

# Study of an Integrated River Basin Management Model and Its Implications for River and Lake Management in China

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**Abstract** A model combining basin management and administrative management is currently adopted for the lake and river management in China. In applications , the model suffers many problems , including the confusion of rights and responsibilities of river basin authorities and the dominant governmental agencies , and the lack of effective public participation. In this paper , we employ the Great Lakes Basin in the United States , the Loire – Brittany River Basin in France , the Southeast Basin in the United Kingdom , the Murray – Darling Basin in Australia , and general German model as examples to analyze and summarize the characteristics of their river and lake management modes , regarding river basin authorities , dominant governmental agencies , public participation , and basin management. This study may provide some referable experience for the integrated river basin management in China.

**Key words** Integrated basin management; Lake and river management; Public participation  
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Currently , the basin management in China is based upon administrative units , which means a whole basin is respectively managed by different local governments. Moreover , as river and lake management involves many government agencies , like those in charge of water conservancy , land resources , environmental protection , urban construction , transportation and forestry , and each of them manages river , lake and water resources in their own ways regarding different administrative functions. This makes it difficult to effectively manage the resources based on the features of the basin as a whole. In recent years , despite China has issued many policies to address the problems from decentralized management , and many innovative theories and practices were proposed to improve coordinated management , the role of market mechanism , and public participation , which all served the construction of an integrated basin management model , many problems remain there.

Like China , many western developed countries suffered similar problems in their process of industrialization and modernization , such as over-decentralization in management , poor coordination across regions , up-downstream competition over water resources , and water pollution. Now , many of them choose integrated basin management model as the primary way. Despite different countries developed their own modes that were not totally same , integrated management is more suitable for the natural law of water resources , and is thus more efficient in management coordination , and good for sus-

tainable development. Although foreign management modes are products of their own political systems , and China cannot simply copy them , they are still insightful.

In this paper , regarding the lack of integrated management and public participation in Chinese model , we will analyze the characteristics of five western countries' integrated basin management modes , mainly over their administrative bodies , their power and responsibilities , and management experience.

## 1 Problems of Chinese basin management model

In response of the increasingly intensified conflicts between eco-social development and natural environment protection , Chinese government recently issued a series of policies on water resources management from both national and basin levels. The newly issued policies have many innovative points in basin management. They called for employing a more centralized and integrated management method in China , imposing the responsibilities of water management upon the local government chiefs ( Hezhang System) <sup>[1-2]</sup> , introducing public participation<sup>[3]</sup>. Although these points might be common in western countries , they are very ambitious in Chinese governing system.

However , despite some new policy principles were proposed , Chinese way of basin management remains as before , as these policies never actually solve the problems of decentralized management and poor coordination , and the functions , power , and responsibilities of different relevant government agencies are not identified clearly. For example , when endowing the power , two policy documents titled as *The State Council's Opinion on the Implementation of the Most Stringent Water Resources Management System* and the *Guidance Opinion on Enhancing River and Lake Management Works* only de-

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scribe the management body as "water administration or basin management agencies" without specifically defining particular bureaucracy. Moreover, according to a planning of seven great basins, despite integrated basin management is nominally working in six of China's seven great basins, and basin management councils were established to represent all stakeholders, their roles in management system remains unclear in policies, and overlapping functions is still a problem, which makes them hard to bear the responsibilities of integrated and coordinated management<sup>[4]</sup>. What is more, Hezhang System seems a good way as it takes advantage of government chiefs' personal influence in coordination and enhancing cooperation across different agencies, yet it is still the rule of man, rather than an institution-oriented management, which makes it lack formal coordination mechanism to integrate regional development, environment protection, law enforcement, and ecological compensation<sup>[5]</sup>.

