Water resources administration institution in China

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Abstract

Water is one of the basic natural resources and a strategic economic one. According to Chinese law (The Constitution and The 2002 Water Law), water resources are national properties and the state government has the responsibility to administer and protect them. At present, water administration is shared by several ministries of the State Council and called “nine dragons administer water”. This paper illustrates the overall water administration scheme. It focuses on the overlapping mandates and interactions between various ministries, particularly those between the Ministry of Water Resources (MWR) and the State Environment Protection Administration (SEPA). The paper then analyzes the reasons why conflicts and disputes over ministry policies and strategies occur and the resultant lowering of administration efficiency and degradation of the water environment. Considering the complexity of water administration and the multiple demands on and limited water resources, some trends must be developed in water administration institutions to improve the efficiency of water administration. In particular, water administration must be strengthened and unified; administrative power must be separated from supervisory power; watershed management and planning must be strengthened; and cooperation among the related water departments must be increased.

Keywords: China; Cooperation; Overlapping function; Responsibility; Water administration

1. Present water problems and an overview of water administration in China

In China, the amount of water resource per person is approximately 2,200 m\textsuperscript{3}, which is only one-quarter of the world average. Along with rapid national economic development, the increased urbanization and improvement of the standard of living in recent years, more than 400 of China’s 668 cities are facing water shortages, a shortage of more than 6 billion m\textsuperscript{3}. Regarding water pollution, nearly 50% of China’s rivers and 90% of water bodies in urban areas are polluted to varying degrees, increasing the urgency of the water
The key water problems faced by China include flooding and water logging; water shortage and drought; ecological and environmental deterioration caused by pollution; declining water levels or drying up of lakes, wetlands and rivers; erosion of land and subsequent sedimentation at the mouths of rivers; and saltwater intrusion, among others. Therefore water resource issues have become an important limiting factor in the sustainable development of China (World Bank, 2001).

Owing to the characteristics of multiple uses, scarcity, lack of the ability to replace water in social and economic development and eco-system maintenance of water, the official departments involved and the requirements of water administration are numerous and broad. In China, the framework of water resources administration institution is dubbed “The nine dragons who administer water”. Water management affairs are divided among the Ministry of Water Resources (MWR), the State Environment Protection Administration (SEPA), the Ministry of Construction, the Ministry of Agriculture, the State Forest Bureau, the State Development and Reform Commission, the State Electric Power Company and the Ministry of Communication (see Table 1).

The objective of this complex institutional arrangement for water administration is to build a combined force to increase the efficiency of water administration. However, the fact that, along with the rapid and sustained economic development of China, the water situation continues to deteriorate, points to some problems in water administration. More specifically, policies on water in different departments differ and conflicts among departments and lack of cooperation between departments weaken their power and reduce the efficiency of water resource management. In addition, the responsibilities of each department are not clearly defined making it difficult to realize that everyone doing their best according to their responsibility. Furthermore, there is lack of coordination between industry management and administrative regional management.

2. Departments of water administration and their responsibilities

In China, each of the related official departments and local governments carries out powers of water administration authorized by laws and regulations. The Constitution authorizes the State Council as the implementing department of the highest state power (Constitution of the People’s Republic of China, Article 85). Article 9 prescribes that natural resources such as water, land and forest are attributed to the state. It prescribes that the state must ensure their reasonable utilization and that their invasion and occupation or destruction is prohibited; it protects and improves ecologic environment, prevents and controls pollution and other social effects of pollution in Article 26. In 1998, in order to define clearly the responsibilities among the official departments, their responsibilities were adjusted according to the Reform Scheme of the Central Government’s Organizations (“the Reform Scheme” Secretary Agency of the State Council and the Comprehensive Division of the office on the Central Institutions Organizing Committee, 1998). The departments involved in water administration are described below.

2.1. The Ministry of Water Resources

The Ministry of Water Resources (MWR) is the department directly under the State Council in charge of unified management of water at the national level. According to the Reform Scheme, the key responsibilities of MWR include: (1) promulgation of the official national report on water resources;
Table 1. Water administration agencies under the State Council and their functions in China.

