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Water Resources Man. Policy



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OSP Water Resources Management Policy Paper

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A L L - I N - 1 N O T E

DATE: 17-Dec-1991 04:55pm

TO: Visvanathan Rajagopalan (VISVANATHAN RAJAGOPALAN)

FROM: Michel Petit, AGRDR (MICHEL PETIT)

EXT.: 30340

SUBJECT: **Water Resources Management Policy Paper**

In response to the request sent by Pauline on December 16, we believe that we could commit sending an annotated outline to the Board by February 15.

- ① Mr. Bock
- ② Mr. Meyus

Pl. note.

we need to decide on the processing before
the outline can be sent to the Board.
Let us discuss.

MR?
12/18

-----Facsimile Transmittal from-----

The World Bank

**Office of the Vice President
Sector and Operations Policy**

-----Telefax 1 (202) 477-0644-----

FACSIMILE MESSAGE

DATE: Dec. 16, 1991

TO: Mr. Michel Petit

FAX No.

FROM: Pauline Clephane

SUBJECT: Mr. Potter's Memo on Water Resources

No. of pages: 4
(including this page)

Remarks:

You will see from Mr. Choi's EM that an outline of the Water Resources paper should be sent to the EDs for information. Mr. Rajagopalan would like you to let him know by what date this would be possible.

Thank you.

DATE: December 3, 1991 10:55am

TO: VISVANATHAN RAJAGOPALAN

(VISVANATHAN RAJAGOPALAN @A1@VAX

FROM: Ken Choi, SECGE

(KEN CHOI@A1@EDSEL)

EXT.: 80201

SUBJECT: Mr. Potter's Memo on Water Resources

Per your note to Mr. Thahane, dated November 26, 1991 on the above subject, the Steering Committee agreed at yesterday's meeting that there was no need for a two stage discussion. Instead, an outline of the Water Resources paper should be sent to EDs for information.


CC: Timothy Thahane

(TIMOTHY THAHANE@A1@EDSEL)

*Thahane.
Pl. inform Mr. Potter's
get a date. WP
cc: LRM*

*Mr. Potter
pl. let me
know
when
this is
possible*

THE WORLD BANK

ROUTING SLIP		DATE Nov. 26, 1991
FROM THE VICE PRESIDENT SECTOR POLICY AND RESEARCH		
NAME		ROOM NO.
Mr. Timothy Thahane		
APPROPRIATE DEPARTMENT	DATE RETURN	
SPECIAL	DATE SEND ON	
CLEARANCE	DATE CONVERSATION	
COMMENT	DATE OUR REQUEST	
DATE RETURN	DATE RETURN	
DATE RETURN	DATE RETURN	
DATE RETURN	DATE RETURN	
DATE RETURN	DATE RETURN	
<p>I would appreciate it if you would raise the matter addressed in the attached memorandum from Mr. Potter at the next Board Steering Committee meeting. Please let me know if this policy paper is to be subject to a two-stage process by the Board so that we can take the appropriate steps in preparing the paper. Incidentally, this is a policy paper on Water Resources Management.</p>		
V. Rajagopalan		EXTENSION: 33419
	S5-055	



Record Removal Notice

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Correspondents / Participants To: Mr. Visvanathan Rajagopalan From: Frank Potter, Executive Director				
Subject / Title Water Resources paper				
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Additional Comments Declassification review of this record may be initiated upon request.		The item(s) identified above has/have been removed in accordance with The World Bank Policy on Access to Information or other disclosure policies of the World Bank Group. <table border="1"><tr><td>Withdrawn by Kim Brenner-Delp</td><td>Date Sept. 20, 2023</td></tr></table>	Withdrawn by Kim Brenner-Delp	Date Sept. 20, 2023
Withdrawn by Kim Brenner-Delp	Date Sept. 20, 2023			

OFFICE MEMORANDUM

Mr. Beck

DATE: December 16, 1991

TO: Members of Water Resources Policy Steering Group

FROM: Guy Le Moigne, Senior Adviser, Water Resources, AGR *GLM*

EXTENSION: 30342

SUBJECT: Water Resources Management Policy

Attached please find A Draft Annotated Outline for the Water Resources Policy Paper. Some sections of this draft have been developed in more detail than is generally expected in an annotated document.

We would appreciate receiving comments from you and staff in your organizational unit by January 15, 1992. We would also like to have your opinion regarding the need to convene a meeting of the Steering Group to discuss this draft. A revised version of this document may need to be sent to the members of the Board to seek their reaction. *11*

Distribution:

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D. Goldberg (LEGOP), I. Serageldin (AFTDR),
H. Vergin (AS2DR).

cc: Mr. V. Rajagopalan (OSPVP)

Attachment

GLM:hrv

**Water Management and Development Policy
Paper: A Draft Annotated Outline**

December 16, 1991

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Chapter 1

Introduction & ? Summary? Recommendations?

- A. Water resource development has played a major role in Bank operations. Up to 1990, over \$16 billion have been lent for irrigation and drainage and \$11 billion for water supply and sewerage, representing 11% of the total Bank lending. An additional 2% has gone to hydropower projects. The proposed Bank program for the next three years also indicates that lending for water resource development will remain a major part of Bank activities.
- B. The growing demand for water, deteriorating water quality and increasing cost of providing a clean reliable water supply have created a water crisis in many developing countries. This crisis is forcing these countries to begin to address serious problems of poor performance in the water sector and its subsectors (irrigation, water supply and hydropower) as well as the environmental and health issues related to water.
- C. The water sector is dominated by inefficient single purpose public agencies trying to manage their individual parts of the water sector. Inadequate incentives and the lack of accountability have resulted in losses within each of the subsectors. Moreover, because of the interdependent nature of water resources, such single purpose approaches fail to correct the serious externalities which characterize the water sector and result in a significant misallocation of resources.