Some experts also mention the problem of lack of real integrated management. Li Ruijuan, a researcher from the Environmental and Economic Policy Research Center of Ministry of Environmental Protection<sup>[6]</sup> said that the policies of managing basin as a whole made by the *Water Pollution Prevention Law* were not fully implemented, as the local governments ignored the role of integrated management, which harmed the management efficiency. China's current water environment management is characterized as decentralized, government resources are invested by each agency independently without joint arrangement and coordination. The lack of collaboration and synergistic effect across different regions and government agencies lowers the management effectiveness of the basin as a whole.

In public participation, some policies propose to strengthen the education over water resources, some call for increase management transparency by establishing public supervision mechanism, and some emphasize medias' role as important supervisors. Yet, none of them gives specific and feasible measures to translate their proposals into reality. More importantly, as no formal institutional arrangement that involves all stakeholders, like citizens, firms, NGOs, into decision-making process exists currently, the management suffers a problem of lacking representativeness. Finally, China also has no law to guarantee the information transparency and public's right to know in environmental issues, which makes public participation and supervision impossible<sup>[7]</sup>.

In summary, two main problems present in China's current basin management model. The first one is unclear definition of primary management body and its functions, power, and responsibilities. The second one is lack of public participation. Therefore, China has a lot to learn from developed countries' integrated basin management modes.

## 2 General introduction of foreign integrated basin management modes

The integrated basin management means two primary as-

pects. First, there must be formal institutional arrangement to coordinate different government agencies and regions. Second, it does not only calculate the financial and economic costs and benefits, but also takes social and environmental costs and benefits into consideration, and keeps in pursuit of balance<sup>[8]</sup>. Moreover, a good water management model must consider externalities. As impacts on all stakeholders must be regarded carefully, the water resource administrators must make them join the decision making process, and try to achieve a win-win solution.

To employ integrated basin management, five measures should be taken<sup>[9]</sup>. First, to establish an integrated and systematic management framework that regards basin as a whole, construct coordination mechanism that allows different government agencies and regions can work together synergistically. Second, to survey and clear the condition of natural resources in the basin, and figure out their relationship. Third, all strategies, policies, and planning over the basin should be made based upon understanding of such relationship. Fourth, all stakeholders should involve the decision making process. Fifth, an assessment system should be established in order to evaluate the sustainability of the basin management model.

As the nature of the integrated basin management is to integrate different agencies, regions, stakeholders, and policies, it highly relies on their collective collaborations. Thus, establishing a specialized basin management body with clear functions, power, responsibilities to work as the core of such collaborations is very important. In developed countries, there are always three types of basin management agencies, including river basin coordination committee/council, river basin commission, and river basin authority. Their applicable conditions, organization forms, and responsibilities are shown as Table 1.

## 3 Practices and characteristics of integrated basin management in five western developed countries

Based on the understanding on foreign integrated basin management model and basin management agency, hereafter, we introduce the specific management modes of the Great Lakes Basin in the United States, the Loire – Brittany River Basin in France, the Southeast Basin in the United Kingdom, and the Murray – Darling Basin in Australia. The five modes all have their own distinguished features. The US – Canada joint management of Great Lakes emphasizes setting common target and dynamic monitoring<sup>[9]</sup>. While the Southeast Basin management in Britain takes Ecosystem Approach as the principle, which pays more attention on balancing both environmental protection and economic development, and invests to address the problem of information asymmetry<sup>[10-11]</sup>. Australia's Murray – Darling Basin management model combines river basin coordination committee/council and river basin commission, prefers cross-region coordination and community education, and employs economic lever as instrument to distribute resources<sup>[12]</sup>. In contrast, French Loire – Brittany River Basin management

model combines river basin commission and river basin authority , integrates management activities of all types of water resources together , takes regular dialogue and coordination mechanism among stakeholders , and highlights the role of mar-

ket in water resource management<sup>[13]</sup>. Finally , the general German model emphasizes public participation , and legislation is made to ensure the information transparency and stakeholders' involvement<sup>[14]</sup>.