<table>
<thead>
<tr>
<th>Department</th>
<th>Scope of water administration responsibilities</th>
<th>Major functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Water Resources</td>
<td>Surface and ground water management, river basin management, flood control, water and soil conservation</td>
<td>The planning of water development and conservation, flood control, water and soil conservation, designation of water function regionalization, unified water administration</td>
</tr>
<tr>
<td>State Environmental Protection Administration</td>
<td>Prevention and treatment of water pollution</td>
<td>Water environmental protection, water environmental function regionalization/zoning, to establish national water environmental quality standards and national pollutant discharge standards</td>
</tr>
<tr>
<td>Ministry of Construction</td>
<td>Urban and industrial water use, urban water supply and drainage</td>
<td>Planning, construction and management of water supply projects and drainage and sewage disposal projects</td>
</tr>
<tr>
<td>Ministry of Agriculture</td>
<td>Water uses for agriculture (irrigation), fishery aqueous environment protection</td>
<td>Non-point source pollution control, protection of fishery water environment and aquatic environmental conservation</td>
</tr>
<tr>
<td>State Forest Bureau</td>
<td>Water resources conservation</td>
<td>Forest protection and management for protecting watershed ecology and water resources</td>
</tr>
<tr>
<td>State Electric Power Company</td>
<td>Hydro-power Development</td>
<td>Construction and management of large and mid-scale hydro-power projects</td>
</tr>
<tr>
<td>State Reform and Development</td>
<td>Participation in the planning of water resource development and ecosystem building</td>
<td>Planning of water resource development, allocation of production force and ecological environment construction, coordinating the planning and policy of agriculture, forest and water resources, development</td>
</tr>
<tr>
<td>Ministry of Communication</td>
<td>Pollution control related to navigation of ships on rivers</td>
<td>Pollution control and management of inland navigation</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Supervision and management of environmental health</td>
<td>Supervision and management of the drinking water standard</td>
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</table>

(2) study of the planning of water resource protection, including the creation of water function regions and the control of drainage to water bodies in drinking water source areas; monitoring water quality and quantity of rivers, lakes and reservoirs to examine and approve the capacity of water bodies to accept pollutants and self-purify; and advancing opinions on limits for gross drainage; (3) to coordinate and arbitrate water-related conflicts between different government departments and different administrative regions (provinces, municipalities); and (4) to organize and guide the management and protection of hydro-projects, water bodies and shorelines.

The 2002 amendments to the 1988 Water Law authorize the MWR to conduct unified water administration and supervision throughout the country (Water Law of the People’s Republic of China, Article 12). According to the Water Administration Plan, a system of watershed water management is executed in conjunction with administrative region water management. The Watershed Management Agencies (WMAs) in important watersheds confirmed by the State are set up by MWR. The WMAs are charged with water management and supervisory duties as authorized by the Water Law. Administrative regulations are enacted by the MWR. The MWR is responsible for carrying out research to define the
water function regionalization/zones of the important rivers and lakes and reports to the State Council or MWR for approval through coordination with SEPA, other related water management departments and local government. According to national water environmental quality standards and the self-purifying capacity of various water bodies in the different functional regions, the MWR should examine and approve the total contaminants discharged into each water body and forward opinions to SEPA on recommendations for the total allowable discharge in each region. During MWR and WMA monitoring of the water quality of each region, when water quality does not satisfy the requirements of the needs of the water function regions, or discharge limits for key contaminants are exceeded, these should be reported to the respective government(s), which should notify the rectification measures to SEPA within good time (Article 32). Construction, reconstruction, or enlargement of a sewage outfall at a river or lake shall be agreed by the lower departments of MWR or WMA. The departments of SEPA shall be responsible for review and approval of the environment impact assessment report of the construction report (Article 34). Ecological and environmental water demands should be considered when water development and utilization occurs in arid and semi-arid areas (Article 21).

The Law of Water and Soil Conservation promulgated in 1991 is for the prevention and control of soil erosion, the protection and rational use of water and soil resources, the mitigation of disasters of flood, drought, windstorm and the improvement of the ecological environment (Law of the People’s Republic of China on Water and Soil Conservation). The Department of Water Administration under the State Council is charged with water and soil conservation throughout the country. The Departments of Water Administration under the local people’s governments at or above the county level shall be in charge of the work of water and soil conservation in areas under their respective jurisdictions (Article 6) and the MWR is authorized to do this as the department in charge of soil erosion control at the state level.

