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Contradictions and Challenges in China's Water Policy Development

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Abstract: *External assessment of China's water problems, and recommendations for policy solutions, often fail to recognize interrelated physical, institutional, historical-cultural, and ideologically-grounded contradictions in the water sphere, distinctive to China, that challenge Chinese policy makers in unique ways. As new market-based approaches to flood and drought prevention and control, water quality maintenance, adequate water supply, and ecological support are being discussed and implemented, problems of overcoming deep-seated contradictions in the water economy compel searching review of policy assumptions and strategies which force reconsideration and modification of long-standing strategies and procedures for managing water resources. This paper considers the implications of water policy contradictions and challenges in four key areas: (1) coordination of economic measures and legal constraints associated with a 1988 Water Law; (2) a major 1999 policy shift from emphasis on strutural engineering solutions in shuili (water management) enterprise to a broader resource-defined concept of "resource" water management (ziyuanshuili) in support of water sustainability; (3) continuing reference to traditional historical/cultural and Marxist theoretical perspectives despite increasing adoption of Western market-based instruments in water policy development; and (4) problems of modifying and adapting indigenous water science and engineering in the process of building a new water economy. The paper concludes that bilateral and multilateral efforts to ameliorate China's water problems may be successful in achieving limited technical objectives in the several water sectors but face difficulties in contributing to China's long-term water sustainability and hazard mitigation because they are insensitive to internal contradictions that are being addressed with ever greater intensity and urgency in the quest for solutions.*

Keywords: *China, water management, water law, water policy contradictions.*

Introduction

China has embarked upon a vigorous campaign over the past two decades to drastically reshape water development and management policies in the context of ambitious market reforms and a major reassessment of the legal, ideological, scientific and technical foundations of the water economy. The magnitude and complexity of this task is daunting. It represents a concerted large-scale effort to integrate long-standing policies defining State responsibility for judicious water development, protection, and use with newer economic and legal strategies for realizing the long-term benefits of sustainable water use. Ambitious water policy initiatives now underway in China thus seek boldly to reshape deep-seated assumptions about the universal efficacy of engineering solutions for water supply, control, and quality problems. New, still largely unarticulated, concepts of water as a resource to be managed and conserved are being introduced to better serve agriculture, urbanization, public health, ecological integrity, and societal well-being in a rapidly modernizing economy.

Given the magnitude of China's water problems and its long experience in dealing with them, these new ways of thinking and acting are being closely watched to suggest whether the rhetoric of water conservation and sustainability can be effectively translated into workable programs and policies under increasingly stressful conditions of water shortages, sharp spatial and temporal variations in water surplus and deficit, the rapid deterioration of surface and groundwater quality, and the unpredictable effects of climate change.

China's water policy initiatives are of special interest for several reasons. They test assumptions as to the efficacy of modern policy remedies for water conservation, hazard mitigation, and environmental protection in a society where assurance of adequate water supply and protection from flood and drought has been a primary hallmark of successful governance for over two millennia, and where water mythology, water engineering, and water knowledge have been critical in shaping distinctive cultural values, perceptions, and practices that have directly supported the longevity and cohesion of China's unique civilization (Allan, 1971).

For example, myths first officially recorded by historians in the 2nd century AD, raised questions about alternative engineering measures to counter Yellow River flooding. Opposing points of view expressed in these stories have been frequently debated over the past two millennia in discussions regarding the most effective combination of diking, water detention, dredging, drainage, and river training to deal with particular hydrological circumstances (Needham, 1971). China's current water policy experiments also provide insight into the potential benefits and shortcomings of recently-introduced foreign institutional models that aim to integrate engineering interventions, economic assumptions, and management strategies to achieve interrelated water quality, water supply, and water conservation goals in large and small scale projects.

