New institutions for managing watersheds: a comparative analysis of watershed committees in Japan

Tomohiko Ohno[1]

Abstract

This paper uses quantitative empirical analysis to examine the new "watershed committees" established to govern watersheds in Japan. Recent literature emphasizes the importance of external actors such as government authorities, non-profit organizations, and academic experts for the management of local commons, but we have little knowledge about these new efforts to govern Japan's watersheds. In response to amendments made to the River Law in 1997, Japan's national and prefectural governments have established committees to manage many watersheds during the past ten years. These committees exist to allow academic experts and local residents the opportunity to jointly discuss plans for river development. While some of these committees have yielded beneficial results, such as new strategies for environmental protection or the establishment of watershed partnership organizations, others have encountered great difficulty in solving conflicts among stakeholders. The benefits and limitations of watershed committees have not yet been carefully examined. This paper uses a watershed committee dataset to address socioeconomic conditions, committees' institutional designs, and the River Improvement Plans created by these committees. The dataset will then be used to classify diverse institutional features and analyze the relationship between the organization and effectiveness of these committees.

Key words: *Japan, watershed management, new institutions, river development, scientific expertise*

INTRODUCTION

Recent literature has emphasized the importance of greater watershed governance (e.g., Sabatier et al. 2005). Some studies also assert the importance of watersheds as units of management. However, considering their hydrological and biophysical features, the current units of management, which often coincide with administrative jurisdictions, are ineffective. Other literature has discussed the importance of stakeholder participation in watershed governance.

Given the nested structure of a watershed, watershed governance has inherent difficulties. Some literature suggests watershed management should have a

[1] Faculty of Economics, Hannan University, Japan

smaller scope, and much of the research on common pool management emphasizes the advantages of smaller management units. For example, when Ostrom (1990) presented “design principles,” one precondition was that the number of appropriators within a single country should remain below 15,000. However, the importance of larger-scale management is emphasized in the field of watershed management (Goldfarb 1994). Although the literature on Integrated Water Resource Management (IWRM) varies regarding the scope of integration, it consistently argues that watersheds should be managed in accordance with the various water use sectors of the watershed scale. As Berkes (2002) noted, past research on commons has not dealt with the effects of such linkages and interactions within larger-scale organizations.

The newly created watershed committees in Japan represent an interesting case of multi-scale environmental governance. Recent literature on the commons emphasizes the importance of external actors, like government authorities, non-profit organizations, and academic experts, in the management of local commons, but we have little knowledge of Japan’s new efforts to govern its watersheds. In response to the 1997 amendments to the River Law, Japan’s national and prefectural governments have been establishing these committees in many watersheds for the last ten years. These committees allow academic experts and local residents to jointly discuss plans for river development. While some of these committees have yielded beneficial results, such as new strategies for environmental protection or the establishment of watershed partnership organizations, others have encountered great difficulty in solving conflicts among stakeholders. However, these benefits and limitations of watershed committee have not been carefully examined. This paper uses a dataset on watershed committees that incorporates socioeconomic conditions, institutional design of committees, and the River Improvement Plan created by the committees. This dataset is then used to classify committees’ diverse institutional features and analyze the relationship between committee organization and output.

Brief history of river policy in Japan

Before analyzing Japan’s watershed committees, I will briefly introduce the history of river policy in Japan. Japan’s original River Law was established in 1896. At this time, the main purpose of the River Law was flood prevention, and the most important river lines were managed by the national government.

In 1963, the River Law was drastically amended. The main reason for this amendment was an increase in water usage. Under the River Law of 1963, the Basic Plan for the Implementation of Construction Works was a fundamental river management plan that included plans for dam construction or a discharge channel.

During the process of developing this Basic Plan, only the members of the River Council, a national council composed of academic experts, could express an opinion. In short, the former Basic Plan was exclusively created by the national and prefectural government.

Residents along rivers have been unable to participate in the decision-making process for river development programs related to flood control or water utilization in urban areas. Lack of public participation has sometimes resulted in inept river development projects that lead to serious degradation of natural and social environments. Fierce campaigns against large-scale river development projects, such as dam construction, have occurred nationwide (Takahasi and Uitto 2004).