Flood Control Law of the People’s Republic of China promulgated in 1997 is to prevent and control flood, to take precautions against and alleviate calamities by flood and water-logging and to maintain the safety of people’s lives and property. The work of flood control has been part of official affairs in China for thousands years. The work of flood control includes three parts: (1) reinforcing the construction of flood control before flood, (2) ensuring flood control and flood fighting during flood and (3) reconstruction and relief after flood. MWR, as the water conservancy administrative department under the State Council, is responsible for routine duties of organization, coordination, supervision and guidance for flood control nationwide (Article 8). The administrative institution of flood control combines river basin management with management of the administrative regions. The work of flood control is carried out through unified planning and implementation at different levels and consideration is given to the administration of river basins as well as to the administration of administrative areas (Article 5). In the actual implementation of the law, most flood control duties are undertaken by government at all levels. This includes consolidating a unified leadership over the work; organizing the departments and units concerned; taking measures to enforce the construction of flood control works in order to consolidate and enhance flood control capacity; organizing flood control and flood fighting, and reconstruction and relief work after flood or water-logging calamities; lending support to flood storage and detention areas and providing compensation and aid after flood disasters. WMAs are charged with coordinating affairs, supervising management and planning flood control in the watersheds under their authority. MWR is charged with the general planning of flood control nationwide. The statute defines focal points in flood control and the respective authority of the WMA and local government in different types of river basins.
The Regulation of Watercourse Management released by the State Council in 1988 is to strengthen water course management, ensure safety of flood control mechanisms and to promote the comprehensive benefit of water courses (Regulation on Watercourse Management of The People’s Republic of China, 2004). The regulation promulgated under the relative national laws endows MWR with administrative power with regard to the organization of watercourse management nationwide (Article 4) and prescribes its authority and the extent of its enforcement powers (Article 20–21). Watercourse management is carried out by the unified management of watersheds in conjunction with administrative management (Article 5). Construction and enlargement of sewage outlets at a watercourse and lake should be agreed by the departments under MWR before being reported to the agencies of SEPA at the appropriate level (Article 34). The departments of MWR should develop water quality monitoring and coordinate with the agencies of SEPA to implement the supervision of implementation strategies for preventing and treating water pollution.

2.2. SEPA’s responsibilities regarding water management

In the Central Government’s Organization Reform Scheme (Secretary Agency of The State Council and the Comprehensive Division of the Office on the Central Institutions Organizing Committee, 1998), SEPA has the following responsibilities: (1) to formulate national environmental protection plans; to formulate and monitor the implementation of the national plan for pollution control and ecological conservation in key regions and river basins, and to organize the zoning of environmental functions of different regions (Article 1); (2) to work out, organize and implement pollution control and treatment laws, regulations and rules, concerning water (Article 2); (3) to supervise activities concerning of exploitation and utilization of natural resources which might affect ecological environment (Article 3); (4) to guide and coordinate efforts in dealing with major environmental problems involving different departments, localities, river basins and regions; to coordinate the inter-provincial environmental disputes; to organize and coordinate the work of water pollution prevention and control in the important river basins (Article 4); (5) to release on a regular basis reports on the environment quality of key cities and river basins (Article 5).

The authority of SEPA which relates to protection and management of water resources are endorsed by the Environmental Protection Law, the Law on Prevention and Control of Water Pollution and the Implementation Measures of Law on Prevention and Control of Water Pollution. In the 1989 Environmental Protection Law (Environmental Law of The People’s Republic of China, 1998), the term “Environment” refers to both the natural and artificial features that affect human existence and development, which include water, land, forests and so on. SEPA, as the competent department of environmental protection administration under the State Council, shall conduct unified supervision and management of environmental protection work throughout the country. The administrative departments of land, minerals, forestry, agriculture and water conservancy of local government at or above the county level shall, in accordance with the provisions of relevant laws, conduct supervision and management of the protection of natural resources (Article 7). The main responsibilities of the competent departments at or above the county level shall, in conjunction with relevant departments, be to draw up plans for environmental protection which shall, subject to overall balancing by the department of planning (Development and Reform Commission), be submitted to the peoples’ government at the same level for approval before implementation (Article 12). The plans for environmental protection must be
incorporated into the national economic and social development plans and the state shall adopt economic and technological policies and measures favorable for environmental protection, so as to coordinate environmental protection with economic and social development (Article 4). SEPA shall establish a monitoring system, formulate the monitoring standard and, in conjunction with relevant departments, strengthen the management of environmental monitoring. SEPA and provincial governments shall regularly issue bulletins on the environmental situation (Article 11). Pollution damage involving various administrative areas shall be conducted by the relevant governments through negotiation, or by the decision of government at a higher level through mediation (Article 15).