Table 1 Three types of integrated basin management agencies<sup>[8]</sup>

Agency types	River basin coordination committee/council	River basin commission	River basin authority
Applicable conditions	Current basin management agencies are effectively operating	Some key development planning projects in the basin are still at the stage of discussion and demonstration	It is a kind of power centralization model , and was universal before 50 years. At that time , fast expansion of urbanization , industry and agriculture generated a lot of large-scale water resources development projects; needing concentrating power to develop water resource potential; not applicable for the region with complicated geography and political environment
	With important data and information	Information and data sharing system is still imperfect; information channel and policy guaranteeing each area and department to fairly share resources and limit negative impact brought by resource utilization within certain range still need further perfection	
	Complete construction of water conservancy facilities and technical facilities	Planning and management of water resources have unclear targets in the practice , such as whether further impelling and stimulating resource utilization or restricting utilization to reach the protection target	
	Competition in water resources is properly coordinated and solved in different administrative divisions ( province/prefecture/county ) of cross basin	Competition conflict in resources by each administrative division and department in the basin is not properly coordinated and solved	
Composition	Official representative of related government functional departments in each administrative division and representative of other interested parties in the basin	Set ministerial-level council , which is composed of ministerial-level officials in each administrative division; set basin management commission , which is generally composed of senior officials of water resource management and environmental protection department	The organization integrating many departments and responsible for specific work function; or the organization of absorbing all water resource management functions in the basin
Form	Regular meeting ( once every 6 months)	The ministerial-level council meet once a year; the management committee meet four times a year	
Duties	Coordination and discussion	Coordination , discussion , target setting , policy formulation , strategic guidance	Operating under the specific national laws and regulations , management bureau can take over all or part of functions and duties of the existing related government functional departments
	Agreement of related strategy , policy , data information sharing aspect of basin management; model of whole basin management; topic on institutional systems and procedures of cross administrative division; potential dispute and conflict areas	There are a series of units( such as technology office) responsible for providing support for committee , containing water technology , natural resources and social economic planning; ministerial-level council is responsible for final decision making , decides key policy direction and makes the related long-term financial planning; management committee is responsible for actual implementation , guides office work , makes strategy plan and short-term action plan , supervises new data sharing system and model , communicates and interacts with the departments responsible for specific work in each administrative division	
	Supervise management situation of whole basin by evaluating sustainable utilization and distribution situation of natural resources	Set water portion distributed to each administrative division , and supervise trial situation of water resources	

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Agency types	River basin coordination committee/council	River basin commission	River basin authority
	Supervise the work of each government function department , and guarantee the implementation according to watershed management policies and strategies have been agreed upon	Strategic natural resource management of basin river	
Advantages	Need comprehensively evaluating the existing and future management demands and proposing coordination proposal , such as establishing new basin committee with larger power , canceling coordination committee	There is limited execution and management power defined clearly , which impels equal cooperation of all interested parties , promotes sharing of basin information data , and transfers local community group in the basin participating in planning and decision making	Could concentrate force to develop water resource utilization

Characteristics of all these five countries' modes are shown as Table 2. We summarize them from the perspectives of management body , primary government agency , and public participation. We can see that despite the five modes are different , they share something in common. First , although in these foreign modes , basins are also managed separately according to different government agencies' functions , there are always a primary bureaucracy bears the responsibility to coordinate all others and make unified plans ( Environment Protection Agency in the US , Environment Agency in Britain , Ministry of Ecology , Sustainable Development and Energy in France) . Second , they

all establish some kind of committee as a platform to make joint arrangement( International Joint Commission of the US and Canada , South East River Basin Liaison Panel of Britain , Murray – Darling Basin Ministerial Council and Community Advisory Committee of Australia , community advisory committee , Committee for the Loire – Brittany Basin of France) . Finally , although some do not explicitly use the concept of Ecosystem Approach , all five countries in employ its principles in practices , which means in management they take all natural factors of a basin into consideration rather than just regarding water resources per se.