This paper briefly considers four dimensions of the policy adjustment process that Chinese water policymakers are addressing as they confront the challenges of developing and managing water resources in support of the country's economic and technological modernization. The main purpose is to introduce and assess in a preliminary way technical aspects of policy issues as considered in official Chinese sources. Larger Chinese water resources management issues or projects will not be evaluated or discussed.

Four areas to be addressed include: (1) problems of building upon a basic 1988 Water Law to accommodate new water resource management concepts and approaches; (2) difficulties faced in shaping a dramatic policy shift since early 1999 which de-emphasizes planned structural engineering (*gongchengshuili*) interventions in favor of more comprehensive, yet diffuse policy initiatives. New concepts treat water more broadly as a "resource" (*ziyuanshuili*) to be developed and managed in response to a changing market; (3) theoretical and ideological issues involved in reconciling deeply-rooted cultural/historical perspectives on the role of water in mediating relations between society and the State, still prominent Marxist theoretical frameworks developed over the past half century, and recently adopted Western market-oriented water policy instruments to improve the efficiency of water engineering, use, treatment, and control; and (4) meeting the challenges of integrating Chinese and foreign perspectives on water science and engineering theory and practice to facilitate water policy development most relevant to China's needs and capabilities.

The Legal Context

Key underlying assumptions of China's water program are that a landmark 1988 Water Law (*shuifa*) should: (1) serve as a driving force and regulatory framework for a system that must recast and rationalize water and water infrastructure as public economic goods in the transition to a market economy; and (2) articulate a redefined but still paramount role for the Ministry of Water Resources (MWR) (*shuilibu*). This is the main state body responsible for flood and drought prevention and control, as well as for water planning, monitoring, research, and development, national-level policy making, and inter-provincial and inter-basin water policy coordination. Sections of the law dealing with strategic planning, water conservation, flood control, engineering and facilities management, and regulation, among others, thus closely parallel and substantiate a major 1999 administrative and functional reorganization of the Ministry.

From its preliminary drafting stage in the early 1980s, it was assumed that the Water Law would be empowered through ancillary statutes to address planning and regulatory policy issues associated with specific problem areas like water quality, soil erosion control, inland navigation, and groundwater protection. To this end, in recent years, complementary laws have been promulgated that focus on pollution, soil erosion, and flood control. Also, to facilitate basin-wide water quality regulation and to improve coordination of national water protection, control, and development initiatives across provincial administrative and watershed boundaries, there are strong appeals for a "water basin law"(*shuiliuyufa*) to improve technical cooperation and bureaucratic efficiency among the seven major river basin systems (Liu, 2000). This is universally and repeatedly recognized as a major challenge which confronts long-entrenched bureaucracies in each basin that have virtually autonomous planning and engineering authority.

The Water Law and its progeny are thus seen as a powerful force for redefining and reshaping the scope and impact of "water management," broadly conceived, in keeping with a strikingly new vision of water resources development, conservation, and use in the 21st century. This is a major departure since recourse from the rule of law as a basis for natural resources policymaking was unheard of until recently. Since the demise of the Qing Dynasty in 1911, through the period of Nationalist government control from the 1920s through the 1940s, and since the establishment of the People's Republic in 1949, water policy has been developed and promulgated by the central government (Ke, 1991; 1998).

In the period of socialist modernization since the early 1980s, moreover, it has been especially difficult to establish a solid legal foundation and a law-based program to effectively address unfamiliar technical, institutional, regulatory, and environmental dimensions of the water economy. There are several reasons for this that illustrate some of the fundamental tasks China faces in trying to modify its supply-driven water system, a legacy of the earlier planned economy, to create a law-based, economically efficient, and ecologically-sound water management regime. Ironically, the continuing prominence of the Ministry of Water Resources as the designer, promoter, spiritual guide, and chief cheerleader of the Water Law has perhaps been a primary reason for its failure to more quickly achieve its objectives.