- D. One critical first step to resolve the misallocation problem is to adopt a comprehensive approach to water resources management which views water as a multipurpose resource and considers its numerous alternative uses. The economic inefficiency and environmental cost of the single purpose approach to water development and management can no longer be tolerated. The change to a comprehensive approach will require major changes in the ways countries organize and manage their water resources as well as in the way the Bank addresses water resource issues.
- E. A second step will be to reduce the dependence on government enterprises. This means greater emphasis on relegating more responsibilities and functions to non-government entities. Where possible the private sector and water users must be called upon to participate in water resource management. Government's role should focus more on overall water policy, on ensuring access to water, on regulating water quality, on developing institutional frameworks for water management and on supporting research, technological development, data collection and training for water resource management.
- F. The problems of inefficient water use and wasted resources are particularly severe with international waters. The interests of individual countries can no longer be depended upon to optimize the use of international waters where conflicts among countries can lead to warfare. In many cases help from international agencies or outside countries will be needed if those using
- will they ever?*

the international waters are to reach an agreement on how to allocate the water..

Chapter 2

Conditions and Challenges in the Water Sector

A. Growing Scarcity of Water.

The development and management of water resources is presenting ever increasing challenges because of a combination of three factors: (i) rapid growth in population concentrated in developing countries, (ii) deteriorating water quality and (iii) escalating costs of expanding water supplies with a resulting large volume of investment funds needed.

1.0 Population Growth.

A key factor is the expected continued growth of population in developing countries. Under the most optimistic scenario that assumes successful population control programs, the world population will grow from 5 billion today to 6.2 billion by 2000 and to at least 8 billion by 2025. This growth will increase the demand for food supplies and thus the demand for irrigated agricultural production.

This growth in population, with about 90% concentrated in urban areas, will also increase the demand for potable and industrial water. By the year 2000, seventeen of the world's 21 cities with more than 10 million inhabitants will be in developing countries compared to only one in 1960. These rapidly growing urban population centers will need large volumes of water acceptable for domestic and industrial use. The existing water supply systems often do not provide adequate services. Moreover, higher energy demand related to

urbanization will increase the need for power generation, thus limiting some of the options for water use in other sectors. The overall increase in demands will exacerbate water management problems in developing countries where additional supplies of water at costs of the same magnitude as prevail today are very limited.

2.0 Deteriorating Water Quality.

The quality of water supplies for both human use and production has been deteriorating. Water borne diseases are the main cause of death in children in developing countries in both rural and urban areas. About four million children die every year due to diarrheal diseases caused by unsafe water. Agricultural chemicals, eroding soils, wastes from industries and human wastes concentrated in the growing urban areas all contribute to the enlarged health risks and to a degradation of water quality in many developing countries. Furthermore, problems of waterlogging and salinity continue to grow in many of the existing irrigation systems. This reduces yields and forces highly productive land out of production.

Preventing and cleaning up the water pollution has become a complex and costly venture. Costs of waste treatment are high and rising. Groundwater sources that could provide clean drinking water are being contaminated and used for low priority activities. The clean-up cost of this contaminated groundwater is time consuming and very costly. In fact, in most cases the clean-up will be more costly than measures to prevent the contamination.

3.0 Cost of New Water Supplies.

Adding to the water quantity and quality problems is the fact that the lowest cost sources of supply have already been developed. The new sources of supply being considered now have higher financial and environmental costs than those developed earlier. For example, Beijing may have to go long distances to obtain badly needed new water supplies. Others like Mexico City must consider expensive schemes to pump water over a height of 2000 m. As a result, the cost of these additional supplies will often be many times higher than those from current sources. Many of the best dam sites around the world have already been used and new water development projects will be increasingly expensive and possibly environmentally damaging. Soil erosion in upper watersheds is accelerating due to deforestation, over grazing and encroachment of agriculture. This results in sedimentation which reduces the effectiveness of water resource investments and increases the cost of maintaining existing systems and establishing new ones. A recent review of Bank municipal water supply projects shows that the cost of a cubic meter of water provided via "the next project" is often 2 to 3 times the cost of current projects. These higher costs place added pressure on countries which already have severe budget concerns.

Given the growing water demands, deteriorating water quality and the high cost of new water supplies, economic inefficiencies in water use and allocation will become increasingly costly in the future. These inefficiencies are wide spread. For example, in many countries, water is used to produce low valued and water-intensive crops while cities nearby spend large sums to develop new water supplies. Water management in multiple purpose dams often focuses on

one purpose and ignores the large benefits that could be obtained by small changes in water release and allocation schedules.

B. Why Government Interventions in the Water Sector?

Water is not efficiently allocated by market forces because of a number of special characteristics which when considered together distinguish water from other commodities. Water, although fixed in absolute supply, can be considered a renewable resource because it is recycled through the hydrological process. Water has multiple uses which has encouraged numerous types of human interventions in the hydrological cycle in order to provide water for these multiple uses. Because of the hydrological cycle, intervention within a river basin or aquifer are interdependent. For example, an upstream diversion for irrigation will result in some consumptive use and some return flows back into the river and/or aquifer. This usually means less water available downstream and lower water quality if the return flows contain chemicals, salts or other waste materials. This, of course, could impair downstream resources including wetlands and fish. Groundwater pumping by one user may lower the water table and increase pumping cost for all users (negative externalities) or reduce waterlogging problems caused by a high water table (positive externality).