Table 2 Basin management characteristics and modes in each country

Case	Basin management body			Primary government agency		Public participation manner	Basin management characteristics
	Name	Type	Effect	Name	Duty		
The five great lakes basin of the United States <sup>[9]</sup>	International Joint Commission	Basin commission	Coordination , study and provide suggestion , monitoring , supervision and assessment	Environmental protection agency	Issue policy and coordinate local government to implement	Participate in local decision making process , and use more environmental living manner	1. Set common target of two countries; 2. dynamic management , research and monitoring , and regularly update target and standard; 3. management techniques develop from control specific pollution to comprehensively considered "ecological system method"; 4. two countries' governments are action subjects , and the international joint commission serves as a supplement , with low social participation degree
England south-east basin <sup>[10-11]</sup>	South East River Basin Liaison Panel	Watershed coordination committee	Communication , coordination and suggestion	Environmental protection agency	Monitor water environment , suggestion , manage pollution discharge , distribute permit , and enforce policy implementation		
	The interested parties of commerce , environmental organization , consumer , shipping , fishery and tourism group of sou-	1. Take " ecosystem management thought; 2. economy development has an important position in management but not only environment; 3. excessive use the means					

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Case	Basin management body			Primary government agency		Public participa- tion manner	Basin management characteristics
	Name	Type	Effect	Name	Duty		
	theast valley area; cooperate with environmental agency to join in management	of providing consulting service , and value solving the problem of poor information; 4. management is commanded by environmental agency , emphasize the cooperative interaction with local interested parties , and government plays the part of basin committee and basin authority					
Australia - Darling basin <sup>[12]</sup>	Murray - Darling Basin Ministerial Council	Between basin coordination committee and basin committee	Policy decision and assessment	Murray - Darling basin minister council	Policy decision and assessment	Community and local interested parties provide suggestions via community coordination committee	1. Value coordination and cooperation in each administrative region of the basin; 2. use the combined manner of basin committee and basin coordination committee; 3. value the education and coordination on community; 4. distribute and manage resources by overall planning and marketization , and impel effective use of resource , reaching the effect of natural environment and economic benefit double harvesting
	Murray - Darling Basin Committee	Between basin coordination committee and basin committee	Suggestion , supervision and implement policy	Murray - Darling basin committee	Suggestion , supervision and implement policy		
	Community Advisory Committee	Basin coordination committee	Education , communication and coordination	Basin coordination committee	Education , communication and coordination		
France Loire basin - Brittany <sup>[13]</sup>	Committee for the Loire - Brittany Basin	Basin committee	Consult and consider all important problems in basin water policy	Sustainable development , environmental and energy department	Make national water resource management policy , water resource use , water pollution control , river and water ecological environment protection , responsible for inter ministerial wading events	As basin committee member dialoging and joining	1. Use the combined model of basin committee and basin authority; 2. implement integrated water resource management , overall consider the demands of various water uses , water eco-environment and control pollution; 3. implement dialogue and action coordination mechanism , carry out wide dialogue in each management

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Case	Basin management body			Primary government agency		Public participation manner	Basin management characteristics
	Name	Type	Effect	Name	Duty		
	Loire basin – Brittany Basin Management Bureau	Basin management bureau	Implement policy enforcement agency of basin water resource management ,containing expense collection , financial aid , effect evaluation				link , and coordinate various measures; 4. implement financial resource management , use water to raise water , polluters and users pay; 5. set total head of watershed coordination , and basin committee carries out work by relying on specialized committee and regional commissioners; 6. implement the operation model of policy making – policy implementation – evaluation and supervision
Germany <sup>[14]</sup>	Cross-city joint working group , various associations	Basin coordination committee	Communication and coordination	Federal Ministry of the Environment , Nature Conservation , Building and Nuclear Safety	Cross-border cooperation of water resource management , policy making and water resource management	Join in key decision process by formal public planning procedure	1. Determine public participation manner in basin natural environment and water management via formal laws and procedures; 2. value listening to the opinions of the interested parties and corresponding communication and coordination works; 3. local government also takes the form of association in basin management to enhance cooperation and coordination; 4. NGO coverage is wide , and plays an important role in management
				Environment department of each state	Make and supervise water management strategy decision	Coordinate by local agenda	
				Regional government , city , district and technical department	Plan and licence of regional water management aspect , issuing and supervision of related licence , provide technical consultation	Folk NGO provides information delivery , consultation and education service	