One problem is that economic, regulatory, and social support dimensions of the Water Law still reflect a pervasive ideological stance that promotes the "cultural essence" (*shuiliwenhuajingshen*) of water policy as a major element in State and Communist Party principles of social guidance and welfare, popular identification with national goals, and fiscal responsibility in water conservation and management. Prior to the late 1970s "opening" of the country when an engineering mentality reigned supreme, the powerful nationwide authority of the MWR over water control and infrastructure development was seldom challenged, and capital and labor support for key projects was usually made readily available (Qian, 1991).

Since the early 1980s, however, modernization efforts have drawn attention to many previously neglected problems like non-point source pollution, hazardous waste management, wetland loss, biodiversity preservation, adequate, and safe urban water supply, and environmental health and safety. The current practice of drafting supplementary water-related laws to address pressing issues may no longer adequately respond to urgent policy needs. Now, legal proscription, scientific and engineering research, and regulatory enforcement and adjudication must be creatively combined in the face of inter-related challenges of urban and rural water supply, pollution control, and environmental preservation. Legal thinking and law-drafting, however, will undoubtedly continue to set the main guidelines and substantive directions of water policymaking in the context of the country's burgeoning market economy (Wang, 2000).

Recognition of this critical need for an integrated policy approach to confront development-related water issues is reflected in current discussions surrounding the drafting of the aforementioned "river basin law." This is a daunting task, however, as the MWR now must share its traditionally preeminent authority over water matters with agencies like the State Environmental Protection Administration, the Ministries of Construction and Agriculture, and various other technical, scientific, and industrial bodies to facilitate transition to a sustainable water regime (Wang, 1999).

Finally, China, along with many other countries and international bodies, promotes the idea of "sustainable" water use as a key policy goal. To this end, in the case of China, it is assumed specifically that the Water Law, with its complementary statutes, can somehow help to translate and integrate Western management experience and policy models to facilitate "reform" (*gaige*) of the planned, engineering-dominated water economy to better accommodate foreign concepts like demand management, market-responsive economic optimization, rational pricing, and institutional power-sharing.

This transition, however, is extremely difficult to realize and confronts contradictory goals. Institutional strategies for adopting new approaches, in the context of the Water Law, must, out of necessity, derive from efforts to reshape policy while still acknowledging the continuing relevance to China of long established, historically and culturally-forged ideas and practices that reflect fundamental responsibilities of the state to society in the water realm (Zhang, 1998). But even these firmly fixed assumptions are being challenged as China's water economy expands rapidly in new directions: For example, the growing construction, financial accounting, and resettlement problems in the gargantuan Yangzi River (Changjiang). Three Gorges hydropower dam project clearly reflects a lost of confidence in state management of large scale hydraulic engineering construction (symbolized by the MWR) (Pomfret, 2001).

The "Engineering-to-Resource" (*Gongchengshuili-Ziyuanshuili*) Transition

A dramatic shift in water policy thinking occurred in early 1999 with MWR's introduction of the *ziyuanshuili*, or "resource water conservancy," concept as a major theoretical and methodological departure. This represents a distinctive new perspective in Chinese water management. It aims to formally recast and reinterpret long-standing social and economic criteria for justifying and measuring the economic and social value and costs of hydropower resources, as well as for water supply, treatment, control, protection, and distribution infrastructure.

Wider focus on water as "resource," moreover, clearly anticipates new, more effective institutional mechanisms for policy development and implementation. These will serve to ease the transition from long-standing reliance on center-driven planning guidelines for goal attainment and performance evaluation. Further, there is formal recognition of the need for greater provincial and local autonomy in choosing appropriate market instruments that can enhance the efficiency of project-specific water use while improving water quality and conservation more widely in agriculture, domestic supply, wastewater treatment, inland navigation, and ecological support.