In 1997, the River Law was again drastically amended. “Environmental conservation” was included as a new objective of the law. This amendment to the River Law introduces river improvement planning system designed to incorporate the opinions of local residents. The Basic Plan for the Implementation of Construction Works established under the former River Law was replaced with the Basic Policy for River Improvement and the River Improvement Plan. In response to critics of the former planning process, the amended process provided the opportunity for academic experts, local residents, and heads of local government to all express their opinion regarding the drafting of the new River Improvement Plan.

Background information on the establishment of the watershed committee

The River Improvement Plan is a specific mid-term plan that spans 20 to 30 years. The provisions it makes with regard to public involvement are as follows: “River administrators (i.e., national or local government) shall take necessary measures, such as public hearings, etc., to take on board the opinions of the people concerned whenever necessary” (River Law of 1997, Article 16-2-4). With regard to academic experts, the law states, “When river administrators intend to draft a river improvement plan, he shall consider opinions from persons with experience or an academic background when necessary” (River Law of 1997, Article 16-2-3). With these two provisions now in place, the new planning process has begun.

Watershed committees, the focus of this study, have been established as key to this new planning process. The legal bases for these committees can be found in Article 16-2-3, River Law of 1997.

LITERATURE REVIEW

Few studies on watershed committee in Japan

It has been over ten years since the 1997 amendment of the River Law; however, few studies have been conducted on watershed committees. Most of the

past literature comprises small-N case studies and can be divided into two categories. One would include case reports by river administrators; for instance, we could find reports on the River Improvement Plan processes for Tama River, Shira River, and Yodo River. The other would include analytical studies conducted by researchers. We would be particularly able to find sociological research; for example, Obitani (2006) analyzed the planning of the Ohno River Improvement Plan and the role of watershed committee in this process. He concluded that the watershed committee played an important part in improving the River Development Plan and establishing watershed-related partnerships between non-governmental organizations (NGOs) and national and prefectural agencies. However, despite the successful results at Ohno River, some watershed committee faced difficulties in achieving successful outcomes regarding the improvement of River Development Plan, resolving conflict, and building consensus. The case that has been most frequently discussed is the Yodo River watershed committee. In the Yodo case, the watershed committee actively discussed the planning and fully disclosed information early in the process. However, after the committee reported that dam should not be constructed in principle, the relationship between the committee and the Ministry of Land, Infrastructure, and Transportation (MLIT) worsened and the committee was suspended.

The number of Large-N studies on watershed committees is also limited. Ohno (2003) has analyzed the overall trend of the establishment of Basic Policy for River Improvement and River Improvement Plans. Kuraji et al (2006) collected available data on already established watershed committees, focusing on member composition and number of meetings, among other factors. His study explained that the institutional design of committees vary in each Regional Development Bureau of MLIT.

Resource use and representation

Environmental governance issues have led to the question of who should be able to participate in environmental decision-making processes. Inoue (2010) noted the importance of “commitment principle,” which implies that participation in natural resource management should be decided based on a potential participant’s degree of resource dependence. If local residents rely greatly on natural resources for their livelihood, they should be given an opportunity to voice their opinion during the decision-making process. If some NGOs have supported residents, the voices of these organizations should be permitted on the degree of their commitment.

From the commitment principle perspective, the member composition at the public meetings is vital. Comprehensive studies on international watershed institutions (Sabatier et al. 2005) have examined member composition of the National Estuary

Program (NEP) and seventy-eight watershed partnerships in California and Washington. In the NEP, elected or appointed officials represent 60 percent of the stakeholders; environmental groups, 11 percent; economic interest group, 12 percent; and researchers, 9.5 percent. In the watershed partnerships in California and Washington, local agencies represent 26 percent of the stakeholders, while 16 percent are private resource users, 13 percent are environmental groups, and three percent are facilitators, consultants, or university researchers. For the collaborative engagement process, they indicated that the use of significant resources, recognition of the importance of welfare, and assurance of outcome effectiveness are required for the identification and recruitment of participants (Sabatier et al. 2005).

We found similar research conducted in fields other than watershed management. For instance, in an analysis of the membership of federal advisory committees dealing with human and medical genetics policies, Ard and Natowicz (2001) found that consumers were underrepresented.

METHOD

Member lists and committee demographics were collected from the official websites of each watershed committee. In cases in which the website had been closed down or changed, information on that committee was collected through a web archive site (http://www.archive.org/web/web.php).