The Law on Prevention and Control of Water Pollution implemented in 1984 (Law of the People’s Republic of China on Prevention and Control of Water Pollution, 1998), is to prevent and control water pollution, protect and improve the environment and ensure the effective use of water resources. This law applies to the prevention and control of the pollution of rivers, lakes, canals, irrigation channels, reservoirs and other surface water bodies and of ground water (Article 2). Environmental protection departments at all levels (SEPA departments) exercise unified supervision and management of prevention and control of water pollution. The administrative departments of water conservancy, public health, municipal, geological and mining and the water resource protection agencies for major rivers at various levels shall perform their respective functions and in conjunction with SEPA departments, implement supervision and management of the prevention and control of water pollution (Article 4). SEPA shall establish national water environment quality standards (Article 6) and establish national pollutant discharge standards, in accordance with the national water environment quality standards and the country’s economic and technological conditions (Article 7).

To improve enforcement of the Law of Prevention and Control of Water Pollution, the Implementation Measures on Law of Prevention and Control of Water Pollution were promulgated in 1989 (Implementing Measures on Law of Water Pollution of the People’s Republic of China on Prevention and Control, 2004). The regulation includes several articles relating to the administrative functions of several government departments. After the lowest allowable average water discharge below the large and middle scale dams is defined and the purification capacity of the downstream water body is determined, the MWR should consult the opinions of the departments of SEPA at the local level (Article 6). The designation of and any adjustment made to water body conservation schemes are initiated by SEPA departments at or above county level in conjunction with other concerned departments. At any given level of environmental administration, the same level of government must approve the plan. If the conservation plan involves various administrative areas, the scheme must be approved by the highest level of government involved (Art 7). The construction of new discharge outlets near water body conservation areas must be approved by the environmental protection department and the relevant authorities of water body protection (Article 17). Water discharged onto land for potable ground water replenishment should satisfy basic standards of drinking water quality and be approved by the health department at or above the county level (Article 30).

2.3. Responsibilities of other departments for water administration

From the above introduction to the relevant laws and regulations, we can see that the task of water administration is shared by several departments and their responsibilities overlap and intersect (see Table 1).
3. Major problems in water administration

From above introduction, it is clear that there are some serious and outstanding overlaps and intersections of responsibilities undertaken by SEPA and MWR regarding water resource protection and administration, which are further analyzed below.

3.1. The issue of water pollution control

The overlapping responsibilities in the unified water management and supervision of water pollution control create three key areas of conflict between MWR and SEPA. (1) The concepts of “water function regionalization” and “water environmental function regionalization/zones” are not clearly distinguished and it is difficult to determine the key responsibilities and division of labor between the two departments. (2) The capacity of a water region to accept pollutants and to self-purify and therefore the prevention and treatment of water pollution in a watershed directly correlate with the quantity and velocity of flow and the replacement period of a water body. Therefore the responsibilities of the two departments intersect with respect to defining the relationship between the capacity of a water body to accept pollutants and the prevention of pollution of the watershed. (3) The MWR’s responsibility for water quality monitoring overlaps with SEPA’s implementation of water quality monitoring. The challenge is in the simultaneous operation of the water quality monitoring functions of the two agencies, when it is difficult to confine the function of each to their particular duties.