This fundamental policy shift, now in its early stage, is seen as an essential adjustment that requires new, non-Marxist theoretical perspectives on the historical benefits of traditional hydraulic engineering (*shuili)* theory and practice. It also calls for the reshaping of public attitudes and responsibilities toward water as a resource, thereby promoting new ethical values of protection, conservation, and improved scientific management to "reform" (*gaige*) the *shuili* enterprise in support of the modern socialist market transition. New technical vocabulary and scientific perspectives, moreover, must extend definitions of *shuili* engineering benefits to include newly-specified non-material benefits, like ecological support, improved public health, and recreation that are implicit in the *ziyuanshuili* agenda. There is now spirited debate in the Chinese water science and policy community as to how this policy transition can best be accomplished.

One commentator suggests, for example, that three

main theoretical areas must first be pursued to facilitate and guide a smooth transition from engineering-dominated water management thinking to the new *ziyuanshuili* program. These include systems-thinking to probe the interrelated roles of water that are supportive of its multiple and combined functions, in Chinese terms, as a "natural, human, and ecological resource; second, problems of delimiting and measuring connections between vague notions of "sustainable use" (*kechixuliyong*) and real world physical, economic, and social processes that can formally substantiate the *ziyuanshuili* initiative through effective, targeted policies; and finally, the need to recalculate the physical and social asset values of engineering facilities while incorporating unfamiliar and intangible health, environmental, and welfare benefits of water use implicit in the *ziyuanshuili* concept.

This recalculation exercise poses perhaps the most difficult challenge. New market-based criteria must be devised to evaluate the soundness and appropriateness of water engineering infrastructure investment values and the efficacy of new institutional arrangements to achieve wider water resource benefits. Criteria for project development, financing, review, maintenance, and evaluation, moreover, are being fundamentally redefined (Jiang, 1999; Wang, 2000).

History, Dialectics, and Markets

China's ambitious efforts to confront water problems though the introduction of new laws and policies that seek to wean the water economy from its familiar planned orientation is a Herculean task that requires revolutionary policy measures. Given China's size, its variable and uncertain physical endowments, and the speed with which the economy is being modernized, it is not surprising that progress is slow. There is a historical aspect of the Chinese water dilemma, however, that is frequently overlooked by those who wish to quickly introduce market-based policy reforms and other institutional measures to better address pressing problems.

The main 21st century water challenges and contradictions to be overcome in China are associated with population growth, the expansion of industry and agriculture, a growing gap between water supply and demand in the North, rampant pollution, and fragmented administrative jurisdictions stemming from weakened central authority over provinces, regions, and localities. Policy initiatives to address these problems must accommodate both the historical legacy and cultural imprint of two millennia of traditional water engineering (*shuili)* knowledge, practice, and values, along with a well-established Marxist theoretical/ideological framework that probes and seeks to adjust contradictory aspects of the relationship between government, the physical environment, and society in water policy development, (Dong, 2000).

This broad dialectical (*bianzhengweiwuzhuyi*) framework contributes in at least two important ways in China to the development of a "socialist market economy" (*shehuizhuyi shichangjingji)* that can support modern water management. It does this by categorizing the main contradictions that need to be addressed in undertaking the transition from a centrally planned to a more flexible market-sensitive "resource" perspective on balancing water engineering and policy initiatives and practices. Important areas of policy "contradictions"(*maodun*) are clear and salient in the Chinese context. They include, among others, water resource "development and use" (*shuiziyuankaifaliyong*), "governance" (*zhili*), "deployment" (*peizhi*), "economizing" (*jieyue*), and "protection" (*baohu*). Each of these issues are addressed in depth in the literature and underline the continuing importance of Marxist frameworks as theoretical points of departure for assessing the relevance and applicability of foreign water policy strategies.

One writer, for example, suggests that "deployment" (*peizhi)* of water resources is the most critical concept because it forces consideration of how "governance" (*zhili)* can serve as a key policy link for resolving inherent contradictions between water development, use, and conservation alternatives while setting priorities for water projects primarily either as providers of social and economic benefits (e.g., wastewater treatment plants, irrigation works, storage reservoirs) or as physical protection against hazards to society (e.g., sea walls, flood diversion and drainage works, dikes) (Zhang, 2000).