In order to determine the present status of water resource use, we use statistical data. The 2003 Census of Fisheries was used to determine the number of members of Fishery Cooperative Associations that also participated in watershed committees. To determine permitted water usage, data available from MLIT web sites were used.

First, we collected descriptive statistics on watershed committees (Analysis 1). Then, we examined the relationship between resource use and representation by using regression analysis (Analysis 2). Finally, the relationship between the institutional features and output of these committees was examined (Analysis 3).

RESULT

Analysis 1: Overall picture of watershed committees

Watershed committees were based on River Law and established by MLIT. As of October 2010, I could locate 91 committees in the direct management section of 109 Class A rivers. Basically, one committee was established for each watershed; however, some watersheds have multiple committees attached to them. For instance, the Tone River watershed, one of the largest in Japan, has five committees to cover each of its regions. If a dam construction plan exists in a sub-watershed section,

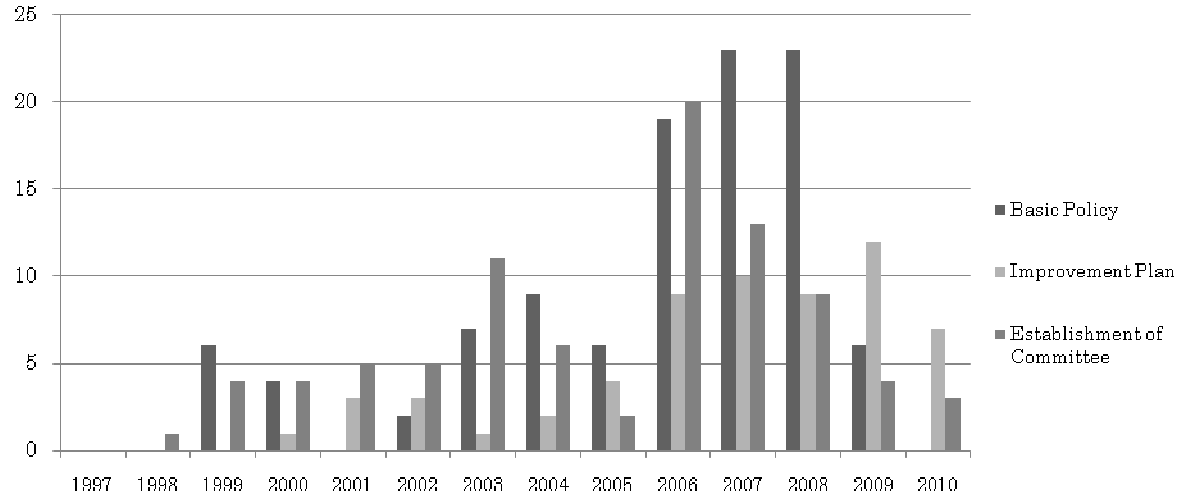

Figure 1. The number of established policies, plans and committees

another independent committee may be established only for this section. The Nakasuji River, which is part of the Watari River watershed and has a dam construction plan, has its committee despite the fact that no committee exists for the watershed as a whole. The same situation applies to the Johbaru River at the Chikugo River watershed.

The numbers of established Basic Policies for River Improvement, River Improvement Plans, and watershed committees are indicated in figure1. Watershed committees have been emerging gradually since 1998, and their establishment increased rapidly after 2006.

In comparing the year of establishment of Basic Policies, River Improvement Plans, and watershed committees, interesting spacing trends can be found between them. Basically, under the provision of the River Law, a Basic Policy should be established first, and then the River Improvement Plan should be established after watershed committees have expressed their opinions. In actuality, some committees were established before the establishment of Basic Policy. Figure 2 shows the gaps between establishment dates of Basic Policy and watershed committees. Most of the earliest committees were established before Basic Policy. After about 2005, most committees were established after Basic Policy. There are two possible reasons for the earlier establishment of committees. One is that the establishment made it possible to incorporate the opinions of local residents and academic experts into earlier stages of Basic Policy. The other is that the rivers around which early committees were established had preexisting dam construction plans and new plans had to be made as soon as possible.

