
Development and Maintenance of River Environment in the Future

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1. Introduction

Since the River Law was revised in 1997, 20 years have passed. One of the aims of this revision was addition of "Development and maintenance of river environment" to the purpose of the River Law. After the elapse of 20 years, how has the added purpose been implemented?

In June 2017, "20 years after the revision of The River Law --- Proposal from the Nature-oriented River Management Promotion Committee [For Sustainable and Practical Nature-oriented River Management]" (the "Proposal") was published. With reference to the Proposal, this paper considers development and maintenance of the environment in future river management.

2. Nature-oriented River Management

In 2016, "Basic Guidelines for Nature-oriented River Management" (the "Basic Guidelines") was notified and gave the following definition to "Nature-oriented River Management" as a form of universal river environment development --- "River management performed with the aim of conserving or creating the life habitat, growth, and breeding, which is inherent to rivers, and diverse riverscapes, taking natural river system processes into account and giving consideration to harmony with community life and local history and culture."

Nature-oriented River Management has been implemented in accordance with the Basic Guidelines and related technical standards and manuals, and the Proposal mentioned the following five issues on Nature-oriented River Management and provided responsive policy to each of them --- (i) Goal setting for river environment, (ii) Process of activities from specific technology and research to maintenance, (iii) Human resource development and dissemination / awareness raising, (iv) Sustainable Nature-oriented River Management, and (v) Expectation of future image of river environment in Japan.

Almost 30 years have passed since the start of nature-oriented type river management in 1990, and over 10 years have elapsed since Nature-oriented River Management was adopted as a universal form of river environment development by removing "type." Accordingly, examples for advanced management have

been reported but there still remain some issues. In addition, the responsive policy to each of the issues mentioned in the Proposal shows a broad direction, rather than presentation of a specific method for advancing Nature-oriented River Management. Such approach may suggest the difficulty in considering Nature-oriented River Management or development and maintenance of river environment. Next, development and maintenance of river environment in the future is considered based on the Proposal.

3. Development and maintenance of river environment in the future

(1) River environment should be considered in the basin space scale and long-term time scale.

Tree growth in river channel is often indicated as an example of deterioration in the river environment. Restoration of river plain seems to be a typical menu item in river environment development. As the causes of tree growth in river channels, river-bed degradation in low water channels due to river channel improvement works or gravel digging from rivers in the period of high economic growth and the effect of dam construction are indicated. These causes are considered to have contributed to the tree growth in river channels to some extent, while the recent drastic decrease in sediment supply from mountains ¹⁾ and changes in lifestyle, as known from and little use of riparian forest as a wood supply source (no need to be cut down), have also a great effect ²⁾. Ohta ¹⁾ indicated that the forest of Japan, which went to ruin remarkably at the beginning of Meiji Era, and immediately after World War II, has dramatically recovered and is "full of green for the first time in 400 years" and has a concern about further river-bed degradation due to decrease in sediment flowing into rivers. When tree growth is taken up as an example of changes in the river environment, it is known that countermeasures should be devised considering not only direct impact on the river but changes in the sediment transport system in a basin scale from mountains to the sea, changes in the ambient environment in a very long time scale, such as forest change, and changes in social conditions, such as little use of riparian forest as a fuel source. (Besides tree growth, Ohta ¹⁾ also points out the

increase in driftwood in the case of a flood due to recovery of forest and resulting increase in trees.) As the example of tree growth shows, when considering development and maintenance of the river environment, it is necessary to evaluate the site conditions in a proper spatiotemporal scale including not only the river but ambient environment and to discern clearly the driving force of river environment change to ensure development / maintenance.

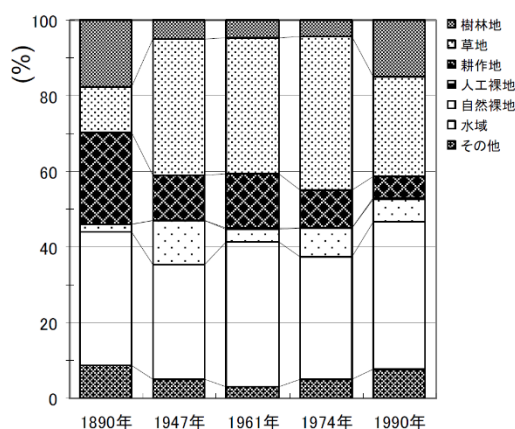


Figure: Vegetation changes in the Kokai River (10-30kp)²

(Measured the ground cover condition between levees from the quick maps and air photos)

(2) Data use for multi-lateral river environment evaluations

When trying to evaluate the river environment, even the physical environment elements that are relatively easy to index are multi-lateral, such as channel shape, flow regime, water quality, sediment transport and combination of these elements is numerous. Further, even if the biotic environment elements (flora and fauna, ecosystem) are indexed, quantification thereof is often difficult. As known from these, with regard to river environment, far from goal setting, evaluation itself is not easy.

It is therefore strongly desired to improve the methods for evaluating the river environment. To this end, it is first of all necessary to integrate available information and grasp the situations of river environment as accurately as possible, e.g., by relating the increasing data of the Census of Rivers and Riparian Areas with physical environment elements data. It is also desired to develop techniques to analyze the river environment using newly available mass data, such as three-dimensional channel shape information.

(3) Flood control project is a good opportunity for river environment development

The physical environment element that define river environment, including channel shape, flow regime, water quality, and sediment transport, are also important elements to be set in river development and management for flood control. River channel improvement and development of flood control facilities to make a river resistant to floods often accompany changes in physical environment elements and are therefore likely to be considered inconsistent with development or maintenance of river environment. However, the channel condition after improvement work is also desirable in the environment and requires less effort for maintenance, it will be the optimal river development. Additionally, river development for flood control can be led to the environmental development including the ambient environment of the river, e.g., a flood control basin developed for disaster prevention can be the one with high environmental value as swamp environment.

It is difficult to satisfy many requirements at the same time but channel design techniques that also lead to river environment maintenance will be established by avoiding excessive development of river channel from the beginning, designing a river channel in reference to the sections of the same river with good environment, and implementing adaptive management. River channels expanded by channel improvement work are designed considering safe runoff at design flow rate but river channels constantly change, e.g., channels may become smaller due to deposit of sediment after a flood, including small to medium-sized channels. Technical development of adaptive management is therefore required including condition monitoring and maintenance after improvement work.

4. Conclusion

River management aimed at by "Nature-oriented River Management the Basic Policy" will be realized by adaptive establishment of an improvement method that contributes to river environment development / maintenance and is easy to maintain from a mid- and long-term viewpoint for each river, for which river improvement continues to be implemented to improve the safety from flood.

References

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