In addition to the numerous externalities, the water sector is characterized by economies to scale, difficulties in establishing and enforcing water rights with the consequent absences of markets and open access to the resource, large capital requirements, long time horizons for return on investments, the public good nature of some water services, and inadequate

information concerning the water resource. Because of these characteristics and high transaction costs market forces alone cannot be expected to result in appropriate levels of investment and in an efficient allocation of water resources among and within water subsectors. Some forms of policy interventions are required, otherwise a significant misuse of the resource will result. Indeed, the record shows extensive public interventions in the water sectors of most countries with central control dating as far back as Hammurabi's Code in ancient Mesopotamia.

C. Government Interventions and Government Failures.

Governments have often not been able to correct the market failures through the market system (i.e., by using taxes and subsidies) because few water markets existed. Thus governments, whether local or national, intervened directly in the allocation process and in many cases, built, owned, and managed the water systems. The result has been a heavy dependence on command and control administrative structures for water management. Governments have greatly restricted the role of the private sector in developing and delivering water services. Because no competition prevails, most water users have no opportunities to voice their demands or complaints to the water managers.

The incentive problems inherent in many government-run service organizations have caused significant inefficiency. Furthermore, the administrative structure is often organized so that each water use is administered by a separate department, agency or ministry. For example, a department of irrigation, a department of power and a department of transportation is each responsible for its own water use independent of the other

departments. Many times domestic, industrial and commercial supplies are provided by local government units completely independent of the national water departments. This leads to situations where different agencies are developing the same water source for different, often competing uses. This fragmented command and control administration creates a serious misallocation of water resources because the opportunity cost of water (i.e., its value to other potential users) is often not taken into account by different government agencies.

Because of the interdependencies in water use and the absence of markets in most subsectors of the water sector, a comprehensive approach to water resources management is required, otherwise water misallocation will lead to lower economic growth, human suffering and local, national and even international conflicts. Water development must be considered in a comprehensive manner so that its system-wide consequences and the opportunity cost of water in alternative uses are taken into account. This does not mean that all water activities must be concentrated in one government agency or ministry. What it does mean is that water activities must be coordinated and that communications and information systems must be improved.

D. Comprehensive Approach to Water Management.

What is a comprehensive approach to water management? Generally at the first level of a comprehensive approach the water sector is considered nationally and viewed as part of the whole economy. What is the role of water in meeting national development objectives? What implications does water development have for other sectors of the economy? How do other national policies, particularly

agriculture, energy, forestry and trade policies, influence water demand and supply?

The second level involves water as a sector composed of subsectors such as potable water, sewerage, irrigation and drainage, hydropower, flood and drought control, navigation, recreation and commercial fishing. At this level the focus is on the assessment of water availability and the trade-offs and interactions among the subsectors. Issues concerning the optimal allocation of water among subsectors, the value of water within each subsector and the possibilities for substitution are addressed at this level.

A third level is the subsectors where each use is considered separately. At this level demand and supply forecasts are made. Much of the detailed project assessment is traditionally done at this level. Conflicts among subsectors that arise from planned subsector activities should be resolved at the second level (sector).

River basins and watersheds can provide another level which is often integrated into a comprehensive approach. Assessment of a country's water resources at the river basin and watershed levels can supplement or even replace sector and subsectoral levels. The advantage of this approach is that water is considered within its natural boundaries and cross-sectoral externalities are internalized such as the impacts of timber harvesting on downstream water projects and the impact of water projects on wetlands. To be truly comprehensive the watershed approach must include the conjunctive management of the surface water and groundwater supplies so that the total water resource is considered.

The last level is the project implementation and operational stage. This comes after either the subsector or the river basin and watershed levels.

At this stage the focus is on construction, user participation, monitoring, scheduling of water deliveries and reservoir management. Privatization and other decentralized strategies for managing water projects must be implemented at this level as well as conjunctive water management strategies.

Most countries are now at the point where they can no longer afford the loss of efficiency due to the use of a fragmented water management approach and must devise ways to consider their water resources in a comprehensive manner.

E. Privatization and the Comprehensive Approach.

Establishing a comprehensive approach will not correct many of the subsector level government failures. The heavy emphasis on public enterprises to manage and regulate water systems has resulted in inadequate water and power services because of the lack of incentives and accountability for those providing the service. For example, over 35 percent of the water in Bank supported urban water supply projects is unaccounted-for¹. In the cities of Cairo, Barranquilla, Lima, Jakarta, Mexico City and Manila over 50 percent of the water is unaccounted-for. To improve performance, increased privatization and user participation must become part of any comprehensive approach. This will require governments to shift the emphasis from directly managing water enterprises to creating the necessary institutional arrangements for non-government sector involvement in water investments and delivery and on taxing or regulating, where necessary, private or local public suppliers to prevent externalities and monopoly pricing. In general, public enterprises are not well suited to manage

¹ Unaccounted-for-water includes both physical losses of water and water that is used but the utility receives no revenues for it.

functions that involve the delivery of diverse inputs or services to numerous consumers. It is these types of activities that private sector enterprises are best suited to conduct effectively.

*natural
in a monopoly?
w/ externalities?*

117
*But have to
be regulated.*

F. Water Scarcity and Disputes Over International Water Resources

1.0 National Interest No Longer Best.

Although there is a good potential for successfully solving interdependency problems within a country by using a comprehensive approach, the same is not true for international waters. International waters are a classic case where the national interests among countries are likely to differ sharply because of unidirectional externalities. It is in this international context or in some interstate (interprovincial) situations where interdependencies cannot be internalized. Without international water rights established by treaties, countries treat the water resource as an open access resource and take little consideration of its value to other countries.

Over 200 river basins, that account for more than 50% of the land area of the earth, are shared by two or more countries. More than 280 treaties have been signed by countries on water issues. Consequently, this is no isolated issue but one that touches many developing countries from Africa to South Asia. With the growing value of water resources and the increased ability of users to consume or pollute water, international water issues can no longer be ignored.