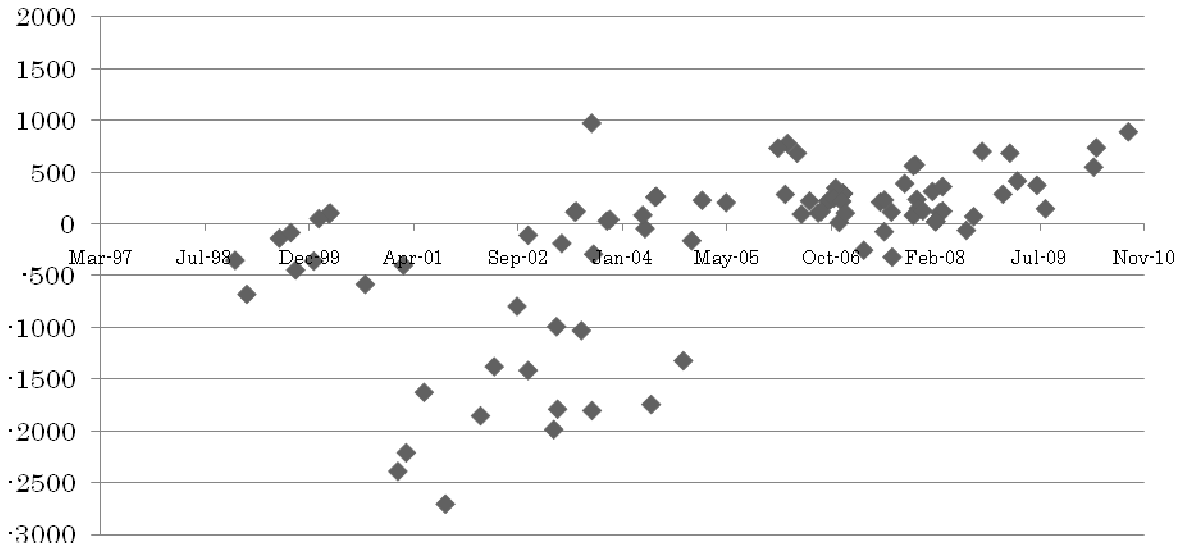

Figure 2. Gaps between establishment dates of Basic Policy and watershed committee

We also collected the data pertaining to the number of committee meetings and terms under which committees were established. Meeting times range from maximum 84 times (in the Yodo River case) to minimum 1 time (in the Oita River and Bansho River cases). Eight point seven meetings were held on average (standard deviation: 11.6). The terms used to create the River Improvement Plan range from maximum 2,980 days (Yodo River case) to minimum 101 days (Nakasuji River case). On average, it takes 917.5 days to establish a River Improvement Plan with a standard deviation of 681.9.

Regarding member composition, we classified members into five categories: academic experts, Land Improvement Districts (LIDs), Fishery Cooperative Associations (FCAs), mayors, and non-profit organizations (NPOs). Academic experts are defined as a member who belongs to universities, research institutes, and museums. LIDs are farmers' associations for irrigation management and land improvement projects. FCAs are composed of fishermen who work on the river. Heads of cities, towns and villages are classified as mayors. The NPOs are voluntary associations concerned with environmental conservation. We classified a total of 1,333 members using these five categories and others. Basic statistics delineating the percentages of members from each category per committee is indicated in table 1. As watershed committees were established based on the River Law provision that specifies the opinions of academic experts should be heard, the percentages of such experts within each committee are higher than percentages from other categories. However, certain other categories are well represented, such as mayors, with an average per committee percentage of 8.3.

Table1 Percentages of members from each category

	Academic expert	LIDs	FCAs	Mayors	NPOs
Average	53.6%	2.2%	2.4%	8.3%	5.4%
Coefficient of variation	0.41	1.69	1.76	1.43	1.22
Max	100.0%	15.4%	18.8%	50.0%	25.0%
Min	9.5%	0.0%	0.0%	0.0%	0.0%

Analysis 2: Resource use and member composition

To examine the relationship between resource use and member composition, regression analysis was conducted. Dependent variables included the percentages of mayors, LIDs, FCAs, and NPOs in each committee. Independent variables were the indicators of each resource used. For the percentage of mayors, the amount of drinking water used per watershed area was included in the model, because drinking water supply seems to be closely related to the municipalities. Furthermore, watershed areas are considered an independent variable, because coordination among municipalities is vital to larger watersheds. For LIDs, the amount of irrigation water use per watershed area was included. For FCAs, the number of FCA members per watershed area was included. For NPOs, the population density was included, because there are many more NPO activities in urban area with high population density.