3.2. Coordination and management of trans-boundary pollution control in a watershed

Owing to the character of water flow within the watershed, the utilization or pollution of up-stream water resources directly affects downstream water use. Disputes over trans-boundary water pollution between upstream and downstream users, or between/among different administrative areas in the same watershed are frequent and difficult to resolve. SEPA has both administrative authority and the responsibility to guide and coordinate the trans-regional environmental problem and the environmental pollution disputes between provinces. However, because trans-boundary water pollution disputes usually occur in a watercourse, the MWR, as the administrative department entrusted with watercourse management, has the power to manage and coordinate the disputes.

3.3. Functions of executing laws and regulations and supervision of water management

As the department entrusted with supervisory power over the unified administration of water pollution control, SEPA has the authority to supervise the implementation of pollution control planning in important river basins and of the environmental effects of natural resources development. SEPA is also the organ that executes water pollution control laws and regulations and implements national pollutant discharge standards. The MWR is charged with unified management, supervision, development, utilization and protection of water resources. Regarding environmental protection and management of water bodies, the MWR has the power to execute laws and supervise the control of pollutant discharges in water areas, such as controlling discharges in drinking water areas, supervising water quality and
quantity of rivers, lakes and reservoirs and approving acceptable pollutant loads of water bodies. There are obvious overlaps between the MWR’s responsibility for ascertaining and approving pollutant load capacity and SEPA’s responsibility for studying and implementing the planning of pollution control for river basins and total pollution discharge control planning. In addition, to a certain extent, both departments have powers to establish regulations (planning, policy), execute regulations and supervise the execution of laws and regulations. This results in conflicting plans, policies and regulations promulgated by different departments, which reduces the efficiency of the implementation of laws and regulations.

3.4. Urban water resource use, protection and management

Traditionally, some urban infrastructure construction projects, such as development of water resources and the protection of the water environment, including pipeline construction for water supply, drainage and sewers handling are the responsibility of municipal agencies and municipal construction departments (MCs). At the same time, the development, protection and management of urban water resources is the responsibility of the MWR, SEPA and MCs. Coordinating the working relationship between the departments and clarifying the division of responsibilities regarding water supply, urban water recycling, drainage and sewerage handling and discharge monitoring, is key to improving the efficiency of water development and protection of water resources.

4. Suggestions and schemes

China’s membership in the World Trade Organization (WTO) requires implementation of a sustainable development policy. To comply with this requirement, the major administrative functions of the government regarding management and protection of water resources will change from participating in market operation and management to a focus on providing service, macroscopic regulation and control (Eckhart et al., 2002; Sheila, 2002; Wise, 2002). During this time, the government must strengthen supervision and management of common property, which includes environmental protection and management. At the same time, it must gradually decrease participation in the development of water resources and other natural resources to allow competitive market conditions to help optimize resource collocation and management. However, some issues of water utilization and development deal with social equity and the social effects of pollution control, including ensuring the safety of the water supply for lower income people and flood control. Reform of the water administration is being undertaken to resolve the institutional inefficiencies in water administration, including administration by multiple departments (called “dragons”), overlapping policies and administrative functions of multiple departments and low efficiency of policy enforcement. The following trends will be apparent during reform of the institutional water administration.

4.1. Separation of the functions of management of water resources and supervision of management

Management affairs should be separated from supervision affairs for water resources in the official departments. According to the above analysis, it is unreasonable that there are limits to the authority and
the functions of MWR and SEPA, to the extent that the MWR and SEPA both have powers to execute laws and regulations and have powers to supervise the enforcement of the laws and regulations. To avoid the official department being the framer, executer and supervisor of regulations, in other words “the athlete as well as the umpire”, changes must be made to institutional powers. MWR has the power to enforce the unified management of water (water quality and quantity). The supervisory function of MWR should focus on internal self-examination of its departments and examination of reasonable use of water resources by users, in order to realize integrated river basin management from the standpoint of water allocation. In contrast, SEPA is charged with the unified supervision of water protection and should supervise the efficiency of water protection and management procedures implemented by other agencies, liberate itself from the substantial burdens of water quality monitoring and fix attention on water environment supervision. This division of labor will simplify the complex relationship between MWR and SEPA in water quantity and quality management.