International water problems involve groundwater as well as surface water. There are a number of cases where aquifers cross international boundaries and pumping by one country is interfering with another country's pumping or stream flows. Furthermore, water diversions in one country, that are used to

recharge an aquifer or to transfer water to another river basin, can reduce stream flows in other countries. This, of course, highlights the need to manage these international waters in a comprehensive manner.

2.0 Bank Policy.

The Bank has a standing policy for supporting projects that involve international surface water. A country developing an international surface water resource must inform other affected countries concerning its development plans and obtain their comments. If they do not, the Bank will not provide assistance for the water project. In contrast, the Bank has yet to develop a similar policy for international groundwater.

3.0 Country Response to International Water Issues.

Treaties have been the major means of dealing with international surface water issues. They have been used to establish the rights of each country to a given allocation of water. These treaties have also included provisions concerning water quality, particularly salt content. In cases where coordinated international river basin development is desired, countries have tried river basin commissions. However, the record of these river basin commissions has been mixed. They have found it difficult to coordinate water developing activities among competing countries primarily because they have few powers to enforce rules or collect fees. On the other hand, they have been more effective as a source and mechanism to collect data concerning water resources and development in a given river basin.

The Great Lakes Basin Commission in North America is a good example of a commission that is an excellent information source for the whole basin. The two countries involved, USA and Canada, have also attempted to control water development by establishing the Great Lakes Charter which is designed to regulate water withdrawals from the Great Lakes. This involves coordinating the activities of eight U.S. states and two Canadian provinces. The real test of the Charter will not come until some state or province wants to transfer and sell water from the lakes to some entity outside the basin.

Chapter 3

Strategies for Improving Water Resources Management and Development

Given the numerous potentials for market failure it is not surprising that only a few localized water markets are functioning effectively in developing countries. The lack of markets combined with the many examples of government failure makes the task of reforming the water sector especially difficult. Although a comprehensive approach must be the starting point, the details of the approach will need to vary from country to country because of the unique endowments of each country. Clearly, changes in institutional arrangements must be developed and implemented so that it is possible to make greater use of competitive market forces to improve water allocation and investments. However, since markets are not widespread, production externalities abound. Furthermore, environment externalities are prevalent even when water markets exist. Governments will have to be actively involved in helping correct for these externalities, in improving water allocation and in reducing water pollution. To accomplish this will require changes in the incentives and accountability of government agencies along with other entities in the water sector and a recognition of the long time horizon involved in water investments.

A. Reform of Water Allocation and Investment Policies.

Until recently many countries have not recognized the need to consider cross-subsectoral opportunity costs in water planning, project design, and water allocation decisions. In the past, in response to growing water demand in different subsectors, most countries have emphasized narrowly focused single subsector strategies to boost supply. As demand for water continues to grow

while the cost of new supplies accelerates, the alternative uses of existing supplies can no longer be ignored. This means that water allocation issues among subsectors are of prime concern. Conflicts occur not only over the quantity and quality of water, both received and discharged, but also over the timing of water releases and over management and allocation rules. Yet most developing countries are not equipped to resolve these conflicts and to do the analysis necessary to make efficient inter-subsectoral water allocation decisions.

A combination of activities will be necessary to address these serious water allocation issues, including greater emphasis on: demand management strategies, adopting comprehensive approaches to water utilization and supply development, utilizing market forces to allocate water and improving water information systems.

1.0 Demand Management.

As we consider these difficult water allocation questions, demand management must be given a new emphasis. Governments need to adopt strategies that emphasize water conservation and institutional arrangements and water pricing strategies for reallocating water to the highest socially valued uses.

While unregulated market forces often do not generate optimal allocations, the allocation of water through custom, law and old-style governmental command and control procedures has not worked well either. Incentives and mechanisms need to be developed and implemented that foster water conservation, improve water quality, and increase cost recovery and investment in the maintenance and operations of existing water systems. Volume based water charges, pollution charges and discharge permits are examples of demand management mechanisms that

provide incentives to conserve water and improve its quality. Their implementation should be encouraged whenever feasible.

2.0 Comprehensive Approach to Water Utilization and Supply Development.

The comprehensive approach to water management is essential if trade-offs among subsectors and the potentials for water reallocation among subsectors is to be appropriately understood and acted upon. The comprehensive approach highlights the interdependencies among the different water subsectors and makes it clear that excess water consumption in low valued uses in one subsector may place heavy costs on another subsector. The comprehensive approach also indicates how much can be gained from water reallocation and what the failure to make needed reallocations cost.

Once it has been determined that increases in supply are needed beyond what can be obtained through demand management, then supply development must proceed within a comprehensive framework. Failure to do so can lead to over-investment and redundant investments in water. By taking a comprehensive approach, individual subsector water development activities can be assessed to determine potential conflicts and complementaries. Water use in one part of the river basin must take into account the impacts it will have on users in other parts of the basin. For example, how might a hydropower dam reschedule its releases to better meet the water demands of downstream users.

3.0 Reliance on Market Forces Where Possible.

Water prices subject to competitive market forces are good signaling devices to introduce comprehensive water management considerations in water

allocation and investment decisions as well as a means to improve cost recovery. However, for water pricing to work, governments need to: (a) establish water use rights and rules or procedures for transferring and enforcing these rights (b) improve monitoring and information systems concerning individual or group water usage and (c) make system changes that facilitate water exchanges among users, i.e., construct interconnecting channels. Establishing an effective water market system may involve high transaction costs (high monitoring, transfer, enforcement and collection costs). Yet as water becomes increasingly scarce, the benefits of water markets and demand management strategies will outweigh the transaction cost of their installation.