A second, and perhaps more elusive, application of dialectical thinking in water policy development, however, has to do with the fundamental challenge of redefining the traditional *shuili* water enterprise in market terms. Here, the main issues are: (1) how to resolve contradictions in thinking about *shuili* primarily as a productive commodity in itself where value can be enhanced through private investment and the auctioning of land and facilities; or (2) whether the *shuili* enterprise should primarily become a mechanism and vehicle for the spreading of benefits throughout the wider socialist market economy through public health improvement, increased energy generation capacity, cleaner water, and better ecological support (Wang, 2000).

Recalculation of the social welfare benefits of hydraulic engineering is a particularly challenging policy task that forces integration of new and old thinking. For example, long-standing engineering criteria for estimating costs, assessing social values, and determining discount rates of projects are now beginning to be extended to reflect traditional *shuili* perspectives and goals like "promotion of benefits and elimination of harms" (*xingli chuhai*) in new thinking about the sustained welfare benefits of water engineering (Dong, 2000).

Understanding current efforts to reshape the Chinese water economy in market terms also requires careful assessment of how entrenched Marxist concepts of "ratio-

nality" in the spatial distribution of water resources "productivity" and "use" are being rethought and adjusted to accommodate new, unfamiliar ways of thinking about water allocation processes that derive from Western economic theory and practice. Each of the policy "contradictions" identified above, along with others not mentioned, are the focus of much research and analysis in current attempts to forge new, unfamiliar relationships between private and public dimensions of the water economy.

Science, Technology, and Policy

Since the early 1970s, Chinese environmental science research has supported the development of policies and regulations to protect marine and fresh water environments. Extensive university and research institute-based studies were completed in marine and aquatic ecology, environmental chemistry, pollution biology, estuarine dynamics, soil science, genetics, epidemiology, and other fields. These studies supported the development of environmental monitoring, standard-setting, and enforcement work that was critical in shaping the country's early environmental initiatives. China's environmental protection program, launched in 1973, was also grounded in rich, discipline-grounded theoretical/ideological literature in fields like pollution biology and oceanography that sought to guide research for a better understanding of the patterns and dynamics of complex, multiscalar material and energy exchanges in the interplay of people, water, and land, especially in the densely populated eastern third of the country.

This early work laid the foundation for current water-related scientific and technical work that seeks to understand how local and global changes in factors affecting hydrological regimes can be understood and managed both in response to new physical, chemical, and biological assaults associated with the technological modernization of industry, agriculture, and land use, as well as the need to maintain the integrity of physical systems and ecosystem services that have supported the longevity of Chinese society and civilization. (Boxer, 1987; Bray, 1994)

Prior to the flood of foreign contacts that began in the early 1980s, self-reliant Chinese investigators studied diverse aspects of hydrology and pollution. Their goal was two-fold: to describe, analyze, and recommend solutions for local and regional air, water, and solid waste pollution problems; and to explore, refine, and show the practical relevance of dialectical thinking about human-environment relations in the quest for improved human welfare, a major Communist Party theme. In this context, scientific problem-solving and policy development relating to water pollution control and nature conservation was especially productive in such areas as fluvial geomorphology and sediment pollutant transport, fisheries science and aquaculture, phytoremediation, and microbial degradation of pollutants in textile, petroleum, chemical and other industries (Boxer and Pramer, 1978).

