

## Field Research to Evaluate the Environment of Rivers Downstream from Dams

AMANO Kunihiko, Head  
HARANO Takashi, Senior Researcher  
ENDO Maremi, Researcher  
ITO Kanako, Researcher  
River Environment Division, Environment Department

(Key words) Dam, environment, field survey

### 1. Introduction

Little past progress has been made in the evaluation of the impact of dams on the environments of the rivers downstream from the dams, because the impact manifestation mechanisms are complex and the impacts themselves are not easy to abstract.

This research was undertaken to evaluate the impact of a dam on the riverbed of the river downstream from the dam. The impact of a dam on the riverbed downstream from the dam is assumed to be a result of the dam varying the downstream river's flow regime and the change of the flux of materials flowing downstream, typified by the flux of sediment transport, so dam quantities related to these were collected and evaluated at 79 dams nationwide. The riverbed materials (soil forming the riverbed) and the benthic organisms which inhabit this material were selected as the indices used to evaluate the manifest impacts, and a field survey of these was carried out.

### 2. Survey of dams nationwide and their surrounding rivers

In order to evaluate the quantities of sediment transport at 79 dams selected from all dams managed by the national government throughout Japan, the annual average specific sedimentation was calculated by dividing the annual average dam sedimentation by its drainage basin area, and at the same time, to evaluate the degree that dams change flow regimes, the annual average maximum cut rate was calculated by dividing the annual maximum difference between the dam inflow and discharge by the annual maximum inflow, and using these two indices, the dams were classified (Fig. 1; dams not suitable for the purpose, those constructed separately upstream for example, were omitted.)

In rivers downstream from dams with large specific sedimentation (Group 2), the supply of sediment ought to be sharply reduced. And downstream from dams with small annual average maximum cut rate (Group 1 and 3), the sediment flushing force is not reduced very much. Therefore, it is hypothesized that in rivers downstream from dams in these groups (on the left side of Fig. 1), the riverbed material will be coarser grained or the riverbed will be degraded, and that

inversely, in downstream rivers in Group 4 where the flood cut is large, according to circumstances, the riverbed material can be fine-grained.

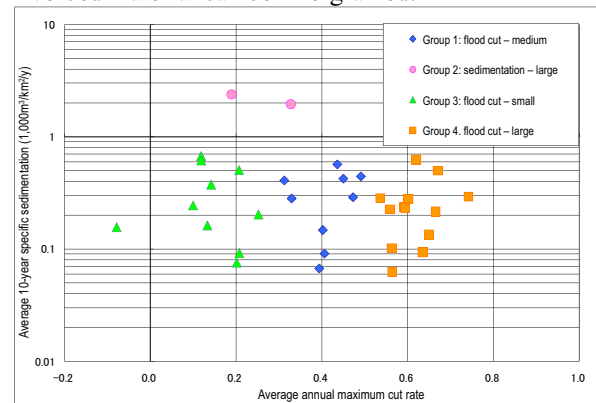


Figure 1. Classification Based on Specific Sedimentation Rate and Peak Cut

A field survey was carried out longitudinally on rivers upstream and downstream from dams. A comparison of the 60% grain size of the riverbed material and the shear stress at the riverbed calculated based on the flow regime and shape of the river channel revealed that in all groups, the 60% grain size was relatively larger just downstream than it was in the river upstream from the dams. This result suggests that just downstream from many dams, the possibility of the riverbed becoming coarse-grained is high.

The examination of results of the survey of benthic organisms has confirmed that in addition to the dams in Groups 1 and 3, where it is assumed there is a strong tendency for the riverbed material of the downstream river to be coarse-grained material, at dams in Group 2, downstream from the dams, species which prefer a stable environment with riverbed material somewhat larger than that upstream are increasing.

### 3. Summary

In the future, we plan to interpret the data obtained by a quantitative method such as hydraulic analysis to study revealed patterns of the environment impact on rivers downstream from dams according to the properties of the dams and countermeasure methods.