#### 4 What China can learn

Although the five developed countries' water resources/ lake and river management modes are very different and are designed for addressing their own problems , they reflect some good management thoughts , which also represent some future trends.

For China's problems of blurry management body setting , and overlapping power and responsibilities , foreign integrated basin management modes give good lessons to learn. China should strengthen the role of current basin management councils' roles , giving them more resources and authorities by means of legislation. Upon different conditions , China has three alternatives.

Should China has guaranteed existing basin management councils work effectively , solved water resource competition

and conflicts across regions smoothly , had all necessary infrastructures ready , and established basin information and data sharing system , had it choose basin coordination committee.

Also , if China still suffers problems like yet-decided planning , unclear management goals , unsettled conflicts over water resources across regions , lack of information sharing mechanism , river basin commission mode could be an appropriate choice.

Lastly , when it urgently needs to exploit water resources , the most centralized river basin authority could also be an option.

To reform current basin management councils in seven great basins , further clarify their responsibilities , strengthen their power , avoiding overlapping functions , all three modes can be referred. Yet , the reform should also consider different

basins' own characteristics, like the development stages, local management traditions, and combine different modes according to local realities.

Being more specific, American and British modes both emphasize the role of government, and the coordination committees play secondary and auxiliary roles. In contrast, French mode combines basin committee and basin authority together. In Australia, three committees (basin minister council, basin committee and community advisory committee) are employed to undertake different coordination responsibilities over water resources management across different regions, government agencies, and stakeholders. The three committees respectively fulfill the functions of making overall strategy, policy implementation, and communication and coordination. The Murray–Darling Basin Ministerial Council is composed by the several state governments' chiefs in charge of land, water, and environmental protection.

More importantly, in coordination, laws or formal institutions should be made to define a specific government agency to play the primary role in basin management, and avoid over-decentralized management. For example, the US EPA's leading role is determined by the *Great Lakes Water Quality Agreement*, while the positions of British Environment Agency and German Federal Ministry of the Environment, Nature Conservation, Building and Nuclear Safety are both decided by the *EU Water Framework Directive*.

For enhancing public participation, institutions should play more important roles. All specific means, procedures, information transparency and feedbacks should be defined by formal laws or policies. For example, under the *EU Water Framework Directive*, German public participation serves more significant functions in its basin/river and lake management than in other countries. First, the German mode guarantees the participation rights of public in basin management via formal legislation. Second, it treats stakeholder's suggestions seriously, and pays heavy attention in coordination and communication. Third, local governments across regions establish closer ties with the help of different associations and joint working groups. Fourth, NGOs have wide influences.

## 5 Conclusions

Currently, China's basin management mode remains far from real integrated basin management. Many problems are impeding effective and efficient management. The basin management councils still lack legal foundations to perform their functions and responsibilities, which are even not clearly identified, no smooth coordination mechanism yet, over-decentralized management among government agencies, pervasive and conflicted sectoral interests, lacks of public participation and of representativeness in policies, poor information transparency, and weak market mechanism, and so forth.

Although the management mode of western developed countries are designed under their particular political systems, means they could not be simply copied by China, there are many insightful points China can learn. Ecosystem approach, public participation, basin management body construction are all good elements that can be borrowed. China can take and modify them, creating its own ways to serve the transformation and upgrade of China's management mode, and to promote the parallel development of both ecosystem and economy.

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