4.0 Information for Comprehensive Water Management.

For comprehensive water management to be effective, improved information on water resources must be collected and utilized. In many cases the unreliable hydrological assessments combined with inadequate information on water demands constitute serious constraints to improved water management. This results in uneconomic investments and inappropriate water allocations among subsectors and regions. In other cases, the data have been collected by many different agencies and may not be consistent or readily available. The collection, analysis and dissemination of a comprehensive data set on water resources quality and quantity should be a high priority activity for governments.

5.0 Technologies to Improve Water Quality and Water Allocation.

Governments need to promote and provide incentives for the development and adaptation of appropriate technologies to increase water availability and the

efficiency of water allocation and distribution. These technologies will make it easier to conserve water, increase water use and conveyance efficiency and reuse waste water. As water scarcity and waste disposal problems become more acute, the importance of improving and adopting water conservation, waste water reuse and overall pollution reduction approaches will become increasingly important and profitable. Moreover, it will become more critical to develop and adapt new and improved technology for effectively monitoring water quantity and quality in many developing countries at reasonable costs.

B. Strengthening National Water Institutions and Organizations.

Institutions are defined to include laws, property rights, customs, rights and obligations of individuals and groups and rules governing the operation of governmental organizations. The set of institutions that influence a country's water resources are critical in determining how effectively its water resources are utilized. For example, water rights are critical for water markets to work effectively.

1.0 Institutional Development for Comprehensive Water Management.

Most countries have a multitude of agencies and commissions with various responsibilities for water resource development and management. Because each agency often focuses on only one use such as irrigation, water supply or hydropower it is critical that governments develop strategies to overcome the deficiencies of this fragmented approach. Institutional arrangements need to be developed that encourage water agencies to exchange information and communicate

with one another on a regular basis and engage in joint planning and sometimes exchange water rights.

To implement a comprehensive approach for water management institutional arrangements will have to be modified in most countries. Roles, functions and responsibilities will have to be altered and substantial changes made in how various water subsector agencies relate to one another.

Two principles should govern the formulation of the comprehensive framework. First the need to build a comprehensive or coordinating framework that considers water demands across all subsectors and assesses the supplies available to meet water demands. Second, this comprehensive approach does not mean that all water management decisions must be centralized. Rather, the emphasis should be on providing water supply entities with the proper signals and on giving water users (farmers, industries, cities) greater responsibility for water management decisions at the local level. The central government should focus on developing a comprehensive water resources strategy and framework, on resolving often conflicting interests, on minimizing externalities and on fostering complementary arrangements by developing appropriate legal, regulatory and incentive systems. The idea is to separate the management functions so that the oversight and enforcement functions are separate from operations. This will reduce conflicts of interest and opportunities for rent seeking while at the same time central governments can exercise their authority to reduce externalities and benefit from returns to scale. This does not rule out cases where due to investment size or its public good nature direct government control is necessary.

This approach represents a major departure from current practices and thinking in two respects. First, water is currently treated in a fragmented way

both by borrowing countries and in the Bank. Second, the standard administrative response to such "market failures" has been to pass all responsibility to central government agencies, rather than having a more limited role for central governments and a greater reliance on the private sector, local units of government, public utilities and water user organizations.

2.0 Water Rights and Water Allocation Mechanisms.

Because water is mobile and highly variable in time, space and quality, it is difficult to establish exclusive property rights for given quantities and qualities of water. In addition, the inability, in many areas, to monitor water use makes it difficult to establish water markets and to have users pay according to the quantity of the resource received. Governments need to establish water rights where feasible, to arrange for monitoring of water use and to encourage greater cooperative community management of water resources when water is an open access or common property resource.

3.0 Institutional Arrangements to Correct Market Failures and Accommodate Water Transfers Among Subsectors.

Institutional arrangements also need to be developed to correct for market failure and increase the opportunities for transferring water among subsectors. In many cases this will require changes in water law and government water allocation rules. One of the typical sources of market failures in arid environments is the uncertainty regarding water supply due to highly variable rainfall and stream flows. An effective means of addressing this market failure is to establish prior water rights or allocation rules. Thus certain critical

high valued domestic uses would receive first priority while selected low valued agricultural crops might have low priority. A number of water systems have developed rules for water allocation during drought periods.

Externalities are another important market failure in water use and transfers. Here the key problems are changes in the quantity of return flows due to water transfers or changes in the quality of discharge into water bodies. Both of these problems can be corrected by imposing and enforcing a rule or law which prohibits appreciable damages to other users on the water body. The no appreciable damage rule can be applied to streams or aquifers both in terms of quantities of water withdrawn and polluting materials discharged. For water transfers it might mean that only consumptive uses could be transferred while for pollution it might mean a set level of waste treatment before discharge or compensation for those damaged.

4.0 Reorient Water Agencies.

As pointed out above the command and control administrative structure of many water agencies has often not been effective in obtaining a high level of efficiency in overall water resource management. Many investments have low rates of return, fail to service even half of the estimated service area and are rapidly deteriorating because of poor construction and maintenance. To deal with these problems most water agencies need to be made more accountable to water users. This usually means a greater transparency and decentralization of decisions which in turn require establishing water user organizations, private water utilities or developing other decentralized organizational arrangements where water allocation decisions are closer to the users (who actually have a

voice in the decisions). This will also require establishing an incentive system for water managers that rewards good performance and penalizes poor performance. One direct way of doing this is to let the water users have a significant voice in oversight boards with powers to hire and fire water managers. Another ingredient is to make water agencies totally dependent on user fees for their operation and maintenance activities.

