

## CHALLENGES FOR INTEGRATED WATER RESOURCES MANAGEMENT

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During the past century, while world population tripled, the use of water increased six fold. Irrigation accounts for 70% of global water withdrawals, industry for 20% and municipal use for 10%. The increased use of water has come at high environmental costs: some rivers no longer reach the sea, 50% of the world's wetlands have disappeared in the past century, 20% of freshwater fish are endangered or extinct, and many of the most important groundwater aquifers are being mined, with water tables already deep and dropping by meters every year, and some damaged permanently by salinization. The World Commission on Water (2000) estimates that water use will increase by about 50% in the next 30 years. An estimated 4 billion people will live under conditions of severe water stress in 2025, with conditions particularly severe in Africa, the Middle East and South Asia. To meet these water resources challenges, a series of transitions is under way, with major implications for water management: from development or management to development and management, from local to regional and international management, from disputes to cooperation, toward public-private partnerships.

Water management can be conceptualized as a comb, in which the teeth are the water-using sectors and the handle is the resource itself, defined by its location, quantity and quality (Fig.1.). This Strategy does not focus on the water-using sectors such as energy, environment, rural development, irrigation and drainage, water supply and sanitation, but on water resources management and the connections between resource use and service management. This approach means addressing: *the institutional framework; the management instruments; the development and management of infrastructure; the political economy of water management and reform.*

The suggested approach must be defined and adapted in each identified use-sector (Fig.1). Irrigation and drainage is one of the most challenged issue with the redefinition of the hydraulic infrastructures. The historical challenge of water resources management has been the reconciliation of human needs for predictable and regular flows of water with the variable patterns of precipitation and stream flow. The challenge is, of course, particularly large where average flows are especially low and where variability is high. Societies have developed a combination of structural and non-structural mechanisms for attempting this reconciliation. The principal lessons from the experience of industrial countries are, first, that infrastructure is critical, and, second, that infrastructure investments need to be complemented by previously neglected non-structural investments. The emphasis in infrastructure-rich industrial countries is now heavily and appropriately focused on non-structural solutions. In this moving environment, the vision of the technician must be redefined. Developing countries face three major challenges. The first is that many have stocks of water infrastructure that are much smaller than those of climatically similar industrial countries. The second challenge is to invest simultaneously and heavily in non-

structural management solutions. The last challenge is that global change exacerbates, in most cases, the underlying imbalances between human demands and natural hydrologic patterns, making the task of developing an integrated package of structural and non-structural tools more urgent.

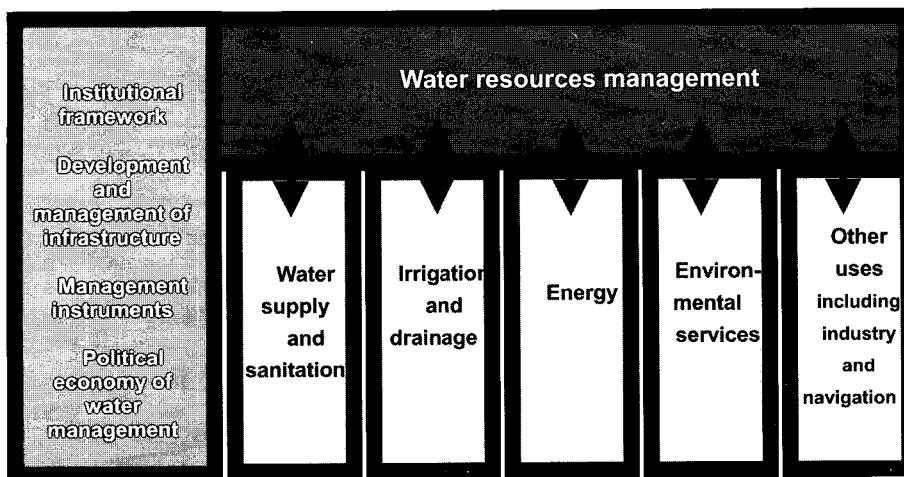


Fig. 1 Strategy for water resources management from World Bank 2004

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