4.2. Realization of coordinated management of water resource through increased cooperation between the relevant departments at the state level

Coordination, exchange and communication among the relevant departments are the basis for realizing coordinated management stipulated by the laws and regulations on water. One trend is to build cooperative relationships between the departments into the water laws to make cooperation one of the legal principles upon which water management is based. Each department will then have the obligation to cooperate when it implements its authority on water management.

4.3. Separation of water enterprises from the MWR by initiating progressive marketing of water resource development

The infrastructure enabling water utilization has an economic value and is amenable to being developed, operated and managed by enterprises under market rules, guided by the government according to comprehensive planning and the macro-policy. For example, the construction of drainage system and water supply networks, sewerage handling/sewage re-use systems and hydro-power development are clearly economic development projects. These projects can be developed by privately investing companies instead of undertaken by the government. The objectives of water institution reform include separation of the official enforcement authority and resource development authorities which currently are both the purview of the department of water administration. At same time, the reforms aim to strengthen the functions of policy guidance, macro-regulation and control to water resource protection and satisfy the reform scheme targets of state organizations.

4.4. Realization of the “multi-dragon collaborative administration of water” through institutionalizing collaborative negotiation and administration of water resources

The complexity of water administration makes it impossible for one department to have comprehensive power of administration. The development of a collaboration/negotiation institution is
necessary and is based on the development of a soundly coordinated relationship between several
departments and implementation of the model of multi-dragon administration through combining the
forces of the departments.

One option for achieving this result would be to set up unified collaboration/negotiation institutions
at the state and river basin levels to facilitate negotiation between the relative departments of water
administration, to confirm water policies and to coordinate and mediate water resource disputes.
Alternatively, management could be achieved by using the favorable cooperation relationship with
other official departments and the coordination capacity of the Reform and Development Commission,
at all levels in the long-term, to coordinate the objectives and the standards of the relative plans on
water resources and to avoid intersections in works and disputes among the departments of the
planning establishment (for example, the planning of water development and utilization and the
planning of water protection). Alternatively, setting up a Coordination Commission of Water Affairs
(CCWA) organized by leading officials of the relative departments would improve water resource
management. The CCWA would be in charge of organizing, examining and approving the state water
resource planning, writing and amending water law and water policy at the state level and mediating
the conflicts surrounding development and protection of water resource among the relevant
departments. At the river basin level, the river basin protection agency established by the MWR in
combination with SEPA could be in charge of coordinating the work on water protection and
administration in the river basin to facilitate communication between the MWR and SEPA, with the
goal of promoting collaboration in management of water resources and water environment protection
in river basins.

4.5. Separation of the public institutions from the official departments in order to strengthen
administrative functions

At present, it takes many steps to establish special laws and regulations. The administrative
organization under the central government is entrusted by the Legislation Committee of the
People’s Congress to draft new articles. Then the drafts need to be examined, amended and
approved after considering comments from hearings organized by the Legislation Committee. The
approved laws and regulations usually still contain some ideas from the department that drafted the
laws and regulations, resulting in residual contradictions, inconsistencies and even conflicts between
the different laws and regulations. In the implementation of the special laws and regulations by
different departments, overlaps, intersections and conflicts about the functions occur between the
departments. To avoid this outcome, a neutral organization such as a consultative agency, research
institute, or a group of experts is elected to draft the laws, regulations, plans and standards. Then
the comments and suggestions from the relative departments should be heard and integrated during
a period of amendment and finally, the law should be approved by all concerned departments. The
objectives of the scheme are to avoid the creation of laws and regulations that benefit a particular
department on one side and harm others on other side, while at the same time strengthening their
reasonableness, fairness, scientific basis and operability. Then the policy division of the official
department is charged with implementing measures to implement the law or regulation and making
their own working plan.
5. Conclusions

In order to realize scientific management and efficient protection of water, there are several key focus points for resolving the serious problems in water administration. Building a cooperative relationship between the official departments of water administration will require a clear prescription so that the negotiating institution can be designed to realize complementary duties and efficient management. Supervisory power should be clearly defined in order to realize execution of the laws and regulations by the relative departments and unified coordinated management of water and “multi-dragon coordinated management of water” by coordinating the functions of the relevant departments the relevant departments to manage water together in cooperation.

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References