5.0 Water User Participation.

Where it is difficult or costly to establish and enforce private water rights, it is critical that water users participate in water management decisions. Women must be included as key participants because of their important roles in water use. Governments need to make such participation both easy and rewarding. Effective water user participation occurs when the rewards from improved water management are clear and sizeable. Mechanisms must be developed so that users can participate in planning, and management (including maintenance) decisions. In fact, participation in decision making should be closely tied to water users contribution to project costs. If water projects are built to accommodate their needs, users will be much more willing to pay for project construction, operation and maintenance costs.

C. Protecting Water Supplies from Pollutants.

To reduce the health risks from water and to lower treatment costs, more has to be done to protect water supplies. In many cases preventing water pollution is less expensive for society than cleaning up after the pollution has occurred. Thus countries need to develop mechanisms and incentives that

encourage water users not to pollute water supplies. Such incentives and mechanisms could include taxes, fines, penalties, restrictions on land use and bans on the use of certain chemicals.

1.0 Watershed and Land Use Policies

In the development and planning of water investments one of the critical and neglected areas is the watersheds that supply much of the water for reservoirs, lakes, wetlands, rivers and groundwater recharge. It is from these watersheds that the silt comes that is filling up reservoirs through out the developing world. Managing these watersheds is critical for the success of many water projects. If land use practices are not improved in these watersheds many water projects will have their economic lives cut drastically. Government must develop incentives and programs that improve land use in some watersheds and reduce or limit their use in others. In some cases, this may mean changing government policies that currently encourage inappropriate mining and exploitation of timber. In others, it may mean changing agricultural development policy so that more opportunities are made available for intensive farming in the flood plain and thus reduce pressure on upland watersheds. Sometimes it may entail legitimizing existing indigenous forest management schemes.

Agriculture, forestry and mining, including road building that facilitates these activities, are the major land use activities in upper watersheds that cause problems for water projects. Thus governments must adopt policies in these other sectors that require them to internalize the externalities they create. Soil conservation practices should be promoted through technical assistance, subsidies and educational programs. Changes in timber harvesting, in line with

the Bank's new forest policy, and in forestry practices such as the use of buffer strips and selective cutting must be promoted. Finally, road building practices must be improved and take into account the impacts they have on soil erosion, water flows and the opening up of previously inaccessible areas.

The important lesson to be learned from past land use practices is that their impact on water resources has too often been ignored. This has reduced biodiversity and caused extensive pollution of water resources, drainage of important wetlands and damage to water projects. Therefore, it is essential that land use policies and practices be included as part of any country's comprehensive water resource management program. In many cases, what happens in the upper watershed determines the success of downstream water investments.

2.0 Urban Waste Treatment.

To reduce the cost of urban waste treatment, industries should be given incentives to reduce their waste loads. Governments must develop taxes, regulations and other incentives that encourage firms to conserve, recycle and reuse water and adopt practices that are less polluting. Studies have shown that at relatively little extra cost, technologies can be selected that are much less polluting than those currently being used in many developing countries.

Even if firms are encouraged to reduce their waste loads, there will continue to be a sizeable need to treat and reuse the waste coming from urban areas. Many urban areas collect but do not treat the waste generated. One key issue is the cost involved in providing adequate treatment for the waste load generated in most cities. Methods must be developed that not only reduce waste loads but also lower treatment costs and encourage reuse of waste water.

However, this will be difficult under the current public management structure for water systems. Inefficient and high cost public entities manage most of the urban water supply and waste treatment facilities. If done correctly, privatization of the management and even ownership of these facilities can improve water supply and waste treatment plant performance and reduce the cost of providing services. To be able to privatize these facilities institutional arrangements will need to be in place that support the change. Government's role will be to provide the necessary institutional arrangements, to set and enforce water quality standards, to provide incentives for investment in waste water reuse, to regulate prices so as to restrain monopoly profits and to help assure adequate investments in water facilities.

In some areas, community based water and waste disposal systems will be the cost effective system. For these systems, governments can provide technical assistance, help in organizing users and provide a legal basis for these communities to organize and charge local beneficiaries. Ownership and basic responsibility must rest with the communities and water users.

3.0 Change Private Incentives that Encourage Pollution.

In most developing countries sources of water are open access in terms of water pollution, i.e., firms, individuals and government agencies are free to dump whatever they want into rivers, lakes, reservoirs or aquifers. These water sources have been a cheap place for the disposal of waste materials.

Thus a key step governments need to take is to establish standards or rights to certain levels of water quality. The next step is to charge or regulate those who want to use water bodies as sewers. Marketable permits could

be used to specify the amount, timing and place of disposal. Finally, governments must enforce the water quality standards and rights they establish. They might even receive monitoring assistance in their enforcement efforts from those firms that have purchased the right to dispose of waste materials. For competitive reasons these firms will not want others who have not paid for the right, to pollute, to discharge waste materials free of charge. Non-governmental organizations could also be employed to assist with monitoring and regulation.

D. Resolving International Disputes Over Water.

The water problems associated with international water are essentially the same as those discussed above with the added complication of multinational uses of the same water source. Problems that seem difficult in a national context are doubly difficult from a multinational perspective. The pursuit of national interests does not take into account the interests of other nations. Cooperation, however, can produce outcomes which benefit all the nations involved.

Cooperation and mechanisms for fostering cooperation and bargaining are essential. In many cases outside help may be needed to encourage cooperation and bargaining or, at least, to help resolve conflict. In fact, it is in the international context where mechanisms for conflict resolution are critically needed.

1.0 River Basin Organizations.

One organizational arrangement that has had limited success in the international arena is the river basin organization. But in most cases, these

organizations have not been given enough power to coordinate activities within the river basin. This has meant that individual country priorities have overridden priorities for the basin taken as a whole.