Because of their isolation, Chinese scientists had to develop their own theoretical perspectives and methodologies in response to locally-defined conditions, problems, and ideological guidelines. This resulted, in some problem areas, in creative insights, imaginative methodologies, and locally-beneficial policies for the environment and public health despite increasing pollution and environmental degradation on a national scale. For example, to evaluate water quality and the distribution, movement, and effects of toxic elements in aquatic organisms and reservoir sediments, environmental chemists, aquatic biologists, and Soviet-trained "chemical geographers" carried out extensive studies in the 1960s in the semi-arid Yang and Sanggan watersheds of northern Shanxi and Hebei provinces. These studies were designed to support environmental standard setting and regulation in anticipation of intensified industrial and agricultural development (Zhang, 1978).

The question now is whether Chinese environmental scientists and engineers will still be able to contribute as well as they did in the 1970s and early 1980s to policy development imperatives that reflect distinctive Chinese social, environmental, and demographic constraints as they seek to integrate foreign scientific perspectives, methodologies, and technical solutions to water pollution, supply, and control problems. While many foreign-owned or joint venture manufacturing plants and other facilities try to apply internationally-recognized environmental standards and management practices in their China operations, it is sometimes difficult to integrate their operations in a manner consistent with Chinese practices and regulations relating to water supply and treatment (Z. Dong et al., 2000).

An excellent example of challenges the Chinese water science community faces in combining new and old research perspectives on fresh water for urban supply, agriculture, aquatic production, and industrial pollution dilution is the recent comprehensive multi-institutional program to improve and sustain water quality in the Guanting Reservoir basin north of Beijing. This program (*Guantingshuikuliuyu shuizhigaishanzongtijishu fanganyanjiu*), was inaugurated in July 2000, and symbolizes the difficult challenges facing Chinese environmental scientists seeking to combine old and new work on pollutant transport, sedimentation processes, eutrophication, and other problems.

Here, the pressing task is to improve water quality in a reservoir and its basin, which for over half a century has been a major source of Beijing's water supply (located in water-scarce north China where the average annual rainfall is 544 mm). Guanting Reservoir water quality work also symbolizes the difficulty of accommodating a history of self-reliant, locally-generated science with newer imported strategies for watershed scale studies. Guanting Reservoir scientific work occupies a special position in Communist Party historiography, as it was strongly promoted as a model of self-reliant achievement in the early years of the People's Republic in the 1950s (Hao, 1956).

Another problem stemming from the need to adjust rapidly to the influx of foreign perspectives is that Chinese scientific talent often are not most effectively used because many Chinese firms, municipalities, and other consumers of new or experimental research findings and control processes cannot afford to apply them. Also, foreign investors in industrial plants and other enterprises introduce pollution control technologies that are cost-effective and primarily serve their own business agendas. Thus they are sometimes insensitive to problems of added costs involved in adapting the best modern technologies and processes to provide the most effective environmental and health benefits in face of difficult environmental challenges in specific Chinese locales (Qian, 2000).

Conclusion

The challenges of water policy reform in China today can be thought of in two ways. There is the problem of assimilating a host of contemporary economic strategies for gaining the most benefits at least cost in developing, using, conserving, and maintaining the quality of surface and ground water resources. These ideas are being widely propagated by a new generation of economists and engineers, many foreign trained, who avidly seek to address China's water problems by applying internationally accepted-approaches.

These externally originated policy initiatives, however, must make sense in Chinese terms. This means that they must be made workable in the context of an ongoing, self-directed and spirited effort by the Chinese water engineering and science community to redefine conceptual, technological, and social rationales for environmentally-beneficial water policies that were spawned by economic, political, and ideological conflicts over the past fifty years. These rationales still reflect widely held beliefs concerning the efficacy of a planned water economy, and the continuing importance of a Marxist theoretical base for providing a long-tested ground truth framework for thinking about relations between people, water, and the environment under China's unique circumstances.

The four dimensions of water policy development discussed in this paper can be probed in much greater depth to show the great extent and depth of the government's commitment and the scientific community's task. Water policy has become a major focus of high level attention over the past few years. The goal was to sketch in a preliminary way some of the main elements of an effort that is critical in assuring the viability of the Chinese nation in the modernization process.

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About the Author

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