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主 論 文 の 要 旨

論文題目 **Responses of Fluvial Geomorphology and
Riparian Vegetation to Low-head Dam Removal**
(小規模ダム撤去に伴う河道地形と植生の応答に
関する研究)

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論 文 内 容 の 要 旨

In recent years, the number of deteriorated low-head dam structures is drastically increasing due to their life span ranging about 50 years. Particularly, numerous existing low-head dams which were constructed between 1970s and 1980s with rapid economic growth by industrialization are expected to be deteriorated in the next decade. Many deteriorated dams which were abandoned in the river channel cause serious problem for river ecosystem and flood safety. To improve river ecosystem, low-head dam removal is emerging as an alternative for river restoration.

In accordance with a drastic increase of low-head dams under consideration for removal in recent years, it is important to predict the effects of low-head dam removal from the modified river channel by the long-term existence of low-head dam. The fluvial geomorphic process following low-head dam removal strongly connected to riparian vegetation development in bottomlands. Also, there are large differences between the effects of grass type plant and tree type plant for stabilization of bank or sand bar. Therefore, the method to predict low-head dam removal impacts should encompass the fluvial geomorphic process and riparian vegetation changes including grass type and tree type vegetation.

To clarify the fluvial processes and riparian vegetation establishment following low-head dam removal, this study intends to establish conceptual scenario of low-head dam removal including river geomorphology and riparian vegetation changes based on

literature review, develop the numerical model to simulate geomorphological and riparian vegetation changes following low-head dam removal, validate the numerical simulation model by monitoring results of low-head dam removal case with examination of short term response on river morphology and riparian vegetation, and identify the influential parameters on channel evolution processes following low-head dam construction and removal.

To achieve the research objectives, the conceptual scenario for low-head dam removal has been established based on literature review. Moreover, based on several low-head dam removal cases, this study categorized the reversibility of river following a low-head dam removal with flow, sediment, habitat, geomorphology and riparian vegetation.

Then, the numerical simulation model for simulating flow, sediment transport, bed elevation change, and riparian vegetation (grass type and tree type) has been developed to adapt for the conditions of low-head dam existence and removal. The developed numerical simulation model has been verified with the low-head dam removal case in Gongreung River, Korea. The numerical simulation model has been able to simulate the significant impacts on river geomorphology and riparian vegetation following low-head dam removal as well as the results of numerical simulation have shown a good agreement with the monitoring results.

Finally, the verified numerical simulation model has been applied for identifying the influential parameters for long-term channel evolution following low-head dam construction and removal with simplified channel. To identify long-term channel evolution processes and influential parameters (dam height, sediment diameter, and river bed slope), the numerical simulations have been performed through the 3 stages of before dam construction, low-head dam construction and low-head dam removal. Through the numerical simulation results, it is identified that the modified river channel by low-head dam construction and long-term existence may not be easily restored to pre-dam conditions especially in river geomorphology and riparian vegetation.