For every model, a dummy variable that indicated the time of committee establishment was included. As shown in analysis 1, many committees were established before Basic Policy, and the earliest committees established may have different institutional designs due to the opinions of local stakeholders, which were voiced in early stages of planning. This dummy variable appears as “1” in cases of committees establishment before Basic Policy; the other appear as “0.”

Dam construction plans are also included in every model as a dummy variable. When a dam construction plan exists and river administrators are eager to begin construction, they might choose committee members who support the construction and exclude those who oppose it. If the dam construction plans exists at the time of establishment, the variable appears as “1.” In other cases, the variable is “0.”

As dependent variables are shown as percentages, a logistic regression model and quasi-likelihood estimation were used. For this estimation, statistical software “R” (R Development Core Team 2009) was used. The results are summarized in table 2.

Table 2 Result of logistic regression

Dependent variables	% of Mayors		% of LIDs		% of FCAs		% of NPOs	
Independent variables	Coefficient		Coefficient		Coefficient		Coefficient	
Drinking water use per watershed	-131.49 (93.41)							
Irrigation water use per watershed			13.68 (4.54)	**				
The member of FCAs per watershed area					-0.11 (0.13)			
Watershed area	0.16 (0.17)							
Population density							0.00 (0.00)	
Ealier establishment than Policy	0.12 (0.35)		0.12 (0.39)		1.06 (0.41)	*	-0.04 (0.30)	
Dam construction plan	0.44 (0.36)		0.57 (0.39)		0.70 (0.39)	#	-0.03 (0.31)	
(Intercept)	-3.53 (1.23)	**	-4.37 (0.34)	**	-4.27 (0.38)	**	-2.69 (0.20)	**

Note. Standard deviation in parentheses. #p<0.1, *p<0.05, **p<0.01. Model for LIDs were analyzed with subset that Tone River case was excluded.

Variables related to resource use were statistically significant only in the model for LIDs. Given that the coefficient for irrigation water use is positive, there were many more members from LIDs in watersheds where more water is used for agriculture. In other models, variables on resource use or social features were not significant.

Dummy variables for the time of committee establishment were significant in the model for FCAs. This result implies that committees established earlier than Basic Policy included more members from FCAs. By affiliation, the other percentages seem to be the same regardless of the time of establishment.

Similarly, the dam construction variable was positively significant in the model for FCAs; however, the significance probability was weak (p = 0.08).

Analysis 3: Membership composition and output

To examine the relationship between membership composition and the output of committees, correlations between these variables were analyzed.

Table3 Correlations between member compositions and outputs

	% of researchers	% of LIDs	% of FCAs	% of mayors	% of NPOs	Total members	Times held
Times held	-0.34 ***	0.09	0.15	0.17	0.16	0.39 ***	
New dam construction	-0.21	0.15	0.25 *	0.14	0.01	-0.01	0.24 *

Note. *p<0.05, **p<0.01, ***p<0.001. Coefficients are Kendall tau correlation.

With regard to numbers of meetings, the percentages of researchers are negatively correlated with significant possibilities. This suggests that the committees with fewer researchers and greater numbers of other stakeholders met more often. In contrast, the number of total members is positively correlated with statistical significance. This implies that, the higher the total membership, the higher the number of meetings held. The reason for this is assumedly that it takes more time to reach consensus between greater numbers of stakeholders.

For new dam construction, percentages of FCAs and times of meetings are positively correlated with significant possibilities. However, in interpreting these results, we must take into account that most of the new dam construction plans had already been made before the establishment of watershed committees. Thirty committees had dam plans at the time of their establishment. In considering only the committees that had already made River Development Plans, we find only three cases in which dam plans ceased while committees deliberated; Tagawa daini Dam (Naruse River), Yonogawa Dam (Yodo River), and Kiinyuugawa Dam (Kino River).

To examine the effects of watershed committees on the suspension of dam construction, meeting minutes were analyzed. These analyses revealed that two committees engaged intensive discussions on dam construction. Yodo River watershed committee questioned Yonogawa Dam construction. Similarly, some committee members in the Kino River watershed committee opposed the dam construction.