Countries must recognize the importance of interdependencies that exist on international waters and participate in international organizations such as river basin commissions to reduce negative externalities. In many cases through cooperation the whole region can benefit while no country is damaged. Where damages occur in one or two countries while the rest benefit, compensation mechanisms need to be developed to assist the losers. If this is not done the losers could block progress in the region.

2.0 International Water Rights and Conflict Resolution.

Many developing countries have difficulty in establishing water rights, let alone addressing the question of international water rights. To the extent international water rights exist they have been established by treaties. Such treaties usually arise from one country's desire to develop an international water source (river, lake or aquifer). The treaties are usually agreed upon to establish the water rights of the country conducting the water development while compensating countries that might be damaged. As water becomes increasingly scarce there will be increased pressure for treaties covering international waters. International organizations should take leadership in encouraging countries to enter into agreements with other affected parties.

Incentives for cooperating and resolving water conflicts between countries are difficult to develop. International organizations and foundations as well as large donor countries could play important roles in providing needed

incentives to cooperate. They could provide funds for international water planning and investment and even give grants contingent on the cooperative management of international waters. They should support data collection efforts concerning international water resources and the demands for their use.

Chapter 4

Bank's Role in Water Resources Management and Development

A. Introduction to Comprehensive Water Management.

The Bank's involvement in a country's water resources management and development will be designed to support a comprehensive approach aimed at promoting sustainable economic growth and improving the quality of life. Because of the interdependencies among sectors and the impact of other sectors on water resources, the Bank will pay specific attention to water resources planning and management issues as part of its general policy dialogue and country assistance strategies. In particular, the Bank's development efforts which include support for rational population policies and for rural and urban development will prevent even greater pressures from haunting water resource managers.

Within the comprehensive framework, water resources have to be conceived and managed with full consideration given to the interrelationships among water, soil and vegetation as well as the temporal variations of water availability and the impacts of human activities. For example, land use practices in upper watersheds and activities that change wetlands can have important impacts on water investment elsewhere in the river basin. Furthermore, the numerous water-related environmental and health concerns should be addressed as part of the comprehensive water management system. These need to be handled, from the earliest planning stage, in a transparent, cooperative, collaborative and comprehensive manner with all those involved or affected.

B. Bank's Support of Country Activities for Water Resources.

Given a borrowing country's commitment to a comprehensive approach to water resources management, the Bank will promote and assist it with analysis and action on three broad water issues:

1. Policy reform for improving water allocations, investment and related environmental policies;
2. Institutional and organizational capacity building and reform; and
3. Management of shared international waters.

1.0 Policy Reform for Improving Water Allocation, Investment and Environmental Policies.

1.1 In its efforts directly related to the water sector, the Bank recognizes the uniqueness of each country but views a comprehensive approach to water resource development, which includes demand management, as essential for dealing with the water sectors of most member countries.

- The Bank will assist countries in developing a comprehensive framework to evaluate the range of water resource policy options. The development of such a framework will involve participation of many actors in different sectors and at different levels (international, national, regional and local, both private and public) which have a significant role in water and related issues. Within this framework water supply options must be compared with demand management alternatives. In addition, different management alternatives should be considered including user management and private utilities.

- The Bank will assist countries in conducting national water resource assessments and in implementing a comprehensive approach to water resource management and development. In these efforts the Bank will coordinate and collaborate with U.N. specialized agencies and other bilateral and multilateral donor agencies.
- The Bank will promote the use of a broad based watershed management framework as an important part of the comprehensive water management approach, incorporating strategies and plans dealing with land use, water quality, biodiversity, flood control and drought problems.
- Finally, as part of a comprehensive approach the Bank will assist governments in developing strategies and cost effective mechanisms for ecologically sustainable management and/or restoration of environmental quality of river basins, wetlands and other water bodies including waste water reuse. In terms of its own activities the Bank will implement its policies for environmental assessment of projects as well as for resettlement.

1.2 Both supply and demand issues arise in the allocation of water. Economic efficiency criteria are of paramount importance. But such efficiency may need to be modified by social, political, and institutional considerations. Because externalities and increasing returns to scale are prevalent in water projects, government involvement through taxation and regulation will be necessary. Furthermore, in cases of public goods, extreme externalities or very large investments, direct government control may be required.

- The Bank will assist governments in developing an overall strategy (including appropriate incentives and institutional incentive and

regulatory arrangements) which will result in an efficient and flexible allocation of water resources among users and across subsectors, given development objectives, policy priorities and physical constraints. The strategies and related policies will involve both supply and demand management considerations. In particular water pricing will be promoted to effectively signal the opportunity cost of water (thereby allowing efficient allocation) and to increase net revenues generated by water projects.

- The Bank will support country efforts to adopt and utilize appropriate methodologies for project appraisal and evaluation based on economic and environmental criteria that will incorporate multi-subsectoral considerations.

1.3 Water pollution is a major cause of water-borne diseases, especially in densely-populated urban areas. The provision of waste disposal facilities lags far behind the provision of water supply in all developing countries. There is also the growing problem of industrial wastes which are adding new difficulties to wastewater treatment efforts.

- The Bank will support governments in placing greater emphasis on sanitation and wastewater collection and treatment. Given that the required investments are massive, the Bank will stimulate efforts to develop innovative technical, financial and institutional approaches (including greater involvement of the private sector), with the objective to reduce unit costs and ensure efficient delivery and management of services. In the case of industrial waste the emphasis will be on efforts to collect, reuse or reduce the effluents at their

source. Special efforts will be made to protect groundwater from salination, pesticides and other chemical pollutants. Finally, the Bank will encourage the development of pilot programs in water resources management to obtain practical experience in promoting and adapting environmentally sound technologies and in strengthening country-specific policy and institutional frameworks to support prudent environmental management.

