1705, Fax: +81-76-225-1714, e-mail: m-yamamo@pref.ishikawa.jp)

Saigawa River flows through the central part of the city of Kanazawa, the capital city of Ishikawa Prefecture which faces Japan Sea. The present situation of river training works is still in low level compared with the 100-year design flood in the Fundamental River Management Policy. Higher safety from flood and augmentation of environmental flow are required targets in Saigawa River Fundamental River Management Policy. There has been a multiple reservoir construction project for flood control, hydropower, and environmental flow. But the project has been on a dead rock with opposition movements in citizens. The major points in dispute on the existing project are concerned with submergence of the intake facility of a historical aqueduct and environmental impact by impoundment of a reservoir area. The new River Improvement Plan should be established by solving these conflicts based on consensus of all stakeholders represented by the advisory committee of Saigawa River.

In order to obtain higher safety in Kanazawa city either increase of conveyance in the central part of Kanazawa city or decrease of flood peak into the city by a storage reservoir is necessary. According to discussion based on the conservation of local history and tradition a large-scale construction work for increasing conveyance at the central part of the city of Kanazawa was declined because it would alter the atmosphere and landscape of the city. The existing plan of a multiple purpose reservoir construction was declined also because the construction would make the intake of Tatsumi aqueduct submerged. The advisory committee accepted a reservoir plan finally but the shift of the location of the dam axis was recommended as was described by Tamai et al. (2004a and 2004b).

Rejection of the existing plan requires engineers to propose alternatives for reservoir construction. Naturally all alternatives may require higher construction cost. A new target in the action plan is how to reduce the capacity of the reservoir and consequently the construction cost and environmental impact of the new reservoir.

According to surveys on agricultural water and industrial water we reached an essential conclusion that demand in agricultural and industrial waters has decreasing tendency for a couple of decades. With this basic understanding of the water demand in the basin we started to establish a totally new plan in an integrated manner including the change of capacity allocation in two existing reservoirs. Ishikawa Prefecture succeeded in purchasing water right of City of Kanazawa for industrial water allocated to Saigawa Reservoir. This water capacity is finally converted to environmental flow in the River Improvement Plan.

Tatsumi Reservoir is located in a lower reach among three reservoirs. This means that

Tatsumi Reservoir is most effective for peak reduction of flood discharge at the central part of Kanazawa. Crucial key factors in the new plan are summarized into following three items: 1) Capacity for industrial water in Saigawa Reservoir is converted to that of environmental flow. 2) A part of flood control capacity in Uchikawa Reservoir is converted to that of environmental flow. 3) Tatsumi Reservoir serves for flood control only because capacity for environmental flow is secured by two existing reservoirs. The required capacity of Tatsumi Reservoir reduced radically. The old plan requires 8.8 million cubic meters for reservoir capacity but the new plan requires only 6.0 million cubic meters.

The integrated management of all three reservoirs made this capacity reduction possible. Although the valley width increases with the shift of the location of Tatsumi Dam, total volume of the dam structure remains almost the same as that of the old plan because of the reduction of the dam height.

Under low flow conditions the new reservoir will be dry and a present river course will be maintained in the upstream of the dam site. Under low flow conditions migrating fishes can pass through a low flow conduit. Because flood flow conduits will be set near a riverbed, the dam structure does not intercept sediment transport in the longitudinal direction. Under normal condition there is no impoundment in upstream of the dam. The new dam provides higher continuity for flow, sediment, and nutrient. Therefore, the new dam is expected to cause no substantial deterioration in water quality. Consequently, the new Tatsumi Dam project can achieve flood control, conservation of a historical facility, higher continuity of the river basin, and less impact of the project on riverine environment.

REFERENCES

- Tamai, N., Yamamoto, M., & Fukumoto, T., 2004a. Sublimation of river planning to philosophy – Saigawa River master plan, *Advances in River Engineering*, Vol.10, pp.113-118 (in Japanese).
- Tamai, N., Yamamoto, & M., Fukumoto, T., 2004b. A new paradigm of river basin management—A case history study of Saigawa , Ishikawa Prefecture, Japan, *Environmental Hydraulics and Sustainable Water Management*, J.H.W. Lee and K.M. Lam (eds.) , Balkema Publishers, pp.1261-1266.