DISCUSSION AND CONCLUSION

Analysis 1 provides an overall representation of watershed committees, delineating the participation of various stakeholders. Provisions newly introduced by the River Law of 1997, which is the basis for watershed committees, literally allow “academic experts” to express an opinion on River Improvement Plans. If we interpret this provision as it is, the committee members should be composed of only researchers from university or research institutes. In reality, however, considerable numbers of other stakeholders are involved in the committees. This implies that watershed committees have been established as not only the forum for technical discussion but the arena for coordination of interests among various resource users.

According to the regression analysis that predicts the percentage of member

composition, there is no relationship between resource use and representation in any category other than the LIDs. When we consider the effect of River Improvement Plans on resource users, lack of FCA members is notable a problem. In most cases, fishery is affected by river development projects such as dam construction, and it threatens workers livelihoods. On the other hand, farmers are sometimes negatively and positively affected. Some river development projects might negatively affect the quantity and quality of irrigation water; however, much of the dam construction plans aim to ensure adequate water supply for agricultural purposes. According to the commitment principle perspective presented in the literature, FCA members should be included in watershed committee deliberations because on their resource use. In the same vein, residents living near the planned dam site should be included as well.

By analyzing the relationship between institutional features and output of committees, we found member diversity and size are positively correlated to the number of meetings held. If the depth of deliberation increased each time committees convened, membership diversity and size are important institutional features. To confirm this point, further qualitative analysis of the discussions that occurred in each committee meeting is needed.

With regard to the incorporation of new dam construction plans into the final River Improvement Plan, we found a weaker correlation between the percentage of FCA members and the numbers of meetings. These results are difficult to interpret at this point, because FCA members usually oppose new dam construction. One possible explanation for their lower attendance is that their dependence on fishery is less crucial than in other rivers, and therefore they allowed the River Improvement Plans to continue with new dam construction. In fact, there is no significant relationship between resource use and FCAs involvement in the committees.

This study uses quantitative data to show the current trends related to watershed committees established as a new form of watershed governance in Japan. Given that few studies have been conducted in this area, further quantitative and qualitative research is essential to understanding the governance of these large resources. The discussions surrounding watershed governance in Japan has occasionally been based on single symbolic or hypothetical cases; however, we need to engage more concrete discussions in order to determine which governance mechanisms are desirable. Further research should be conducted on the basis of the data set used in this study.

ACKNOWLEDGEMENT

This research was supported by the Ministry of Education, Science, Sports and Culture, Grant-in-Aid for Scientific Research on Priority Areas (18078009).

REFERENCES

Ard, Catherine F, and Marvin Natowicz. 2001. A Seat at the Table: Membership in Federal Advisory Committees Evaluating Public Policy in Genetics. American Journal of Public Health 91 (5):787-790.

Berkes, F. 2002. Cross-Scale Institutional Linkages: Perspectives from the Bottom Up. In The Drama of the Commons, edited by National Research Council.

Goldfarb, W. 1994. Watershed management: Slogan or solution? Boston College Environmental Affairs Law Review 21 (3):483-509.

Inoue, M. 2009. Design principles for collaborative governance of natural resources. In Local commons in the age of globalization, edited by Mrota, T. (in Japanese)

Kuraji, K., Ohno, T. and Gomyo, M. 2006. Evaluation of watershed committee in Class A river by using multiple criteria and indicators. Water Resources and Environmental Research 19: 7-16. (in Japanese)

Obitani, H. 2006. Planning process and public participation at regional environmental management: A case on River Improvement Plan at Ohno River, Oita prefecture. Nara Women's University Sociological Studies 13 (7): 77-92. (in Japanese)

Ohno, T. 2003. “Institutionalized participation” in river policies and its problem. Papers on Environmental Information Science 19: 247-252. (in Japanese)

Ostrom, Elinor. 1990. Governing the commons : the evolution of institutions for collective action, Political economy of institutions and decisions. Cambridge ; New York: Cambridge University Press.

R Development Core Team. 2009. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria, URL http://www.R-project.org.

Sabatier, Paul A., Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, eds. 2005. Swimming upstream : collaborative approaches to watershed management, American and comparative environmental policy. Cambridge, Mass.: MIT Press.

Takahasi, Y., and J. I. Uitto. 2004. Evolution of river management in Japan: from focus on economic benefits to a comprehensive view. Global Environmental Change-Human and Policy Dimensions 14:63-70.