1.4 There is a need to support technology that will aid in comprehensive water resources management. In many cases, the unreliability of hydrological assessments and the resulting lack of knowledge of surface water and groundwater quantity and quality constitute a serious constraint and can lead to uneconomic investments and inefficient allocation of water among different subsectors and regions. Accordingly,

- The Bank will promote the creation or strengthening of an adequate hydrological and hydrogeological database for both groundwater and surface water where necessary. In this context, the Bank will support the use of modern technologies for hydrological monitoring, surveys, and data processing, whenever applicable, bearing in mind the cost of more detailed information as compared to the benefits.

1.5 Water availability can be increased through a series of technological measures, such as water conservation (structural measures, adaption of vegetative cover, etc.), increased efficiency of water use and conveyance, and reuse of wastewater. Moreover, standard treatment methods and water quality monitoring are inadequate in many developing countries. Accordingly,

- The Bank will, together with other donors and countries, promote and support R&D in technology generation and adaptation that will modernize irrigation distribution systems and improve water use efficiencies, sustainability, operation and maintenance.
- The Bank will support countries in their efforts to adapt cost-effective technologies and procedures for improved water supply and pollution control and for strengthening water quality monitoring.

2.0 Institutional and Organization Capacity Building and Reform.

2.1 The Bank's support for formulation of a comprehensive framework for implementing water management programs will have major implications in terms of the roles, functions and training critical to the management of various production and distribution elements in water related subsectors. To be effective, institutional arrangements, in many cases, will have to be modified to facilitate a comprehensive approach to water management.

- Governments need to evaluate their institutional structure, define the roles and responsibilities of various actors, and strengthen the capacity of the various actors to execute their responsibilities within a long time horizon. The Bank will assist governments in these endeavors and support their efforts to establish institutional structures which are capable of designing, monitoring and enforcing water policies conforming with a comprehensive approach to water management and development. Important elements of the institutional structure are formal and informal mechanisms for conflict resolution,

including laws and regulations covering various aspects of water resources management and water markets.

- The Bank will need to adopt internal procedures and structures to ensure that its water sector activities for a country (or a group of countries in case of shared river basins) are treated in a comprehensive manner.

2.2 The overload due to complexity of functions and the fiscal pressures on government make it imperative that the public sector focus on creating the economic and institutional environment for private and non-government entities to operate efficiently and on improving efficiency through the regulation and supervision of water resources.

- Accordingly, in addition to helping countries develop required regulatory and supervisory frameworks and institutions, the Bank will support the transfer of public sector functions to private and nongovernmental institutions depending on the respective capabilities of the principal agents. In delegating or contracting out activities to the private sector, steps will be taken to ensure their accountability for performance.

2.3 Cost recovery from beneficiaries and water pricing have traditionally been difficult in many parts of the water sector. For some categories (flood control) this is because these are classic "public goods" for which cost recovery or pricing is not usually feasible. For other categories (irrigation) the case for cost recovery and water pricing is theoretically justified, when water is actually delivered on a regular basis, but implementation has been hindered by

overall price distortions, and by practical difficulties in monitoring, charging and collecting for services.

- The Bank will support implementation of institutional and organizational arrangements that are effective in increasing the portion of water project costs paid by beneficiaries. These include assigning fee collection responsibilities to those delivering the water, using water fees only to operate, improve and maintain water projects, and giving water users control over water system managers.

2.4 Integrated water resources management requires upgrading the skills of policy analysts, planners, and managers of the various departments of governments and other agencies. Accordingly,

- The Bank will support training necessary for dealing with cross subsectoral analysis, conflict resolution, environmental assessment, economic policy analysis and legal, regulatory and privatization issues and for developing any other skills needed to effectively implement a comprehensive approach to water resources management in all agencies dealing with water resources.

3.0 Cooperation in Management of Shared International Waters.

3.1 There is considerable support for a more proactive role on the part of the Bank in the management of international water systems. Consequently,

- The Bank will assist governments, in response to their requests and without involvement in political decisions, in setting up or strengthening mechanisms to coordinate water management and development activities, such as river basin organizations, through technical and

legal assistance. The Bank will also support studies and consultations that will review available organizational arrangements and propose alternative institutional solutions.

3.2 While a legal basis exists for developing new investments involving transnational surface water resources, similar legal principles need to be formulated for transnational groundwater resources. Accordingly,

- The Bank will prepare operational guidelines for projects involving the utilization of internationally shared groundwater. The Bank will also promote measures in project preparation and conflict resolution that will facilitate planning and efficient conjunctive use of surface and groundwater resources. Particular caution will be applied in the case of nonrenewable groundwater and in cases where pollution problems may be acute.

C. Principles for Bank Involvement in Water Development.

1.1 Water resources management frequently involves difficult political choices. Commitments by governments are essential for implementing a comprehensive approach to water resources management and for the policy and institutional reforms required. Accordingly,

- The Bank will not undertake significant activities in the water sector of a country unless there is substantiated commitment by government for sustainable implementation of comprehensive water resource policies and programs.
- The Bank will support significant water-related investments in a country only if a comprehensive water resource strategy has been

formulated and the institutional capacity is in place to support the implementation of such a strategy. When the organizational and institutional arrangements are inadequate, the Bank will support a significant effort to build the necessary institutional capacities. In the transitional period local capacity will be supplemented with outside expertise.

- The Bank will support significant water investments only in countries where data is adequate to assess the technical, economic and environmental implications of the proposed investments within and across subsectors. When data is inadequate, the Bank will focus its efforts on assisting countries in building information systems to support sound water investment and management decisions.

1.2 Most internationally shared waters pose especially difficult management problems since no one country is faced with all the benefits and costs of its own water development activities.

- The Bank will not support water activities which affect international waters unless all affected countries have had an opportunity to review and comment on the proposed activities.