TOPICS

Examination on method of setting the minimum water level for smooth introduction of small hydro power generation in mountainous rivers

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1. Background of research

Even today, the electric power situation is still critical followed by the suspension of nuclear power plants in Japan after The Great East Japan Earthquake that occurred in March 2011. Also in a future energy policy, "renewable energy" is gaining attention as development of electric power resources without using nuclear power. In such a situation, small hydro power generation is expected to increase in the future because a purchase price of renewable energy has become higher than the past after feed-in tariffs (FIT) for renewable energy started on July 1st, 2012.

Under these circumstances, the Ministry of Land, Infrastructure and Transport is now considering to simplify the water utilization procedures relating to small hydro power generation and encourage its introduction. Especially, a mountainous river is a favorable environment for small hydro power generation to be introduced since its water is not used at present. However, since the form of mountainous rivers is different from that of rivers on the plains, knowledge concerning the effects of water utilization on the rivers has not been acquired. Therefore, it is difficult to decide easily under the present condition whether or not the water should be used. For that reason, we examined a method of determining the minimum water level of mountainous rivers.

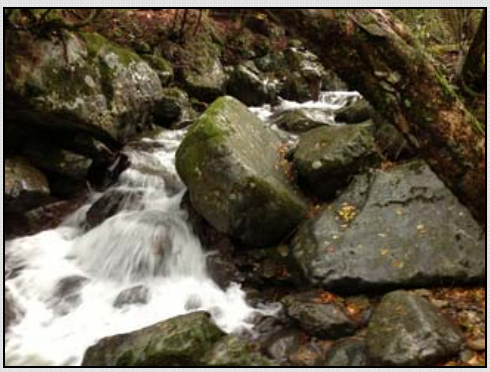

Photo 1. Rivers under study (Kaji-gawa River in Tottori Pref.)

2. Contents of research

Although the minimum water levels of rivers on the plains were examined and determined mainly concerning nine items including the effects on living organism, fishing and tourism, these items were limited to two items which are effects on living organisms and landscapes, considering the characteristics of mountainous rivers.

Concerning the effects on living organism, we decided to determine the minimum water level by modeling the structures peculiar to mountainous rivers such as a riffle, a pool, and a step-pool for hydraulic calculation and verifying changes in water level of the river channel depending on flow condition by model calculation. For building the model and grasping the effects on living organism, we conducted a field study on rivers.

Concerning the effects on landscape, we went back to the elements relating to landscape peculiar to mountainous rivers in this examination, although it is considered to be suitable for flow demand as an indicator in the existing method for rivers on the plains that the width of water surface of a river should be equivalent to 20% of the width of the river. In a questionnaire using photographs showing flow conditions of mountainous rivers, we investigated in which parts of the photographs people *feel the volume of water*, and it was found that most people feel it in whitened parts of ruffling surface arising from drops and other in these flow of mountainous rivers. For that reason, we grasped the relation between the occurrences of ruffling surface and the physical conditions of rivers through this survey and examined for indexing.

3. Future plans

Together with these survey results, we will arrange the results of examinations at the time of implementing existing hydroelectric power and organize the way of thinking the flow demand of mountainous rivers, exchange opinions with scholars based on examined knowledge to conduct water utilization investigation smoothly, and put them together as indicators for water utilization investigation.